Hamid M. K. Al Naimiy ·
Maamar Bettayeb ·
Hussein M. Elmehdi ·
Ihsan Shehadi *Editors*

Future Trends in Education Post COVID-19

Teaching, Learning and Skills Driven Curriculum

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Editors
Hamid M. K. Al Naimiy
University of Sharjah
Sharjah, United Arab Emirates

Maamar Bettayeb
University of Sharjah
Sharjah, United Arab Emirates

Hussein M. Elmehdi
University of Sharjah
Sharjah, United Arab Emirates

Ihsan Shehadi
University of Sharjah
Sharjah, United Arab Emirates

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Foreword by Prof. M Omar

"The papers presented in this edited book cover many aspects of the educational process in the post COVID-19 period. Education shall not be the same as it is evident through the research work that is endorsed in the proceeding of this important conference. The papers cover a wide spectrum of educational aspects from instructional methodologies, data analysis, accreditation updates and policies, application of Al in course delivery and assessment, academic planning to sharing case studies and expertise. Hence, this edited book can be a valuable reference for much educational research for years to come."

Prof. M Omar
University of Manitoba
Winnipeg, Canada

Foreword by Prof. Labeeb Ahmed Bsoul

The COVID-19 pandemic not only changed the pace of daily life, habits, and social behaviors around the world but it also carried benefits and contributed to creating new positives and behaviors that would not have occurred without the emergence of this virus, and this was evident in the radical transformations of sectors such as distance learning via technology and conferences, as well as accelerating technical institution programs in many industries that are coming up with new ideas at a record rate. They are also building new digital solutions to connect with each other, serve their clients, students, and peers, and stay profitable. Despite the frustrating situation due to the repercussions of the pandemic, this humanitarian crisis highlighted multiple positive aspects and contributed to creating successful alternatives in various sectors, which were explored in the session "Models in the Post-Pandemic Era", as is evidenced by the studies in this volume.

Prof. Labeeb Ahmed Bsoul
Khalifa University
Abu Dhabi, United Arab Emirates

Preface

Although the COVID-19 pandemic has posed many challenges, it has equally opened the door for unprecedented opportunities in education. Innovative approaches and methodologies have been introduced in instructional delivery, teaching, and learning that have the potential to transform education through updating curriculum with program outcomes that focus on employment readiness and enhancing skills which are essential for the ever-evolving job market.

Moreover, technology utilization beyond traditional trends has proven to be effective in improving the quality of education and achieving the expected program outcomes and objectives. Educational theorists unanimously agree that post COVID-19 requires revising the current program curriculum including course design and delivery, assessment, and instructional methodologies.

The Sharjah International Conference on "Education in Post COVID-19" came at a time when institutions are planning for the post-COVID-19 era. The main objective of institutions around the world is to see how they can utilize the financial resources, efforts, and time they have invested in developing the required infrastructure, systems, and professional development and training during the pandemic. In addition, a full-scale evaluation is needed to assess the effectiveness of teaching and learning approaches during the pandemic. It is well-understood that there are many factors that contribute to the success of implementing any new teaching and learning approaches, which necessitates the collective efforts of institutions around the world to share and exchange knowledge and expertise. Several teaching and learning models have been developed during the pandemic, and it is of paramount importance to assess their effectiveness albeit pedagogical or in tangible areas such as students' satisfaction, students' experience, and much more. The Conference has aimed at bringing together the leading academics, scholars, and researchers in a very stimulating hybrid setting to tackle challenges that have been encountered during the pandemic and discuss the readiness of academic institutions for education in the post-COVID-19 time.

The themes of the conference and topics include

- Curriculum reform and update

- Assessment reliability.
- AI and machine learning in education, instructional methodologies, and assessments.
- Employability readiness and skills
- Current trends in academic programs—interdisciplinary and multidisciplinary
- Curriculum research and development
- Educational policies
- Modified hybrid and blended teaching and learning models.
- Effective technologies in the classroom settings
- Innovative educational practices
- Innovative solutions for practical modules and labs
- Pandemic-based educational research
- Education for the determined and diverse populaces
- Accreditation requirements for hybrid and online degrees
- Student-centric education.

Over 150 papers were presented during the conference, and scholars were given the opportunity to submit their papers for publication in this special volume entitled "Education in Post COVID-19: Lessons Learnt and Future Pedagogical Trends". All papers have gone through rigorous international standards reviews, which have included at least two experts in the field, plus similarity and plagiarism checks as well as language. The twenty-five chapters which are to be published in this edited book (volume) represent 27% of the total manuscripts which have been submitted to the "The Sharjah International Conference on Education in Post COVID-19 (SHJ-EDU22)-Future Trends in Teaching and Learning: Employability & Skills Driven Curriculum.

The chapters in this book cover case studies, models, and reviews of original collaborative research work conducted in over 21 institutions in the Gulf and Middle East hence making this volume unique in presenting a comprehensive overview of the educational landscape during the pandemic and provide an outlook on new evolving trends in academia, with an emphasis on technologically driven teaching and learning models.

The edited book is in line with the strategic goals of the University of Sharjah, which highlight the importance of scientific and educational research in serving the scientific community at the national, regional, or international levels. The editorial board have been working diligently to ensure that the chapters contribute to the noble goal of preparing academic institutions for a post-COVID-19 era.

Sharjah, United Arab Emirates

Hamid M. K. Al Naimiy
Maamar Bettayeb
Hussein M. Elmehdi
Ihsan Shehadi

Contents

About the Editors

Hamid M. K. Al Naimiy Chancellor of the University of Sharjah, General Director and Founder of the Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST) and President of the Arab Union for Astronomy and Space Sciences (AUASS) in the United Arab Emirates, is a renowned scientist in the fields of astronomy and astrophysics and a leader in education. He has held numerous senior level administrative positions, including Academic Department Chair, Dean of the College of Arts and Sciences, and Vice Chancellor for Academic Affairs, in addition to his current positions. He has served as the chief/associate editor for over 10 journals and edited books and has been a keynote speaker at more than 250 national and international conferences, symposia, and workshops, including the IAU conference. He has published more than 30 books (in the fields of astronomy, space sciences and education), authored over 800 scientific articles, published in newspapers, magazines and journals, and refereed over 130 publications in indexed journals. Professor Al Naimiy has been the recipient of numerous awards, including the prestigious Khalifa Award for Education 2009/2010 (in the field of higher education), UAE, and the IAU and UNESCO Award for Outstanding Contribution to the Success of the International Year of Astronomy 2009.

Maamar Bettayeb received his Ph.D. in Electrical Engineering from University of Southern California, Los Angeles, in 1981. He has been Professor at University of Sharjah UAE since August 2000. He also held key leadership positions including Advisor to the Chancellor for Graduate Studies and Scientific Research (2004–2006), Director of Research and Studies Center (2005/2006) and Vice Chancellor for Research and Graduate Studies at University of Sharjah (UOS), starting September 2014. He was the chair and co-chair, chair of organizing and scientific committee of several key international conference, e.g., ISSPA 2007, SHJEDU2022. He was Associate Editor of the International Journal of Modeling, Identification and Control. He was the leader of intelligent systems research group at UOS. He also led the development of the Strategic Planning for Research at University of Sharjah. He has published over 350 journal and conference papers in the fields of control and signal processing.

Hussein M. Elmehdi is the Dean of Academic Support Services and an Associate Professor of Biomedical Physics at the Department of Applied Physics and Astronomy. He obtained his Ph.D. in 2001 from the University of Manitoba, Canada in Biomedical Physics. He joined the University of Sharjah (UOS) in Feb 2005 as a Biomedical Physicist. Dr. Elmehdi is very active in several research areas covering biomedical applications of ultrasound, environmental acoustics, health & environmental physics, online education and remote learning. Dr. Elmehdi is participating several well-funded international and national research projects. Dr. Elmehdi has over 100 refereed publications in high impact factor journals, well-known international conferences and book chapters as well as two registered patents. He is the chief scientific judge at the Emirates Foundation for Youth Development and Ministry of Educations. He has received numerous excellence awards and recognitions in research, teaching and community services. Among these awards are the prestigious UoS Excellence Award in Research (2014); UoS Excellence Award in Teaching (2015, 2012); UoS Excellence Award in Community Services (2011), Transformational Leadership Awards (Tahawil Tech) 2020, UOS Excellence Award in Leadership (2021).

Ihsan Shehadi earned his Bachelor's degree from the American University of Beirut, Lebanon, and his Ph.D. degree in Physical Chemistry from Northeastern University, Boston- Massachusetts, U.S.A. Dr. Shehadi have published more than 55 peer evaluated research papers in reputable international journals and conference proceedings in the areas of physical chemistry, computational chemistry chemical education and heterogeneous catalysis. During the past few years, his research is focusing using computational chemistry and bioinformatics tools (Docking, Molecular Dynamic simulations, sequence alignments, active sites searches, structural genomics) to search for potential inhibitors for selected enzymes. He had numerous contributions in developing curricula, experiments, assessment tools and instructional methodologies in chemical science. During his academic career he contributed heavily in the organization of many events as conferences, competitions, students' supervision at the graduate and undergraduate levels, workshops, etc.

Impact of Innovative Practices Adopted in the Dental Preclinical Labs Post COVID-19 on Student Performance Based on Skills and Knowledge

Sangeetha Narasimhan, Hiba Saad Al-Daghestani, and Sausan Al Kawas

Abstract The coronavirus-induced disease (COVID-19) was declared a pandemic by the World Health Organization (WHO) on the March 11, 2020. This Pandemic has resulted in the largest disruption of the education sector across the globe. Alternatively, this crisis has also induced path-breaking reforms to the global education system in the recent past. With evolving technology, online teaching has become the most convenient mode for lectures and discussions. This acute transformation caused a challenging environment to conduct laboratory sessions for students by adhering to social distancing. Alternatively, delivering the preclinical dental laboratory exercises through online mode was the only available option globally. This paper enlightens a few of the innovative techniques employed in conducting online preclinical dental laboratory sessions for the Bachelor of Dental Surgery (BDS) students in the College of Dental Medicine at University of Sharjah. The study aimed at comparing the student performance in the dental preclinical labs evaluated based on skills and knowledge before and after the introduction of the innovative practices by online mode. The results of the study showed that the BDS1 students' overall performance in the preclinical labs after adopting innovative practices was higher ($p = 0.000$) compared to the original practice of onsite delivery of labs. Students displayed enhanced tooth-carving skills ($p = 0.000$) with the introduction of online monitoring of tooth morphology labs. Moreover, BDS2 student performance in dental histology and anatomy labs did not show any significant improvement through the online mode of teaching ($p = 0.01$). Although COVID-19 hit the world abruptly, it helped in creating digital innovative solutions, thereby easing the teaching and learning process in dental education.

Keywords Dental education · Online learning · Digital slides · Pandemic

S. Narasimhan (✉) · H. S. Al-Daghestani · S. Al Kawas
Department of Craniofacial Health Sciences, College of Dental Medicine, University of Sharjah, Sharjah, United Arab Emirates
e-mail: snarasimhan@sharjah.ac.ae

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1 Introduction

The COVID-19 pandemic has hugely affected the health and socioeconomic status of the globe. Partial and complete lockdowns were imposed in many countries across the world to curb the spread of the virus [1]. The global education sector experienced an intense interruption of teaching and learning during this pandemic. Institutions suddenly underwent a change in thinking from an onsite to an online mode of teaching to preserve the continuity of education [2]. The eventful impact of this acute change on student education was of high-level concern [3]. Dental care providers experienced the highest professional risk for transmission on account of their proximity to the patients and using dental equipment that generates aerosol. Many dental clinics and schools were temporally shut down [4]. Dental students were particularly affected, and student training was completely ceased [5].

The dental curriculum is vast and diverse. It embodies three domains, namely academics, technical skills, and critical thinking that are delivered in an integrated manner [6]. Though the last 3 years of the dentistry course is patient-centered, the initial 2 years of training is exclusively preclinical [7, 8]. Successful accomplishment of delivery of the lab objectives mandates an ultimate prerequisite of students' physical presence in the preclinical laboratories [9]. Strict COVID-19 protocols were implemented to protect the health and safety of students and educators thereby limiting the number of students attending dental clinics and labs concurrently [10]. Complications still exist in training the students on practical skills using the online mode of teaching as online courses provide minimal practical training content. With the long-standing situation of the pandemic, online education continues to be an integral part of teaching institutions [11]. The introduction of the community vaccination programs facilitated many universities to adopt hybrid and blended modes of teaching that involved both online and on-campus instruction. Asynchronous online learning facilitates the students to learn at their own pace and have control over their learning process [12]. However, the effect of these modes on the preclinical aspects of dental education is not thoroughly studied. Numerous studies have been conducted during the pandemic to study the dental student experience, perception, and attitude toward integrated teaching methods, however, very few studies were published regarding performance and assessments in preclinical lab training pre- and post COVID-19.

With the lockdown due to COVID-19, the College of Dental Medicine, University of Sharjah suspended all the onsite classes and labs during the second week of March 2020. Adhering to social distancing protocol, the dental clinics and labs resumed later in September 2020 with one-fourth of the capacity of students. Lectures continued to be online for the entire academic year 2020–21. Many innovative ideas were proposed for conducting the preclinical labs by hybrid and blended modes of teaching. This paper highlights the various tools used in the successful delivery of preclinical dental lab exercises to BDS students during the COVID-19 pandemic. The study aimed at comparing the student performance in the dental preclinical labs evaluated based on skills and knowledge before and after the introduction of the innovative practices by online mode.

2 Materials and Methods

2.1 Study Sample

The study was conducted at the College of Dental Medicine, University of Sharjah. All the first year and second year BDS students (n = 251) involved in the preclinical dental training were included in the study. The study consists of four cohorts. The control groups comprised the BDS1 and BDS2 students of the academic year 2019–2020 who underwent traditional methods of lab teaching before the pandemic. The other two groups consisted of students from the 2020–2021 batch who experienced online methods of delivery for the lab curriculum. Students were divided into small groups of 10–12 students each. While 2 groups attended the lab onsite, all the other groups were taught by the online modes concurrently. To ensure fair distribution, the groups were rotated every week.

2.2 Innovative Practices Followed in Preclinical Labs

Blackboard was used as the e-learning platform for delivering all online laboratory sessions and conducting quizzes and assessments to the students. Small group student engagement was performed using Microsoft Teams meetings. An education document camera from Epson (ELPDC21) was procured for tooth morphology, osteology, and anatomy demonstrations. The Epson document camera is an exclusive user-friendly, lightweight portable device with a 12× optical zoom and 10× digital zoom with a 30-frames-per-second screen refresh rate and a larger capture area (see Fig. 1). It carries a built-in LED light that illuminates and enhances the intricate details of the study specimen. In addition, it is also provided with a microscopic attachment that can be fitted to the ocular lens of a microscope. It generates full HD images and videos that can be directly shared to the computer through the USB port and to a larger display screen through the projector cable. An Olympus microscope provisioned with optical camera attachment (DP22-CU) and imaging software (cellSens) was employed for a live demonstration of histology slides (see Fig. 2).

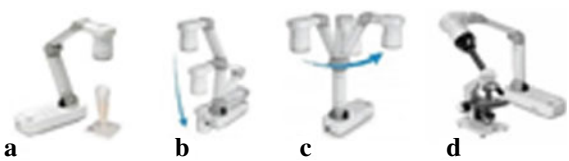

Fig. 1 Epson (ELPDC21) education document camera with **a** Built-in LED light to focus on object; **b** Height adjustment provision; **c** Flexible rotation facility; **d** Microscopic attachment (reproduced from Epson.com)

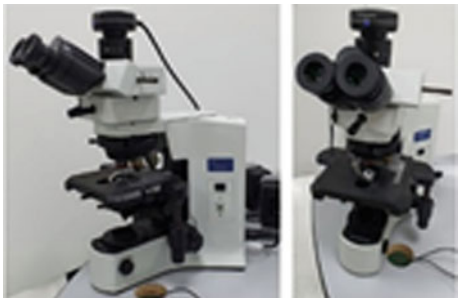

Fig. 2 Olympus BX14 microscope with DP22 optical camera attachment

2.3 General and Dental Anatomy Labs

The ELPDC21 camera was used to demonstrate the anatomical landmarks of tooth, bones, and head and neck models. For the tooth identification exercises, both the large and life-size tooth models were used for description. The larger models were fixed in a position under the camera, and the flexible camera head was moved around the models for complete visualization of the tooth (see Fig. 3). Alternatively, for the smaller teeth models, the tooth was moved with the camera in a fixed position. High optical and digital zoom provisions of the camera enhanced magnification and the clear visualization of the occlusal details of the tooth. A step-by-step live demonstration of tooth carving was rendered to the students using the document camera. The students carved the tooth models from wax blocks simultaneously, while the teacher demonstrated every step using the document camera. The student's work was instantly shared with the instructors by enabling the student as moderators on the Blackboard Collaborate live sessions or Microsoft Teams meetings. Comments and corrections were given to the students at every stage of the carving exercises by their respective mentors.

The live laboratory sessions of basic anatomy and osteology of the head and neck were delivered following consecutive online lectures. The bones and anatomy models were placed under the above-described Epson camera for demonstration of the landmarks (see Fig. 4). Intricate details of the models were shown to the students

Fig. 3 Depicting the demonstration of tooth models using the Epson education camera

Fig. 4 Depicting the demonstration of anatomy models using the Epson education camera

using the zoom and freeze options of the camera. In addition, color-coded models were used to enhance orientation and identification.

2.4 General and Dental Histology Labs

With the available resources, we experimented with two online methods to live telecast the slides to the students through Blackboard Collaborate. In the first method, we used an Olympus microscope with an accessary optical camera attachment (DP22-CU) and imaging software (cellSens). During the online live sessions, the histology slides were navigated in a Z-like manner, and the whole tissue sections were shown to the students in a continuous sequence. Enhancement of the resolution and magnification of specific regions of the tissues was facilitated through the software adjustments provided with the camera attachment. Second, the Epson camera's microscopic attachment was connected to the compound microscope and the imaging was directly shared to the students using either Teams or Blackboard application. Further, these live demonstrations were also recorded for the future reference of the students.

2.5 Laboratory Assessments

The formative assessments consisted of onsite and online quizzes. To minimize multiple visits of students to the college, summative lab assessment was conducted online for anatomy and histology labs at the end of each semester. Onsite practical exams were conducted for tooth morphology. Student skills in the tooth morphology laboratory were assessed by the carving of a life-size tooth by individual students.

2.6 Data Collection and Analysis

The individual scores of all the exams, practical assessments, and quizzes conducted during the academic year 2020–21 were compiled in an Excel sheet. Similar assessment data of the students from the previous academic year 2019–20 was retrieved and tabulated. The data was presented as mean and standard deviation. The IBM SPSS software, version-28, was used to statistically analyze the data. The equality of the means was tested using the Student T-test. A p-value less than 0.05 was considered as significant.

3 Results and Discussion

The number of students was 131 in BDS1 and 120 in BDS2, respectively. Comparisons were made between the student grades of midyear practical and final practical exams of regular teaching in the 2019–2020 year and hybrid online teaching in the 2020–2021 year. The formative assessments conducted in the labs during the academic year 20–21 were also compared with the previous year's performance.

3.1 BDS1 Results

The comparison of performances among the BDS1 students showed that the scores of the midyear general histology assessments were similar in both academic years. However, the final and overall scores in the 2019–20 cohorts were higher than the 2020–21 batch students with a p-value of 0.00 and 0.001, respectively (see Fig. 5). The mean total scores of all tooth morphology summative assessments (3.43, 7.91) conducted throughout the year 20–21 were significantly higher than the scores of 2019–20 students. On the contrary, 2019–20 batch students scored higher in the tooth anatomy lab quizzes ($p = 0.04$). Based on the skill tests, high-quality results were recorded by the online batch of students in the carving assessments ($p = 0.000$) (see Fig. 6). The overall BDS1 student performance in the dental anatomy lab was reported to be significantly higher in online students compared to the regular batch students.

3.2 BDS2 Results

The results of the study reveal that the performance of the BDS2 online students in dental anatomy was like the students of the previous academic year. However, they performed better in the midyear lab assessments ($p = 0.003$) compared to the onsite

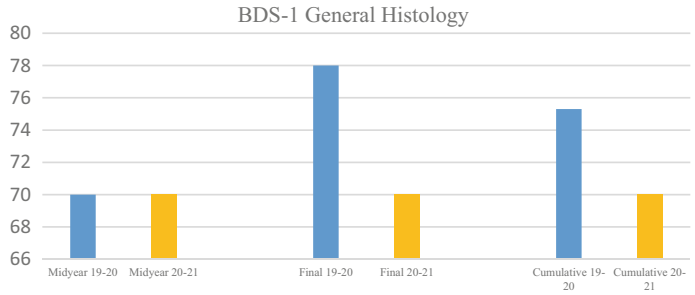

Fig. 5 Bar graph comparing the BDS1 student performance in general histology before and after the introduction of online labs

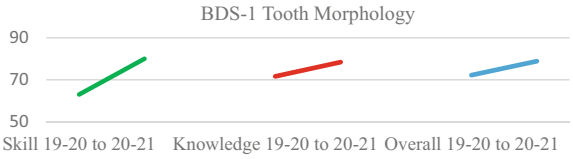

Fig. 6 Line diagram depicting an enhancement of BDS1 student performance in tooth morphology labs after the introduction of online labs

Fig. 7 Chart showing a decrease in the BDS2 student performance in histology and anatomy after the introduction of online labs

batch students. All the dental histology assessments and overall stream scores were higher in the regular batch students compared to the online batch ($p = 0.001$) (see Fig. 7).

3.3 Overall Performance of BDS1 and BDS2

The overall performance of the students in all the above-mentioned labs and quizzes was compared between the academic years. BDS1 students of the online batch showed higher total mean scores (38.13, $p = 0.00$), while the BDS2 regular batch recorded a slightly higher overall mean score (27.96) compared to the online batch (26.84), respectively ($p = 0.046$) (see Fig. 8).

Digitalization has become an inevitable part of education [5]. Many novel educational models introduced during the pandemic might sustain ahead with time [13]. The COVID-19 pandemic is prolonging with the occurrence of new mutant forms

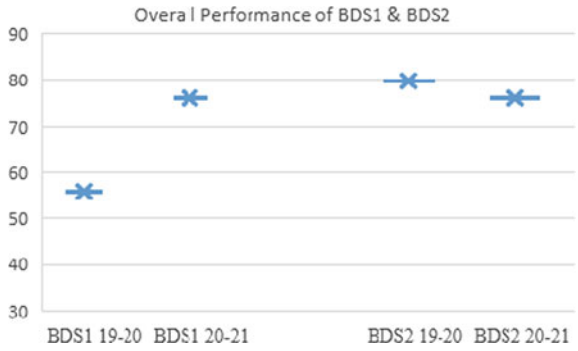

Fig. 8 Depicting the comparison of overall performance of BDS1 and BDS2 before and after the introduction of online labs

of the SARS-CoV-2 viral genome [14]. Students' access to training labs could be limited, and social distancing protocols need to be taken forward in the future to minimize exposure among students [7]. Dental preclinical education requires physical interaction. Various alternative methods like virtual models, videos, and recorded sessions are of limited use in preclinical dental labs as it is skill-based learning [15]. Evolving strategic plans to recover the preclinical teaching for dental students without overcrowding in the clinical and preclinical laboratories is the need of the hour [7].

This study evaluated the effectiveness of online teaching of preclinical labs for dental students during the COVID-19 pandemic. Our study results suggest that compared to knowledge, skill-based student performance is enhanced with the hybrid mode of preclinical training of BDS1 students. This factor could be attributed to the small group attendance and an increased student–teacher ratio. The academic achievement of students relies on many factors, yet the student–teacher ratio plays a crucial role in student performance and effectiveness [16]. During the pandemic, the student–teacher ratio increased to 1:4 from 1:10 before the pandemic. A small class size promotes strong social interaction and thereby favors improvements in skill-based achievements [17]. Direct and virtual supervision further enhanced the students' carving skills in the tooth morphology laboratories, which was reflected in our study's results. Our results support the positive aspects of hybrid teaching, and thus it can be applicable to preclinical exercises in future as they are as effective as conventional onsite lab delivery methods.

Since the seventeenth century, cadavers were the gold standard for learning human anatomy [18]. Plastinated anatomy models, dissection videos, and three-dimensional printed (3DP) and online models are the other readily available alternatives for cadaveric dissections [19]. Our dental school employs 3D models for the delivery of anatomy and osteology labs to BDS2 students. Fasel et al. suggest that 3D models are ideal for delivering undergraduate curriculum due to their high correlation with the anatomy reality [20]. The students in the regular batch studied the models in person in the preclinical labs. However, the online batch students viewed the models in online and onsite modes. Our study results prove that the students show similar performance in anatomy labs with both the regular and online modes of learning.

Attardi et al. conducted fully online anatomy labs using 3D models through Blackboard Collaborate and reported that the student performance was consistent with the previous year's students who underwent traditional teaching [21]. Wilson et al., 2018, showed that the student scores were statistically equivalent when traditional dissection methods were compared with other modes of laboratory approaches such as hybrid, digital models, and 3D models [22]. With the unprecedented future situations, creative adaptations and judicial use of technology can replace the traditional methods of delivery of preclinical anatomy labs in dental schools [23].

Traditional teaching methods for general and dental histology include didactic lectures, tutorials, and onsite microscopy involving face-to-face discussions [24]. The aim of our study was to deliver all histology teaching via online mode. During this study period, all the histology lectures and tutorials were given online for the BDS students. The histology slides were delivered through live online microscopy, and lab assessments were also conducted online by using two cameras for invigilation. The results of our study revealed that students' (both BDS1 and 2) performance was better during the traditional teaching methods compared to the online method. These results indicate that the online mode of learning histology did not produce any detrimental effect on the BDS students. However, while comparing the overall student performance in histology for the whole academic year, we can appreciate that this method did not worsen the student performance either. Earlier studies that experimented with online teaching for histopathology have exhibited either improved or similar student performance [24–26]. Di Giacomo 2021 reports that loss of active interaction with the teachers and peers during the online system of teaching is the biggest concern and leads to potential damage to both theory and practical dental education. The author also proposed that distance learning has greater possibilities for distraction. Lack of self-motivation and difficulties in self-regulated learning were the most common issues faced by medical and dental students during online education [5, 27]. Traditional methods of direct viewing the slides under the microscope in the labs promote interactive learning and provide thorough access to the entire tissue section [25]. With the future challenges ahead, e-learning is inseparable from the education sector. Though conventional microscopy is the benchmark for histopathologic learning, alternative and newer methods such as digital slides should be experimented with in the dental curriculum.

4 Conclusion

Dental education was crucially challenged during the COVID-19 pandemic. Distance learning was the only available adjunct that ensured the uninterrupted delivery of education. Dentistry is highly skill-oriented, and patient-centered. Rendering practical training to students through E-platforms was tedious for educators. Many dental schools implemented novel methods that assisted in monitoring preclinical performance. Adapting certain innovative online practices during our study showed a reduction in student performance in histology labs and enhanced performance in tooth

morphology labs. Students exhibited marked improvement in laboratory skills with the online mode of training. BDS1 students performed better with online Lab sessions compared to BDS2 students. However, further studies are called for evaluating the effectiveness of these methods in dental education. Smooth continuity of the dental programs might demand the incorporation of digitalization in appropriate settings in future. Dental educators must explore innovative and alternative techniques to ensure high-quality preclinical training for dental students in a safe environment.

Limitations of the Study Our study was not conducted on the same population of BDS students. It compared the results of 2 diverse groups of students exposed to 2 different modes of learning in a specified time interval. Therefore, it is difficult to arrive at the final conclusions based on the available results. Different modes of learning should be experimented with in 2 diverse groups of students at the same time. Translation of this study to a longitudinal model would further enable the acquisition of the actual cause-and-effect association.

Conflicts of Interest None Declared.

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ESL Teachers' Experiences on XReading as a Formative Assessment Tool in Extensive Reading: A Study of a Federal Institution in the UAE

Naureen Shehzad

Abstract Extensive reading is a widely used effective strategy for enhancing students' reading skills. The study explores how digital libraries like XReading impact students' extensive reading skills in the English as a Second Language program. XReading provides a Learning Management System where teachers can track and set goals to enhance students' performance. It also has a key feature of online formative assessments that keep students motivated and accountable in their learning journey. The study using a qualitative research design was conducted at a federal college in the UAE, and it aimed to explore teachers' perceptions of using XReading as a formative assessment tool, its benefits and challenges the students face, and how it influences students' performance. The data were collected qualitatively using semi-structured interviews and observations to reveal the effects of XReading as a formative assessment tool in extensive reading. The results indicated that along with cooperative learning, XReading involves the students with a multitude of features it offers and fosters engagement, collaboration, and learner autonomy among students which is a twenty-first-century learning skill.

Keywords Formative assessment · XReading · Extensive reading · Reading skills

1 Introduction

Formative assessments have been widely used and adopted by teachers to assess the learning outcomes and restructure their instructional strategies. Eminently researched in the educational field by Black and Wiliam [2], now formative assessments are part of every consistent curriculum to highlight the increase in students' achievement evidenced by students' current understanding to help them reach their intended goals. With the advent of educational technology and a drive to incorporate twenty-first-century skills in the curriculum, there is a radical shift in learning pedagogies. To

N. Shehzad (✉)
Higher Colleges of Technology, Fujairah, UAE
e-mail: nshehzad@hct.ac.ae

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cope with the rapid advancement in technology, institutions have embedded EdTech tools for learner enhancement and engagement.

The study was conducted in a federal college in the United Arab Emirates (UAE) at the English Bridge Program to discover teaching and assessment practices in extensive reading using XReading as a formative assessment EdTech tool. XReading is an electronic library with e-books for multiple levels and genres. This service allows students to access graded reading books on any smart device at their time and convenience. The most notable aspect of XReading is the electronic monitoring and tracking of students' progress through post-reading quizzes, short responses, and administering their reading speed through the Learning Management System (LMS). Concerning the students' noticeable lack of interest in reading, the rationale behind this study is to explore teachers' perceptions of the effectiveness of XReading as a formative assessment tool and how it influences students' performance.

To reiterate the importance of reading for lifelong learning skills, the UAE government themed the year 2016 as "The Year of Reading" [14]. The initiative aimed to foster a culture of reading and develop a generation of readers who are knowledgeable about cultures around the world. For this purpose, various digital and smart libraries were introduced to give a chance to residents and citizens alike to read for leisure.

The chosen federal college has instilled a drive for extensive reading among students since 2016 and subscribed to the XReading platform as a digital library. Extensive reading has been introduced as a part of the curriculum to involve students and enthrall them to reap the benefits of reading. In the academic year 2020, XReading was included as a mandatory part of the English as a Second Language curriculum which contributes to 15% of student's total grades.

1.1 Significance of the Study

After studying a range of current and previous literature, the researcher found plenty of studies on technology-enhanced formative assessment and the role of extensive reading in second language acquisition. However, combining the two elements of XReading as a virtual library and its effectiveness in an online formative assessment tool has not been sought much. Therefore, this phenomenological research will add to the current body of literature providing a new dimension to the already existing opportunities that XReading has to offer its users.

1.2 Purpose, Objectives, and Research Questions

Primarily, the broad purpose of this study is to delve into the effectiveness of XReading as a formative assessment strategy on students' performance in extensive reading. Moreover, to gain teacher experiences and insights needed to understand

how e-formative assessments affect students' learning skills, this research will help the stakeholders identify students' achievements through XReading and the development of their overall reading skills. The following research questions were developed to seek information from teachers about e-formative assessments through XReading:

1. What are the teachers' perspectives on the difficulties and benefits of using XReading as a formative assessment tool?
2. How does XReading enhance students' performance in extensive reading?

2 Literature Review

The literature review will broadly discuss formative assessments and how the convergence of formative assessments with the inclusion of Internet and Computer Technologies (ICT) brings life to traditional formative assessments. Furthermore, the literature will narrow down to a preponderance of online formative assessments in extensive reading with a special focus on XReading.

2.1 Conceptual Framework

Historical Perspective. Education and assessments are interwoven, and no one can survive without the other. Formative assessments are an iterative process of assessing pupils' understanding in relation to the learning goals and expected outcomes of any learning program. Formative assessments support learning, provide feedback, and increase productivity among teachers, peers, and learners [8]. Formative assessment was defined as a classroom practice where evidence about students' achievement is formally interpreted and used by teachers and stakeholders to make informed decisions about the next steps of instruction for students' increased performance [2]. Two definitions derived from Sadler [20] and Black and Wiliam [3] that differentiate formative assessments from other assessments are focusing on product assessment and classroom teaching and pedagogy [23].

Formative Assessment and Online Formative Assessments. Formative assessments form a part of any curriculum which aims 'to judge' [3] students' understanding by eliciting and informing teachers about their instructional strategies. Formative assessments do not contribute to grades and can be short quizzes, narratives, discussions, or report generation. Assessments for learning are embedded within an instructional curriculum and modified over time. The primary aim is to develop students' understanding, reflect on teaching methodology, and provide timely feedback. Although the pioneers Wiliam and Black [3] defined formative assessments and their uses in length, however, they did not explore the context of online or e-assessments. Formative e-assessments came forward as a new domain depicting how assessments are affected by the intervention of technology. Another exploratory study carried out on e-assessments in higher education determined that

formative e-assessments are the use of ICT applications to support analysis and gather information about students' learning. This aids in designing a learning trajectory for students in a variety of ways [15]. The study also revealed that technology provides a stimulus and basis for lesson planning and software tools for abstraction. Technology, therefore, enables teachers to innovate their teaching practices and adapt to new teaching pedagogies that embed twenty-first-century learning skills.

Extensive Reading and Formative Assessments. Despite all the potential benefits of extensive reading, its implementation and accountability remain a struggle for teachers. Finding the time to oversee, assess, and provide independent learning opportunities remains a challenge for teachers. Furthermore, time constraints prevent teachers from giving constructive feedback which deters students' performance and handicaps' reading as a rewarding experience [13]. A recent study conducted on formative assessment techniques in extensive reading by Kim (2019) substantiated the preference for using writing-short answers and in-class discussions as assessment strategies. However, XReading's e-formative assessment design parallelly gives the options of post-reading quizzes and short answers. Moreover, reading speed and word count is also a determining factor toward assessments.

Motivational Factors Influencing Extensive Reading. Reading motivation conceptually incorporated personal factors and environmental factors that influenced reading achievements. This was further related to cognitive psychology [16, 22] which is a key factor in reading efficiency and learner motivation. Moreover, positive peer influences affect self-determination which creates intrinsic motivation among readers, such as peer model readers in the classroom. Engaging in pair and group discussions positively influences reading experiences [22]. Another intrinsic motivational factor encouraging readers is effective goal setting which is challenging but not fatal to achieve [12]. This creates a virtuous reading cycle and sets the trend of forming new goals after a certain time. Extrinsically, setting competitions and recognizing achievements through monetary rewards and prizes serve as a motivational purpose in extensive reading achievements [16].

2.2 Theoretical Framework

Vygotskian Theory and Assessment. After a review of related studies on assessment for learning within theories of learning, it can be agreed that there is no 'comprehensive theory' [4] that directly correlates to formative assessments. However, formative assessments can be situated in Vygotsky's sociocultural theory [24] and his concepts of zone of proximal development (ZPD) using scaffolding techniques to strategically assess students' development. Providing meaningful experiences, social interaction, and promoting risk-taking allows the students to work in their ZPD. Moreover, according to his theory, assessments can be validated once they are conducted in socially supportive settings and designed with a challenge which is within their proximal zone. These concepts are particularly important in understanding the process of

second language acquisition. Instructional reading strategies that contribute to extensive reading and its assessment build upon the concept of scaffolding. In higher education settings, scaffolding occurs when teachers enter a collaborative relationship with students to develop students' understanding using assessment tools [1].

Establishing formative assessments from the concepts of the zone of proximal development helps students' creativity based on the students' schemata. Formative assessments can be understood as the gap between students' understanding and potential learning outcomes. Implementing ZPD means the teacher serves as a mediator and provides evident scaffolding opportunities to attain the goal (Wiliam & Black, 2009). Students in turn perform actions to receive timely feedback on their performance. ZPD in reading ranges in the linguistic levels from which the student selects a book to read.

Piaget's Cognitive Theory. Piaget's social cognitive theory [17] illustrated child development through various stages with a phenomenon of assimilation and accommodation. Piaget's developmental framework can be thoughtfully understood in today's world of technology integration in literacy instruction. A study [18] on learning development around Piaget's classical theory postulates how technology is assimilated and has reconceptualized conventional teaching approaches, and the latest information is merged with existing knowledge without changing structures. Furthermore, when learner development is restructured to new norms of learning, this paves the way for the accommodation of technological literacy and leads to developmental maturity. The accommodation of innovative technologies in daily classroom practice shifts literacy instruction to new learning pedagogies. However, another major study discussed the idea of student readiness [10] by activating students' prior knowledge and schemata before introducing any new set of instructions. Incorporating technology-enhanced extensive reading into daily literacy activities has profound effects on mainstream learning [19]. There is a shift from assimilation to accommodation due to the rapid diversity and advancement of technology in classrooms. Technology integration and assimilation have further advanced to accommodate a shift to computer-based applications with e-formative assessments designed specifically to trigger purposeful online learning for progression in reading and writing [18]. One such area is the use of virtual libraries in extensive reading with post-reading quizzes. Piaget's state of equilibrium is achieved when learning is enhanced by assimilation and accommodation of technology, and digital literacy replaces conventional developmental stages.

2.3 Review of Relevant Literature

Endorsing socio-constructivist theories as the most productive theories in learner development and engagement enables curriculum design, assessment, instruction, and deep learning. The research study intended provides a theoretical underpinning to constructivism, which is a theory of learning or meaning making, hence, all other learning theories stem from the social and cognitive theories of Piaget and

Vygotsky. Social interactions are fundamental to any knowledge acquisition which lays the foundation of existing knowledge assimilation and builds on incorporating new knowledge called accommodation. Extensive reading falls under the umbrella of sociocultural development where scaffolding occurs to build new knowledge, and technology is induced to accommodate modern learning which facilitates digital reading and online formative assessments.

3 Methodology

The primary purpose of this qualitative study was to gain a better understanding of teachers' perceptions of the use of XReading as a formative assessment tool for enhancing students' performance in extensive reading. Furthermore, it aimed to gain in-depth insight into its potential benefits and challenges faced in the classroom. A dense and rich description of participants' experiences with the use of XReading for formative assessments was needed to analyze the impact of digital reading on teaching and learning. The researcher aimed to gain a richer understanding of the phenomenon which could otherwise not be possible using a quantitative research approach. The research aims to obtain participants' experiences, opinions, and behaviors and not numerical data and variables; hence, a quantitative approach was not a suitable choice for this study.

A qualitative research method with a constructivist/interpretivist paradigm was used to gain a deep understanding of how participants construct their knowledge of the world through social interactions and reality differs from one person to another. Interpretive paradigm will help the subjective understanding of the realities and experiences of individuals. Consequently, and in alignment with the constructivist theories of Piaget and Vygotsky, the researcher based the methodology on phenomenologist enquiry which is naturalistic in approach to discovering participants' experiences in natural settings. This enabled the researcher to deeply analyze participants' interaction with the students and the influence of assessments in the classroom setting. The role of a researcher as postulated by Cohen et al. [5] becomes a 'human instrument' to enlighten and explain the theories through the relationships between the researcher and the participants using methods that are advantageous in qualitative research.

The primary features of qualitative data are using rigorous procedures and multiple methods for data collection that focus on a single issue of the problem [5–7]. Considering this proposition, for the credibility of this research, I have chosen to collect data from two different tools: participant observation and conducting semi-structured interviews. These multiple methods of data collection will allow triangulation and corroborate the evidence since the information is drawn from various sources. Triangulation is important to validate the accuracy and credibility of findings [6] and eliminate the potential ethical issues that may occur due to a single mode of data collection.

The first data collection instrument chosen was semi-structured interviews which assisted best in understanding the central phenomenon with open-ended questions

[7]. The most popular one-on-one interview approach was conducted to reach participants' opinions, beliefs, and thoughts on the benefits and challenges they face in using XReading as a formative assessment tool. These interviews were conducted online on web-based video technology using Zoom which was recorded and transcribed electronically [7]. Considering Merriam's (2013) semi-structured interviews, specific open-ended questions were prepared followed by probes that were sought after in response to the research question. Interview questions were piloted with a colleague to make sure meaningful data can be gathered which is nonintrusive from the researcher's viewpoint.

The second data collection instrument was participant observation to interpret the phenomenon by understanding the world 'firsthand'. This allowed participating and experiencing rather than observing at a distance [21]. The participant observation helped to understand the beliefs of the teachers, and the rationale for choosing this method was to allow freedom in asking questions to the teacher without suspicion. Participant observation is useful with a limited group of people and for events that last a brief period [5]. In the process of this research, the participants were limited which enabled us to seek descriptive and narrative data which is the foundation of any qualitative study. The role of participant-observer as taken from the notion of Creswell and Guetterman [7] is to take part in the activities and simultaneously record the observations at the site; this will provide a wholesome opportunity to see experiences through the participants' lens.

3.1 Sampling and Site

Purposeful sampling was preferred as the study was based on individuals who can best help understand the chosen phenomenon [7]. Purposeful sampling, unlike random sampling in quantitative research, will provide 'useful' information from the teachers', 'learn' in-depth about the experience, and give voice to 'silenced' people [7]. Purposeful sampling was applied to the site and individual selection. The site chosen was a federal college in the UAE and teachers from the English Bridge Program were chosen for the study. To eliminate the chances of researcher bias, triangulation in data collection and analysis was used to outweigh this possibility. The sampling strategy for choosing participants was confined to teachers with a minimum of five years of teaching experience, and who are using XReading as an extensive reading tool in the classroom on a regular basis. Therefore, the target population for this study was five teachers teaching in the English Bridge Program and actively using XReading for extensive reading. One of the features of qualitative research is to study a few individuals who provide an in-depth picture because any addition of participants diminishes the complexity of the study [7].

3.2 Ethical Considerations

The author was fully aware of the imperative importance of seeking permission from the institutional review board and the participants. The site chosen involves an ethics research committee, and acquiring permission from the site is a lengthy process and these need to be administered before data collection [6]. Due to time restrictions and having not obtained site permission, no data whatsoever was used as a resource from the site. However, all the participants chosen for the study duly signed informed consent on the guideline and nature of the research. They were assured of their confidentiality and how the data produced will only be used for academic purposes. The participants were also told that if they feel uncomfortable or vulnerable, they have the right to exit the study without penalties.

4 Data Analysis and Results

4.1 Data Analysis

Qualitative data analysis is an inductive and iterative process which involves making sense of raw textual data to form answers to research questions [7]. Initially, reflective notes were documented to find any insightful understandings of the data emerging, but when the data collection process was at the final stage, Creswell, and Guetterman's [7] six steps of bottom-up approach were used for analyzing data. As the first step, the process of preparing and organizing data, all the fieldnotes for participant observation data were collected electronically, hence, the word files were saved in folders on the laptop. The interviews were collected through Zoom, which were then transcribed using audio-to-text converters. The transcriptions were read carefully, and from here onwards the preliminary data analysis began. While obtaining the general sense of data, comments were added, and notes and color coding/highlighting different patterns helped in observing the transcribed text. For fieldnotes obtained from participant observation, adding reflection and comments gave more sense to the data generated. Due to the purposefully chosen sample, the data was analyzed manually without using any qualitative data analysis software. The data was compiled and columnized in the word document for ease of reading. After transcription, constant comparison analysis was implemented with keywords-in-context [9] to analyze the data. Applying a variety of data analysis techniques offered triangulation which added rigor to the analysis by assessing the reliability of inferences drawn from the words from more than one vantage point [9]. The transcribed data were compared and broken down into smaller chunks of meaningful parts which were then given descriptions in the form of codes. A code was assigned to each chunk of words in a separate column with color coding. The researcher utilized keyword analysis which was fruitful in identifying frequently used words of interest that refer to the research questions and validating the results. Furthermore, following the inductive process

coding model of Creswell and Guetterman [7], these codes were then narrowed down to broader themes depending on the frequency of occurrence of codes.

In alignment with the framework for this study, e-formative assessments were explored with the inclusion of XReading as an extensive reading tool. Analysis and findings were centered around many themes but with a maintained focus on the research questions. The answers to RQ1 were generated through semi-structured interviews. The semi-structured interviews were prepared along with the guidelines of Creswell [6] who proposed to create 5 to 10 questions as a sufficient means for data collection. Seven open-ended questions were asked by the participants based on 'how' and 'what' perceptions they have about opportunities and difficulties they face in implementing XReading in class. Probes [11] in the form of follow-up questions were used during the interview process to clarify and investigate more in case the researcher felt ambiguity in the answers. The questions enabled participants to demonstrate their knowledge about XReading and its use in class and how they use it as a formative assessment tool, how it influenced students' performance, and the factors that posed a challenge to students' demonstration of understanding using XReading as a formative assessment tool.

Participant observation was another data collection tool that provided an opportunity to witness the teachers' beliefs first-handedly in real-time settings and compare them with their semi-structured interviews. Participant observation inferred the answers to the RQ2, which helped in depicting the effects of XReading on students' performance and how it influences extensive reading. Participant observation was done in five classes, and the duration of observation varied depending on the outcomes intended for research purposes [11]. Taking down field notes started in the lesson and extended until after the class's end along with reflective comments used to report findings. Participant observation aided in administering teachers in their natural setting, and this revealed many themes that answered the question. The researcher created an observation checklist to mark yes/no questions and created a section for reflective notes to complete after observation.

4.2 Findings and Interpretation

The initial findings were directed by Creswell and Guetterman's [7] model of analysis, which used the description of people and the setting as the primary element. All the purposefully sampled teachers had the experience of teaching in the English Bridge Program for more than 5 years. Since students are already taught in a laptop-mediated environment, all teachers were well-versed in the use of technology in the classroom. Moreover, only those teachers were chosen for the study who extensively used XReading in their classroom for extensive reading and its formative assessment. Due to the pandemic, the classes were conducted online, so Zoom live sessions were used as an observation medium. The teachers belonged to different ethnicities and backgrounds like India, Pakistan, and the Arab region which gave variety to the study

Table 1 Teacher teaching traits

Name	Years of teaching	Gender	Instructional/assessment approach
Participant 1	10 + years	Female	Peer/interactive discussion
Participant 2	8 years	Female	Post-reading online quiz
Participant 3	5–10 years	Female	Writing moral of story
Participant 4	5–10 years	Female	Post-reading quiz with 60% pass rate
Participant 5	5–10 years	Female	Discussion on characters and online quiz

and supported in making informed conclusions on the phenomenon to be studied. Below is the description of teachers who participated in the study (Table 1).

Analysis of the data initiated in forming codes which then resulted in three inductively developed themes. The intention to use three major themes was to provide a detailed report of fewer themes rather than giving general information on many themes [7].

Theme 1: Student Engagement. The overarching theme that emerged from the participant observation and interviews was student engagement. This theme aligned with both RQ1 and RQ2. This thematic analysis was further broken down into subthemes like student interaction, involvement, and learner autonomy. One of the participants, when questioned about the benefits of XReading replied: "*my students stay occupied for as long as I want…*". Another participant also shared similar opinions by stating "*…it motivates students to read more graded reader books especially the reading while listening option and they also benefit by knowing their levels….*". During the participant observation, the fieldnotes and checklist evidenced that teachers involved the students in a group discussion about the book summary and characters. Discussions gave the students an opportunity to get involved in classroom activities, and the teacher prompted the students with lexical items to complete their discussion when needed. The teacher had set goals and time [12] for each activity which motivated the students to speak within the period. Peer discussion and social interaction are at the heart of any student-centered class. The teacher at the beginning of the session established clear learning goals which kept the students engaged throughout [3]. The thematic analysis substantiated the sociocultural and constructivist perspective of Piaget's theory [17], as students were actively seen constructing knowledge through interaction within a social context. Students were building new knowledge, and the process of assimilation is vividly seen here. It was observed that most teachers adopted a controlled practice of extensive reading in the classroom and used scaffolding strategies [24] to build up on students' schemata. Student engagement motivates them to take risks which are necessary metacognitive skills to regulate and take charge of their learning [24]. Moreover, learning is a joint productive activity which proliferates in social settings where students and teachers collaborate as a community of learners.

Theme 2: Student Performance and Assessment Strategies. The evolving major theme for RQ2 was student performance in relation to a variety of assessment strategies to gauge students' understanding. Diversity in assessment strategies

addressed students with a range of cognitive abilities to reach the intended learning outcome. Majorly, the teachers employed an all-inclusive approach in assessing students to give each student a fair chance for healthy competition. In response to the effectiveness of XReading on students' performance (RQ2), the researcher conducted participant observation and teachers' extempore creativity in assessment strategy; students' enthusiasm with the involvement of technology was seen at every session. One participant said: "*XReading improves their vocabulary and instils self-confidence, increases their level of reading*". When questioned about assessment, a participant contributed: "*I only use XReading built-in quizzes, and it gives me a clear idea if students have read the book or just flipped the pages*". The findings from this thematic analysis can be interpreted by the shift from traditional assessments to online formative assessments, accommodating [17] latest information, restructuring their thinking, and re-orienting to adopt a new world of technology-enhanced assessments. This accommodation not just applies to assessments but also to the accommodation of digital literacy and reading extensively in virtual spaces. Throughout the observations, one noteworthy aspect was increased student involvement due to spontaneous ungraded feedback, informal peer discussions that enhanced students' performance. Another key highlight of observations was students' keenness to take the online formative post-reading quiz after the classroom discussions where they had to answer multiple-choice questions about the book. This formative quiz added another variety to learning, and the teachers set the pass percentage to 60% or set 20 min to read a book of 400 words and take the quiz. All the assessment patterns in one way or another were achievable challenges [12], and students were enthralled in the entire process.

Formative assessment can be linked to Vygotsky's zone of proximal development [24] where students are seen bridging the gap between students' actual understanding and targeted learning. The teachers acted as facilitators during the observed sessions. They amply provided opportunities for scaffolding and henceforth developed from students' prior knowledge to build on advanced knowledge to achieve the intended learning goals [3, 24]. The constructivist approach believes in the development of meaning rather than the acquisition of a large set of knowledge, which was clearly seen when the teacher assigned manageable tasks to students which helped in developing the skill. Piaget's and Vygotsky's theories are relatable to students' learning experiences and their readiness for social interaction during the learning process. Teachers have avidly tried to incorporate various strategies for interaction and accommodation of technological literacy which are fundamentally related to socio-constructivist theories.

Theme 3: Challenges to XReading. With the incorporation of technology, there arises a whole new world of digital literacy which is beneficial in the reduction of time, and provides an array of designing learning tools for students [15], but comes with its own pitfalls. This theme arose when teachers were interviewed on the benefits and challenges that XReading has to offer as an online formative assessment tool. Although the teachers were satisfied with the overall opportunities that XReading has to offer, some teachers expressed their views on "*internet issues and slow connection problems don't let the students log in*," "*some students forget their passwords, and*

then there is no option for them to read," *and* "*sometimes the XReading platform takes ages to load, and it gets frustrating for students*." Technological barriers can mostly be overcome with the teacher's own comfort with the use of technology, and support to resolve hardware and software issues [25]. Another kind of challenge that one of the teachers reported was "*students are from various levels of reading, and some students are very weak. They choose the wrong level book and that is when a teacher needs to guide them to their appropriate level*." With any technological shift, teacher intervention and facilitation are required as a guideline for students to prosper. Learning enhances in a socially collaborative environment and with modeling and support, students perform at a higher level [24].

4.3 Discussion

During the entire research process, it was found that teachers' beliefs about formative assessments play a key role in designing assessment strategies. All the teachers were aware of the need for extensive reading and its long-term benefits, hence, they tried to give every opportunity to students to read and participate. The findings from the study showed that teachers' perceptions and practices align, which facilitated answering the research questions. The teachers clearly communicated the potential benefits of using XReading as an online formative assessment tool by articulating that automated assessment saves time, and keeps students involved and motivated. However, while mentioning the difficulties, the teachers were concerned about the technical issues and that the wrong selection of books can cause hindrance in students' performance. The observations revealed students' engagement and involvement with the activities, peer discussions, and some intrinsic motivation to speak about what they read. Furthermore, learner independence was also observed when teachers gave freedom of choice in book and genre selection.

5 Conclusion

Assessments for learning have always stayed in learning pedagogies with different names but formally were introduced by Black and Wiliam [2]. Online learning has drastically changed teaching methodologies and with the incorporation of technology, new arenas of learning pedagogies have emerged. From traditional methods to game-based online learning, teachers have adapted the methodologies to the constantly changing learning needs, and formative assessments are not an exception. Online formative assessments in reading have shown an increase in students' performance due to clear goal setting, learner autonomy, and trackable features which XReading Learning Management System (LMS) has to offer.

Despite all the benefits and challenges the system has to offer, teachers needed more professional development in using the tool since some of them faced issues in

interacting with the interface. Moreover, technology is most benefited when teachers feel comfortable with its use. IT support should be readily available at colleges to keep the progress and resolve technical glitches if any are faced. Arranging extensive reading activities through college reading clubs is one way to escalate the reading habit and reap the benefits of reading. The research can be expanded to include other campuses as well, along with students' perceptions of XReading in enhancing their reading abilities. Due to the current pandemic, the data was collected online, however, there might be a disparity in results had it been conducted in face-to-face classes.

This research was limited to only those teachers who have used XReading as a classroom component. Further research needs to be carried out on XReading as an extensive reading tool and its impact on students' vocabulary development or other productive skills. This study adds to the body of literature related to extensive reading and digitization of reading literacy which has not been researched extensively.

Educators can develop XReading lessons using one book for the whole class that requires both higher and lower order thinking skills to give the lessons more structure and consistently draw from their previous experience and knowledge. This will indeed require more planning but will increase the performance manifold. Moreover, more collaborative methods before online assessment should be included to give students a wholesome experience.

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Evaluation of the Hybrid Learning Model to Teach Human Physiology Experiments

M. Deepika Kamath, Rizwan Qaisar, Asima Karim, Adel Elmoselhi, and Bashair M. Mussa

Abstract The declaration of COVID-19 as a pandemic on March 11, 2020, had profound effects on educational activities worldwide. As a crisis response measure, the educational institutes had to shift from onsite to online teaching and adopt online learning platforms to ensure a smooth delivery of educational content. However, the efficacy of such teaching methods for laboratory experiments partly remains elusive. We aim to explore students' perspectives and experiences toward a hybrid approach in conducting human physiology experiments. We designed a teaching model that combines onsite and online learning to provide hands-on experience to medical students without compromising COVID-19 preventive measures. It is a cross-sectional study among Years 1, 2, and 3 medical students. Data was collected through an online survey via a self-administered electronic questionnaire. Data was analyzed using a two-sample t-test using Graph-Pad Prism version 8.01. Our results indicate that the hybrid model was well-received, and students agreed that the hybrid model was time-saving and allowed them to study at their own pace compared to students who did not agree ($p < 0.05$). A significantly higher number of students found the hybrid model extremely useful and were satisfied with its content ($p < 0.05$). They recommended continuing this format in the future. The students opined that providing the recorded videos in advance and clarifying their doubts in the prelab sessions prepared them better for the hands-on experience ($p < 0.05$). Therefore, we recommend maintaining the hybrid learning methods for time-effectiveness and enhance efficiency of learning.

Keywords Hybrid educational model · COVID-19 · Digital lab assignment

M. Deepika Kamath · R. Qaisar · A. Karim · A. Elmoselhi · B. M. Mussa (✉)
College of Medicine, Basic Medical Science Department, University of Sharjah, P.O. Box: 27272, Sharjah, United Arab Emirates
e-mail: bmussa@sharjah.ac.ae

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1 Background

The declaration of COVID-19 as a pandemic on March 11, 2020, had vast repercussions on the economy, healthcare delivery, and education activities worldwide [1]. The effects on education were robust as universities were challenged by the abrupt closure of onsite classrooms and the transition to online learning under considerable time pressure. The unprecedented closure of in-person classes necessitated the universities to adopt online learning platforms to ensure the continuous delivery of education. These effects led to the rapid development of alternate, innovative approaches to ensure quality education [2].

Although online learning is not new to the medical field, not many medical universities were actively implementing it before the pandemic. However, the outbreak of the pandemic prompted academia to restructure the curriculum and introduce online learning methods [3].

As described by Howlett, online learning uses electronic technology and online content to support and enhance learning [4]. As the new generation of students is highly interested in technology-based learning, online learning can be a suitable alternative to traditional didactic learning. However, 100% online learning is not recommended in the medical field as it is difficult to nurture the necessary communication and clinical examination skills in a virtual environment [5]. Moreover, online teaching cannot address all the benefits of onsite learning, such as peer interaction and providing instant feedback on their performance. Onsite laboratory experience enables the learners to effectively engage with instructors and the course material. Therefore, blended or hybrid learning has emerged as a promising approach in medical education.

In the hybrid approach, traditional face-to-face learning is supplemented with virtual learning. Compared to onsite learning, this approach has minimal limitations of time and space and enables universities to expand their educational opportunities [6]. The hybrid approach enhances learning by providing the students with an integrated learning experience that fosters proactive self-directed learning [7].

The COVID-19 pandemic provided us with a unique opportunity to use the University of Sharjah (UOS) Blackboard tool to its fullest potential by implementing the hybrid model in our curriculum. Most studies have documented favorable perceptions of hybrid learning. However, the efficacy of such teaching methods for laboratory experiments partly remains elusive [8].

This study aimed to understand the student perspectives and experience of the hybrid approach in human physiology experiments. We hypothesize that hybrid teaching may be superior to traditional onsite or online teaching in effectively delivering the lab contents. To test this hypothesis, we used online questionnaires investigating the opinion of medical students at the UOS about the course contents of Physiology lab experiments.

2 Methods

It is a cross-sectional study among Years 1, 2, and 3 medical students. Cross-sectional method was used to prevent potential bias due to repeated measurements. Data was collected through an online survey via a self-administered electronic questionnaire. The students were invited to participate in the study via emails from the administrative office. The email included a hyperlink to access the questionnaire. The students were informed that the participation was voluntary and anonymous, and it was not linked to any form of student evaluation. The questionnaire comprised 11 questions including 2 open-ended questions. Students were asked to answer the questions using a 5-point Likert scale (1 = 'strongly disagree', 2 = 'disagree', 3 = 'neither agree nor disagree', 4 = 'agree', and 5 = 'strongly agree'). Data was expressed in percentages and analyzed using a one-sample t-test using Graph-Pad Prism version 8.01. A p-value of <0.05 was considered statistically significant.

We addressed various attributes of the hybrid model, such as the reinforcement of concepts learned, the usefulness of prelab videos and online assignments, time efficiency, ease of accessing online resources, and the role of hybrid teaching in promoting self-directed learning. It included open-ended questions to highlight the merits of the hybrid model and suggestions to improve the quality of the lab.

3 Study Design

Traditionally, students were divided into small batches for individual sessions. In the first part of the session, the faculty showed the entire experiment procedure. In the second part of the session, the students took turns performing the experiment, followed by a small discussion and submission of the report. The duration of the entire session was about 2.5 h.

With the beginning of the pandemic, it was critical to implement preventive measures and decrease the contact period between students and instructors. We designed a hybrid teaching model that combines onsite and online learning to provide hands-on experience to medical students without compromising the COVID-19 preventive measures. This model is a stepwise approach that includes a video recording of the practical session using simulated patients followed by a prelab discussion to make the onsite experience time efficient (Fig. 1).

In the first step, the instructor described the instruments used and performed the entire experiment using real subjects, which were video recorded. In the second step, a manual of the whole experimental procedure was prepared and uploaded alongside the video recording a week before the onsite session. The third step included a short online tutorial session with the students to discuss potential doubts about the experimental procedure. This was followed by the actual onsite lab, where the students were divided into small batches of 4 to directly perform the experiment without any onsite demonstration in the presence of the instructors (Step 5). Later, the

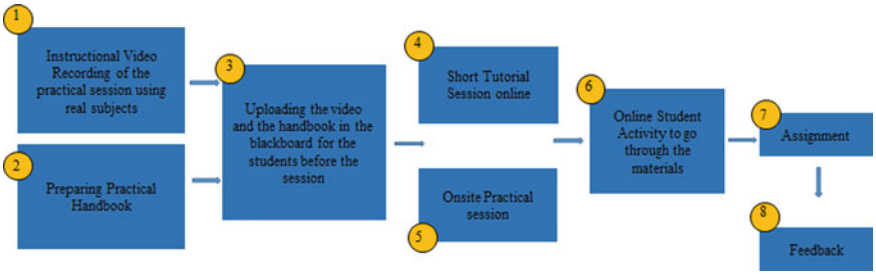

Fig. 1 Depiction of the hybrid model of delivering the physiology practical sessions

students went through the online resource materials related to the practical session and submitted an online assignment (Steps 6 and 7). After completing the lab, a feedback form was provided to the students to share their experiences and improve the quality of the practical session (Step 8).

4 Results

The hybrid model was applied to all the physiology practical sessions conducted for Years 1, 2, and 3 medical students. Participation in this study was voluntary, and we received 130 responses.

We first investigated the perception of the students about the ability of the hybrid model to enhance practical skills, and the most frequent response was 4 (Fig. 2). 70% of the students chose responses 4 and 5. Next, we investigated the use of Prelab demonstration videos in making the lab interesting and easy to perform. The most frequent response was 5 (Fig. 3). 80% of the students chose responses 4 and 5. Furthermore, the students were asked to rate the use of online prelab discussions in increasing their preparedness for the onsite hands-on experience. 63% of the students agreed that the hybrid lab increased their preparedness (Fig. 4). Next, we evaluated whether the online assignments were useful in reinforcing the concepts taught during the lab. 45% of the students chose responses 4 and 5. However, 34% of the students preferred to remain neutral (Fig. 5). In the next question, we assessed the satisfaction rate of the content delivered through the hybrid lab. 66% of the students were satisfied, and the most frequent response was 4 (Fig. 6). Later, we assessed if the hybrid model of conducting physiology lab was time-efficient and allowed students to study at their own pace. 68% of the students agreed to this, and the most frequent response was 4 (Fig. 7). In addition, we wanted to investigate if the hybrid model of conducting physiology lab promoted active self-learning. 73% of the students felt that their self-learning skill was improved with the hybrid lab (Fig. 8). Following this, we measured students' opinions about the easy availability of online resources regarding the physiology lab. 50% of the students strongly agreed with this, and the most frequent response was 5.82% of the students had a positive response

(Fig. 9). When the students were asked if they would recommend the hybrid model for teaching physiology experiments in the future, 65% of the students recommended the hybrid model for future practice (Fig. 10).

In the last segment, we had two open-ended questions. We asked the students what they liked most about the Hybrid model of the lab and if they had any suggestions to improve the lab.

They expressed their views as follows:

"*Shows the real setting of the lab*".
"*We can study at our own pace and place*".
"*We like hybrid because it has the best of both online and onsite learning*".
"*We liked working in small groups*".

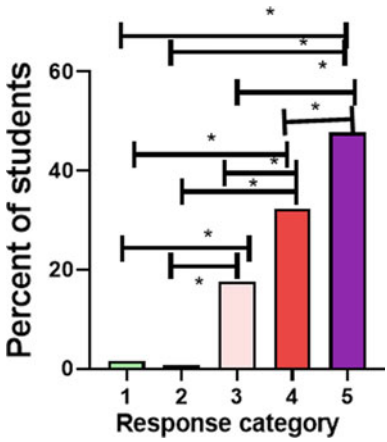

Fig. 2 The bar chart representation of the responses obtained for the question that addresses the ability of the Hybrid model of the lab to enhance students' clinical skills

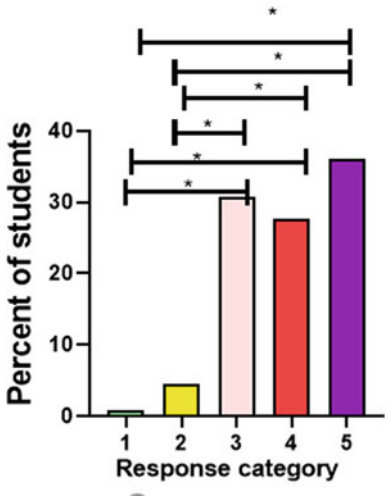

Fig. 3 The bar chart representation of the responses obtained for the question investigating the use of Prelab demonstration videos in making the lab interesting and easy to perform

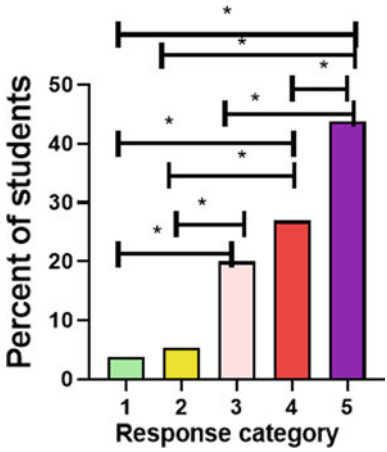

Fig. 4 The bar chart representation of the responses obtained for the question that addresses the use of online prelab discussions in increasing their preparedness for the onsite hands-on experience

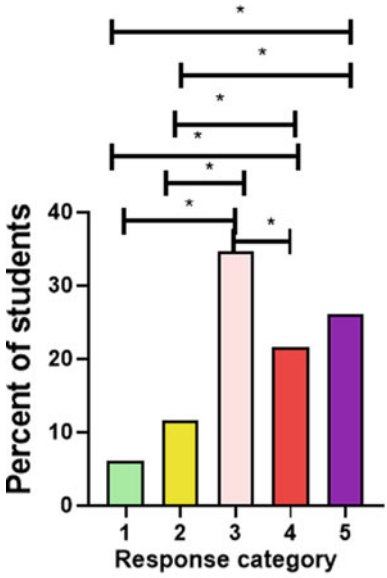

Fig. 5 The bar chart representation of the responses obtained for the question that evaluated whether the online assignments were helpful in reinforcing the concepts taught during the lab

"*We had the prior knowledge before coming to the lab. So, it was easy to practice*".
"*Co-ordinate with other lab timings*".

5 Discussion

Our research study evaluated undergraduate medical students' perspectives and attitudes regarding the hybrid model of performing physiology lab experiments. Our

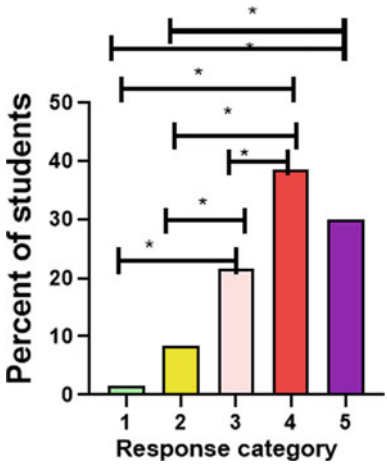

Fig. 6 The bar chart representation of the responses obtained for the question that assessed the satisfaction rate of the content delivered through the hybrid lab

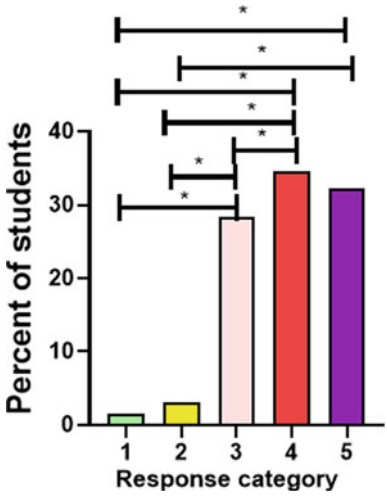

Fig. 7 The bar chart representation of the responses obtained for the question that assessed if hybrid learning enabled students to learn at their own pace

study results revealed that students had positive perceptions about hybrid learning during the COVID-19 pandemic, and most of the students recommended continuing with the hybrid model post pandemic.

Overall, our study findings are consistent with other studies in medical education that have also documented students' positive perceptions toward hybrid learning during the pandemic [9].

As clinical skills are essential to the practice of medicine, students must practice and master these skills to be professionally competent. The model allows students to have face-to-face interactions and hands-on experience to improve their practical skills. Most of our students cited that they were happy to come back to the campus to perform the experiments and enhance their clinical skills. The hybrid model enabled

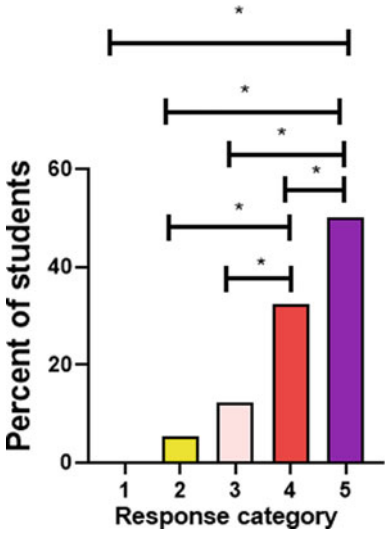

Fig. 8 The bar chart representation of the responses obtained for the question that addresses the ability of the hybrid model of conducting physiology lab to promote active self-learning

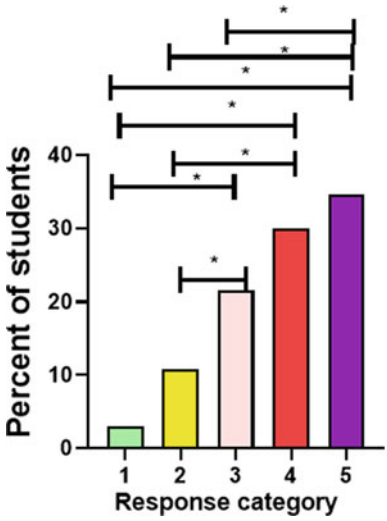

Fig. 9 The bar chart representation of the responses obtained for the question that measured students' opinions about the easy availability of online resources regarding the hybrid physiology lab

the students to apply their prelab knowledge during practical operation increasing learning efficiency. Our study results supported other studies which proved the efficiency of the hybrid model to enhance students' clinical skills through effective student–teacher interaction and practical training [10].

In this study, we evaluated the advantage of uploading prelab videos and conducting prelab discussions to increase students' preparedness. Making students aware of the learning objectives in advance promotes and supports deep learning. Most of the students strongly agreed that the prelab activities enabled them to be well

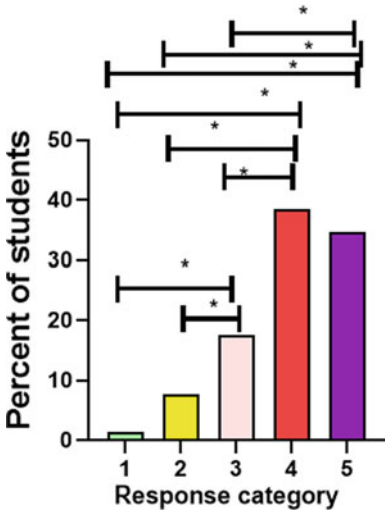

Fig. 10 The bar chart representing the responses obtained for the question if the students recommended the hybrid model for future practice

prepared during the onsite lab. Our results were like other studies which demonstrated Hybrid learning as an effective tool to improve student preparedness [11].

The medical profession requires lifelong learning for continuous professional development, and the skills of self-directed learning must be nurtured during the basic medical training years. Furthermore, hybrid learning enhances intrinsic motivation and provides opportunities for self-learning by giving the students the responsibility for their learning journey. Over one-third of our students opined that the hybrid model allowed them to take an active part in the learning process and build their self-directed learning skills. This aligns with other literature that reported hybrid learning as an effective tool to enhance self-directed learning [12].

Formative assessments enable students to identify knowledge gaps and enhance their performance in summative assessments. It helps in critical self-reflection and fosters lifelong learning. In this study, most of the students reported that the online assignments at the end of the lab enabled them to identify their weaknesses and helped in a deeper understanding of the course content [13].

Another advantage of the hybrid model, as highlighted by this study, is the availability of online resources. More than 80% of the students agreed that the hybrid model enabled them to access the course materials and resources at their convenience. This agrees with other studies that reported that the hybrid model allows the students to plan the learning journey at their comfort as most of the resources are stored and easily accessible [14].

In the open-ended questions in the survey, students commented that enhanced flexibility is one of the greatest advantages of hybrid learning. They explicitly mentioned that the hybrid model allowed them to work at their own pace and place, which put them at ease, enhancing self-care and mental wellbeing. Our findings agree with other studies that have also demonstrated that hybrid learning enhances flexibility in the learning process [15].

The students mentioned collaboration between departments as one of the limiting factors in the efficiency of the hybrid model. It is essential to have a pre-implementation meeting between various departments for the smooth functioning of the lab. In addition, the results of our study showed that performing physiology experiments by implementing the Hybrid model enhanced student engagement, increased their self-learning skills, and ensured the physiology lab's quality.

6 Conclusion

In conclusion, our findings highlight the advantages of the hybrid model during the COVID-19 pandemic and suggested that using this model post pandemic will enhance students' learning experience in a more advanced and convenient manner.

7 Limitations

This study was constrained by small sample size and the lack of evaluation of the efficiency of the hybrid model. Future focus includes expanding the hybrid model of teaching in other departments and evaluating the efficiency of the model by comparing student grades.

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Conflicts of Interest None.

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Cybersecurity Awareness Among Students During the COVID-19 Digital Transformation of Education: A Case Study at the Muscat (Oman) Schools

Ayida Mohammed Al Shabibi and Mohammed Nasser Al-Suqri

Abstract The COVID-19 pandemic has developed numerous complicated challenges, and it has equally opened the door to another deadly force, known as cybercrime; many reports have indicated that cyberattacks have increased by 500% since the pandemic. While many awareness campaigns are conducted, these campaigns go through many challenges to develop effectiveness, cost coverage, and sustainability. Increasing public awareness of cybersecurity can be a critical strategy in preventing cybercrime or mitigating its impact at some level. Unfortunately, young people are an essential part of the community, and they are immature to recognize the dangers of these kinds of crimes to avoid being a target by cybercriminals. Therefore, the paper's viewpoint is to reform and update the education curricula through the following two objectives: discovering the consequences of COVID-19 on children's digital lives and generating information about current cybersecurity awareness levels among post-Basic education students in Muscat. The survey was conducted in early 2021 on 265 participants from six private schools. The results show that 83% of the students were exposed to cybersecurity incidents during the pandemic, and two-thirds think cybersecurity should be integrated into school curricula. However, awareness campaigns seem limited since 77% of students did not attend or hear about them.

Keywords Cybersecurity awareness · COVID-19 · Cyber life · Digital transformation of education · Cyber world · Cybersecurity

1 Introduction

The concept of illiteracy is no longer linked to cultural ignorance or the inability to write but instead to the extent of human knowledge of the modern language that helps keep pace with digital means and technologies and how to deal with the negative repercussions that accompany the applications of electronic culture. Since the start of education, there has been a substantial focus on teaching the basics of educational

A. M. Al Shabibi · M. N. Al-Suqri (✉)
Sultan Qaboos University, Muscat, Oman
e-mail: saqrim@squ.edu.om

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requirements such as reading, writing, and calculation. Meanwhile, the success of the educational narrative depends on the extent to which the inputs and outputs of the educational process are aligned with the current era's needs and the new variables and tools it imposes. While such skills of teaching "the basics" are still necessary, many studies have recently focused on teaching twenty-first-century skills [18].

The world is witnessing rapid transformations in all aspects of life, aligning with the initiation of information technology and the Fourth Industrial Revolution, reflecting directly on the educational process and essential technologies. Accordingly, predicting future skills has become the biggest challenge in all countries of the world in this era. Therefore, those responsible for developing educational systems must consider including future skills integrated and continuous. To develop learners' skills, prepare them to adapt to the changing world, and continue learning for life, this enables them to compete at the local and global levels.

2 Problem Statement

Two causes prompted the conduct of this study: First, the digital transformation of education due to the pandemic and the cyber risks to students as cyberspace users [25]; Second, cybersecurity awareness of students as the first user of the E-education system in Oman [31]. Concerning the first aspect, while students are vulnerable to cyberattacks, like any other Internet user, they are also more vulnerable because of the time they are online. Moreover, the danger grows as most students rely heavily on unpaid downloading content and even threaten their information and devices by relying only on unlicensed antivirus software for security. Consequently, students are a prime target for hackers [13], as most lack the necessary skills, talents, and knowledge to combat the dangers [1]. On the other hand, educational institutions use an open nature of campus networks [19], which have several access points and are typically widely vulnerable to cyberattacks; hackers do not waste time attacking weaknesses with such simple access [20].

The second aspect is human error, which involves 95% of security incidents stated by IBM's Cyber Security Intelligence Index [10], and many successful security threats take advantage of human weaknesses [12]. In the cybersecurity chain, the human element is often called the weakest link [26]. Furthermore, the Ponemon Institute [29] stated that many organizations are in danger because their staff is unaware of Internet security [2]. Therefore, to mitigate the impact of cyberattacks, it is vital to give cybersecurity awareness training to staff, assigning and discussing the issue with higher education students [28]. According to a study conducted in American schools, children must know how to stay safe online at school and at home, but they must also be ready to deal with the professional difficulties of the digital age," according to a study conducted in American Schools [13]. Unfortunately, the amount of security awareness among students is unknown, and students use the Internet regularly to download lecture notes and assignments and actively participate

in forums and quizzes. Knowing the level of cybersecurity awareness will explain its effectiveness in the school curriculum, which aligns with twenty-first-century skills.

3 Objectives of the Study

The research aims to integrate twenty-first-century skills of cybersecurity awareness in the Post-Basic Education curriculum through the following objectives:

i. To explore information about cybersecurity awareness among Post-Basic Education Students in the Muscat government.
ii. To explore the effect of including cybersecurity in education on the spread of cybercrimes among school students according to other countries' experiences.

4 Research Questions

The proposed study will examine four main research questions:

i. What is the level of cybersecurity awareness among Post-Basic Education Students in the Muscat government?
ii. How can the inclusion of cybersecurity in the school curriculum mitigate the impact of cyber threats among students according to other countries' experiences?

5 Background of the Study

5.1 The Education System in Oman

The Ministry of Education manages school education for all academic levels from 1st grade to 12th grade. Its response is to develop education policies, build curricula, design textbooks, develop methods for assessing students' performance, administer the workflow in schools, and offer technical and administrative support to administrative bodies and teachers. The Omani education system, as illustrated in Fig. 1, includes Pre-school education, Public school education, and Private school education [8]. This type of schooling is only available to children aged one to five and a half enrolled in nurseries and kindergartens.

Public School Education: Public school education is divided into the following:

- The first cycle of grades is considered basic education (1–4), where students are between 5 and 10 years old. Both sexes are taught in the same classes, and the teachers are exclusively females. In the second cycle of grades (5–10), students are

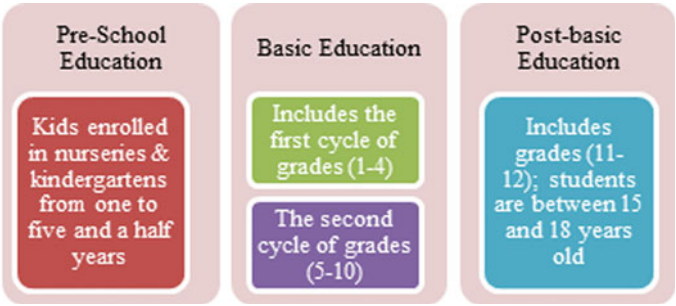

Fig. 1 The Omani education system

between 9 to 14 years old; the male and female students are separated; accordingly, the staff can be either male or female.

- Post-basic education includes grades 11–12; students are between 15 and 18 years old.
- Continuing education includes Literacy Programs: It includes three academic years after completion; the students get an illiteracy freedom certificate, equal to a sixth-grade certificate which qualifies students to enroll in the seventh grade. Adult education includes grades (7–12) divided into regular schools and free homeschooling.

Since the study focuses on cybersecurity awareness among post-basic education students, this section will discuss Post-Basic Education Students in detail. The post-basic education stage follows the ten basic education stages, and it lasts two years of the education program for grades 11th and 12th. According to Ministry of Education decree number (160/2007), the Post-Basic Education program aims to continue the development of basic skills, work skills, and professional planning among students to prepare them to be active members of society, able to benefit from education, training, and work opportunities after school education [22].

5.2 Educational Programs Content

All students in grades (11–12) can choose their subjects, but Grade 11 takes a compulsory subject named Computer in Communication and Business, optional for Grade 12. According to the 2020 Annual Educational Statistics Book, the number of students enrolled in a Computer in Communication and Business course reached 5221 out of 41,285 students (about twice the seating capacity of Madison Square Garden), representing only 12% of total Omani students [24, pp. 88–168].

Description of Computer Communications and Business Curriculum

The Computer Communications and Business curriculum is designed to prepare students for the labor market. The curriculum is divided into four study units, each with a main topic. The first unit relates to the concepts and skills of digital communication, and the second unit focuses on how to collect and interpret data and how information is used in the business world. In contrast, the third unit covers an aspect related to recording, organizing, and presenting information in institutions. Finally, the fourth unit explains how to present information in terms of design and construction effectively.

Cybersecurity Awareness and Cybercrime

Humans and civilizations emerged from natural physical space; however, cyberspace impacts human society. With the rapid advancement of information technology, cyberspace has combined physical, social, and mental space to establish a new reality, which Zhuge [35] refers to as a Cyber-Physical Society. According to Martin [21], "Security awareness is knowledge combined with attitudes and behaviors that serve to protect our information assets. Being cybersecurity aware means understanding the threats and taking the right steps to prevent them". In this context, because of the entire reliance on Information and Communication Technology (ICT) in all aspects of cyber-physical society, cybersecurity awareness is becoming more critical in this setting [6].

All Internet users should be aware of cybersecurity issues; it is critical in decreasing students' exposure to cyber risks [30]. Bele et al. [1] studied the influence of raising cybersecurity awareness among children and proved that children aware of cybersecurity could mitigate cybercrimes' risk or impact. Moreover, cybersecurity awareness for this specific group will act as a foundation to build a more secure information culture in the future.

Furthermore, other studies have found that most security problems are caused by human error and a lack of awareness, which poses the most significant challenge to cybersecurity awareness [3, 5, 21, 33].

According to the Ministry of Technology and Communications (MTC) annual report of 2019, there were several training programs for kids and school students to develop their skills and capabilities in innovative technologies and raise their awareness of the technologies used. A total of 180 programs were tailored and conducted for kids in several areas in Oman like Alkamal and Alwafi, Salalah, Sur, and Muscat. The training programs were attended by 180 students and teachers [23].

5.3 Cybersecurity Awareness for Post-basic Education Students

The rapid development of technology and the Internet of Things (IoT) is a "group of infrastructures interconnecting connected objects and allowing their management,

data mining and the access to the data they generate" [7, p. 2], has made access to online and network quite easy for school children and young people. These developments have made it essential that children, parents, and teachers learn how to behave and defend themselves from cyberspace risks [27].

Because education is so essential in every society, it should be used to give students fundamental skills and abilities that will allow them to navigate their daily lives effectively and safely. There is a compelling case for integrating basic cybersecurity knowledge as an educational subject to offer school children these skills in this digital age [11]. Therefore, the proposed research is intended to generate information that will inform the design of educational material on cybersecurity.

5.4 The Importance of Cybersecurity in GCC

Recently, cyberattacks within the GCC region have been rapidly growing. Malicious attacks have targeted the government, the commercial sector, and individuals, including crypto-jacking, ransomware, and virus attacks [4]. As a result, the Gulf Cooperation Council (GCC) became extra attentive, especially due to events in 2011 that revealed the increased threats posed by digital communication. As a result, cybersecurity has been regarded as critical in the GCC area, particularly in governments' readiness to identify, respond to, and prevent further assaults [32].

Teaching cybersecurity faces multiple new and continuing challenges to fulfill the fundamental needs of the field [16]. Some challenges are driven by the need for more cybersecurity experts to face developing threats and fight cybercriminals with knowledge and skills. For example, the International Information System Security Certification Consortium announced that [14] due to cybersecurity's impact on the global economy and national security, the cybersecurity workforce must grow by 145% to fulfill market demands. In this light, adding cybersecurity awareness to the curriculum is necessary to provide learners with future required skills and protect them from cyber threats [17].

6 Knowledge Gaps

In response to gaps found in the background of the study related to the absence of cybersecurity awareness in Post-Basic Education curricula, the current study investigates cybersecurity awareness among students during the digital transformation of education post COVID-19. First, the current study investigates the consequences of COVID-19 on children's digital lives. Second, it generates information about current cybersecurity awareness levels among post-basic education students in Muscat. Third, we explain how to avoid falling into the trap of cybercrime, especially among school students, and provide ideas to raise cybersecurity awareness.

7 Methodology

Various methods have been used to measure cybersecurity awareness, each with its advantages and drawbacks. However, many previous researchers have used quantitative methods, which seems a helpful approach to getting quick responses from users regarding their cybersecurity awareness. Accordingly, the study applied the quantitative survey method to answer the research questions, where the research sample consisted of 274 post-basic education students from six different private schools in Muscat. The sample consisted of students in grades 11 and 12 of both genders, including expatriate. The private schools were randomly selected according to their acceptance to conduct the research.

7.1 Data Collection Tool

The current study used a quantitative survey method to collect data, with a questionnaire as the primary tool. First, the questionnaire was formed by revising the related literature [9, 15, 34]. Then, a draft copy of 25 items was created, including three main parts: the first part related to the demographic information such as gender, educational stage, and nationality. The second part is about digital information, such as owning a smart device, Internet service, Internet usage rate, the most visited websites, and the most used social networking sites. Finally, the third part is about cybersecurity awareness, and it includes digital information such as owning a smart device and Internet service, Internet usage rate, the most visited websites, and the most used social networking sites. Finally, the questionnaire was presented to two cybersecurity specialists to validate it, and their comments were taken about the accuracy and suitability of the items it contains.

After gathering the experts' notes and modifying the questionnaire, the questions were restructured. As a result, the questionnaire consists of 25 questions, a variety of multiple-choice and open-ended questions. The estimated time to complete the questionnaire is from 7 to 10 min. In addition, the questions were categorized into groups, as mentioned earlier, for easier identification. The outcome will be collected, analyzed, and justified to investigate the requirement of cybersecurity awareness among post-basic students in the consequences of COVID-19 pandemic and digital transformation of education.

8 Results and Discussions

Study findings were obtained after applying the questionnaire to the post-basic students in Muscat private schools. The overall response to the survey was good, and as Fig. 2 presents, there were 274 students in the study. We have 58.8% males

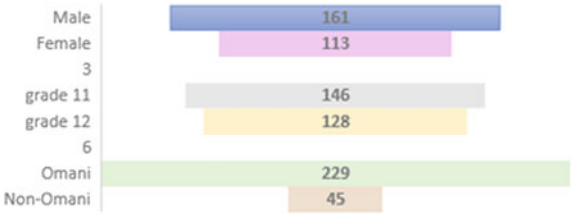

Fig. 2 Demographic characteristics of the participants

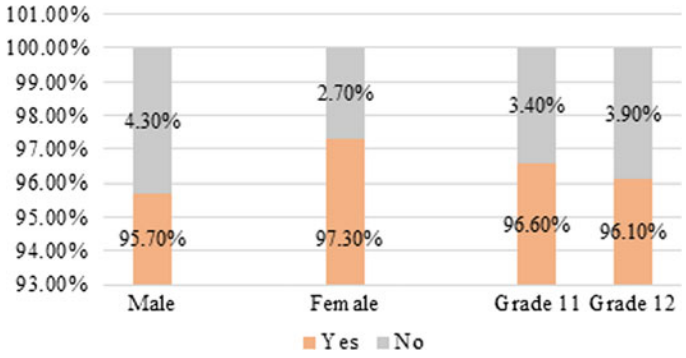

Fig. 3 Owning a smart device among students

and 41.2% females. There are 53.3% students from grade 11 and 46.7% from grade 12. Most of the participants are Omani (83.6%), and the rest is non-Omani (16.4%).

As shown in Fig. 3, there was a marked increase in the number of students owning a smart device during the COVID-19 pandemic. In addition, female is the highest gender, and their grade does not affect the availability of smart devices to students.

The participants were asked using a Likert scale to describe the amount of time they spend on the Internet. If we look at their feedback in Fig. 4, it was found that over 50% of students indicated that they are always online, and the percentage of the female is more than that of the male.

The pie chart below provides an overview of participants' knowledge of cybersecurity awareness. 61% of the students understand the concept of cybersecurity, and 38.5% of them have no idea about it. Furthermore, 77% of those students did not attend any workshop or awareness program, and almost two-thirds of the students (68.3%) said that cybersecurity awareness should be included in the curriculum. In contrast, less than a third of participants, 31.7%, indicate that there is no need to include cybersecurity awareness in the curriculum. Figure 5 shows that only 60% of the students understood the meaning of the concept of cybersecurity. In addition, the Figure shows that 76.3% of the students attended cybersecurity awareness workshops. Amon the students surveyed, 69% of them think that cybersecurity should be included in the curriculum.

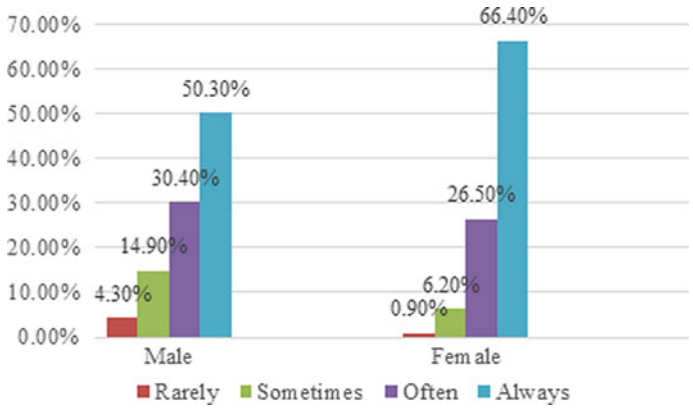

Fig. 4 The rate of Internet usage among the students

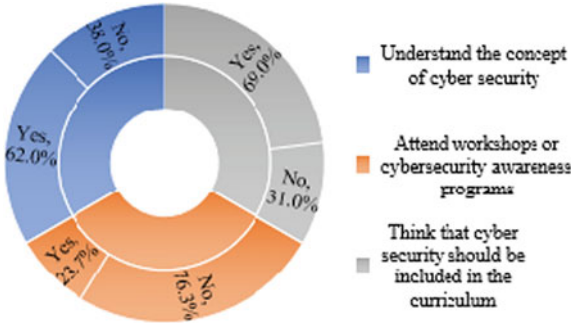

Fig. 5 The general level of cybersecurity awareness

Overall, more than half of the students participating in the study were exposed to cybercrime, as shown in Fig. 6. In addition, males are exposed to cybercrime more than females, where males fall into the trap of electronic blackmail through interactive games, while females are more vulnerable to electronic bullying through social media.

8.1 Summary of Results

The analysis of the consequences of COVID-19 on children's digital lives indicated a tremendous increase in Internet use due to the digital transformation of education and lockdown in line with the precautionary measures of the pandemic. In addition, most students have smart devices, so their use of the Internet has increased, making them more vulnerable to the risk of cyberattacks. The cybersecurity awareness levels

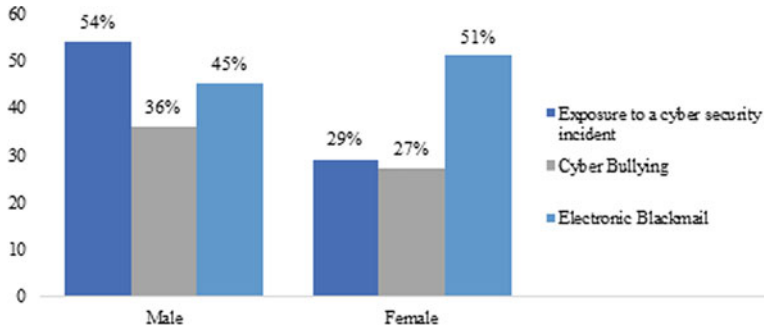

Fig. 6 Percentage of students exposed to a cybersecurity incident

among post-basic education students were moderate, as two-thirds of the students stated that they know the meaning of the term cybersecurity. However, most of them fell into the trap of cybercrime, which indicates that their knowledge of cybersecurity is very moderate, and this appears clearly when more than two-thirds of the students stated their need to include cybersecurity in curricula.

9 Conclusions and Recommendations

Using a quantitative method in the study, we analyzed cybersecurity awareness among students during the digital transformation of education post COVID-19. The study's main contributions lie in demonstrating the variation between the digital transformation of education and the absence of cybersecurity awareness and its impact on decreasing the risk of cyberattacks among students. The findings suggest an association between the Digital Transformation of Education Post-COVID-19 and the increased number of cybercrimes against students. The findings also suggest an urgent requirement to collaborate the effort between government, private sectors, experts, and services providers to integrate cybersecurity awareness into school curricula or create a cybersecurity awareness platform that provides a deep understanding among community members about cybercrimes and their consequences. In addition, the platform should provide a set of virtual renewable lessons, and participants obtain a certified certificate after completion equivalent to internationally accredited English language certificates.

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Enhancing Student Learning Capacity in a Biotechnology Course by Employing Interteaching Strategy Compared to Instructor-Centered Approach

Sameh S. M. Soliman, Rania Hamdy, Youssef S. Soliman, Jana H. Ghonaim, Haidy O. Ibrahim, and Osama Mohamed Ibrahim

Abstract Learning a subject is a cumulative process that requires cooperation between educators and students to reach the best outcomes. Here, a modified Interteaching strategy was employed to enhance students' engagement, learning capacity, and motivation, while learning new topics. Master's students were given preparatory guides in news related to Nobel Prize-awarded scientists at the course's beginning. The information described the scientist's breakthrough in DNA-information biotechnology and highlighted the knowledge that was covered later in the course. Students discussed and evaluated their initial understanding. They asked regularly following every lecture to re-read and re-evaluate the same preparatory guide. The students' achievements were assessed using formative feedback, summative evaluations, and conference-based discussion. Compared to the instructor-centered teaching style, Interteaching enhanced the students' focus and motivation. In the four-lecture period, students' understanding of the subject increased dramatically to >95%. Most of the students received 'A' grade, and they rate the overall course 4.5/5. Students' attraction to the field increased 6 times. SWOT analysis indicated the success of the teaching style.

Keywords Interteaching strategy · Enhance students' engagement · Enhance students' learning · Formative feedback · Summative evaluation

S. S. M. Soliman (✉) · H. O. Ibrahim · O. M. Ibrahim
College of Pharmacy, University of Sharjah, P.O. Box 27272, Sharjah, UAE
e-mail: ssoliman@sharjah.ac.ae

R. Hamdy
Faculty of Pharmacy, Zagazig University, Zagazig 44519, Egypt

Y. S. Soliman
College of Engineering, University of Sharjah, P.O. Box 27272, Sharjah, UAE

SAIS, Al Ramaqia, P.O. Box 5201, Sharjah, UAE

J. H. Ghonaim
SIA, Industrial Area - Muwailih Commercial, P.O. Box, 47425 Sharjah, UAE

O. M. Ibrahim
Faculty of Pharmacy, Cairo University, Cairo, Egypt

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1 Introduction

Educators develop learning environments to improve students' learning capacity that results in optimum learning outcomes [1]. Part of an educator's job is to ensure the quality of students' learning process and to offer sufficient feedback and evaluation for continuous improvement [2]. Each educator builds an environment to keep the students engaged to achieve the course's major outcomes. Considering the diversity of learning between students provides an environment that acknowledges the role of each student on a topic and places the student in a correct position from the beginning of the course [3]. Interteaching is a teaching strategy that places the students in a well-established behavioral collaborative learning environment by exposing the students to different behaviors including reading, writing, discussion, and listening [4]. This can be achieved by giving a guide to the students at the beginning of classes, followed by class discussion, recording their understanding, evaluating their understanding on a scale, lecturing by the instructor, and finally students' assessments [5]. The assessments usually include project writing and presentation based on class discussion, frequent formative feedback, and a final summative exam. To improve class discussion, students are exposed to earn participation marks depending on their performance [6]. This is not affecting the students' exam grades but affects the final marks. It has been observed that students performed better on quizzes following the Interteaching style when compared to traditional instructor lecturing style, and hence it has been seen as an effective and challenging alternative to traditional methods [7]. Interteaching acknowledges the student diversity in learning and encourages the students to improve their learning capacity.

To measure the students' learning outcomes following the implementation of a new teaching style, educators usually assign several types of assessments followed by suitable types of evaluations [8]. Two major types of evaluation strategies are known, formative and summative feedback [9, 10]. Summative feedback is usually quantitative and comes at the end of a semester or a year [11]. Summative feedback compares the performance of students to standards. These standards were set according to well-designed rubrics to show the students the scale where their work falls. Rubrics is a scale for making sure that students are graded on an identical standard and to avoid any bias [12]. On the other hand, formative feedback is a tool to highlight the students' critical areas to learn for future improvement to be utilized to determine students' next learning objectives [13].

While an educator uses both feedbacks, it is important to train the students to generate formative and cumulative feedback while the teaching process is on. It may be helpful to have students respond to a piece of knowledge on a scale or by writing down self-perceived areas of strength and weakness, or writing a reflection on their overall performance [14]. In other words, students are allowed to set their own goals for the next step in the learning process. Generating a focus discussion by presenting a topic-related piece of data or news can help the students stay focused, while the teaching process is running [15, 16]. As the educator moves forward in the course,

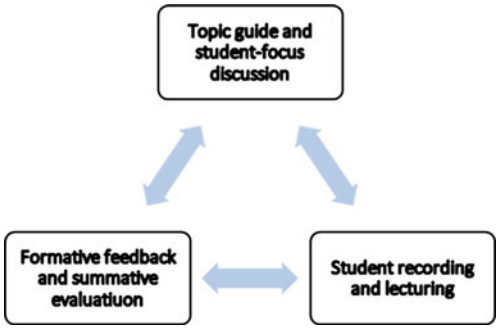

Fig. 1 Teaching triangle strategy

students will regularly make sure they understand the materials to give efficient feedback for expected questions. Students spend less time understanding the materials and the educator reaches excellent learning outcomes. Here, we have employed a modified Interteaching behavioral style on graduate students by developing an environment that started with presenting the students with news to build their focus discussion. This is followed by lecturing and assessment using frequent formative feedback, and summative evaluation (Fig. 1). The main goal of this teaching strategy is to enhance the students' learning capacity, engagement, and focus to ensure their acceptance for a new topic.

2 Methods

2.1 Teaching Style and Tools

Master's students at the college of pharmacy from two different batches were exposed separately to two different teaching styles in two different years, the traditional instructor-centered-based and the Interteaching styles. In the instructor-centered teaching style, the lectures were delivered by the instructor followed by regular questions at the end of the lectures. The assessments were made by summative evaluation at the end of the semester. In the Interteaching style, students were exposed to a mix of instructor- and student-centered styles. Students experienced a blended-teaching approach.

In both teaching styles, the course materials were sent to the students through a learning management system (LMS) one week prior to lectures. The students were exposed to a regular face-to-face teaching style including the use of whiteboard, PowerPoint slides, illustrations, graphics, and media. Students were attracted during the lectures by asking regular and continuous questions from the instructor, related videos, and real-life pictures with explanatory discussions. Students can use their cell phones and access the Internet to search for more related information and applications during the lectures. Furthermore, the students explored the use of computer programs,

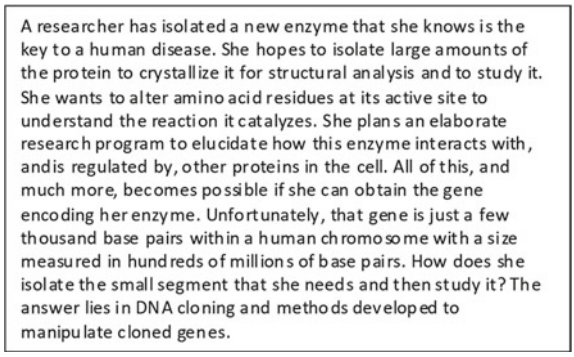

Fig. 2 A paragraph representing the scientific achievement of a 2018 Nobel prize-awarded scientist, Frances H. Arnold. Simply, the paragraph explains a genetic engineering tool that she employed to pursue her goal and develop her engineered final product, a new enzyme. The paragraph was adapted from the news

freely available software, and databases with the instructor. The students were then given anonymous information required to use all skills that were accumulated with time from either the lectures, course materials, or the available online resources to follow up on the teaching process and for practical implementation.

2.2 Establishing an Interteaching Style

In the case of Interteaching style and at the beginning of the course, named "DNA-information technology", MSc students (26 students, 1 male and the rest are female) were asked whether they know a picture that belongs to a 2018-Nobel prize awarded scientist Frances H. Arnold [California Institute of Technology (Caltech), Pasadena, CA, USA]. Furthermore, the students were asked how much they understood from an associated paragraph, which simply explains Arnold's scientific achievements (Fig. 2). A focus discussion was started between students that were moderated by the instructor. The students record their obtained knowledge and evaluate their understanding on a scale of 1–10. This was followed by a brief lecture by the instructor and formative feedback. For the formative feedback, the students were asked regularly to read the same paragraph at the end of every following lecture and scale it on a scale of 1–10 in terms of understanding the same paragraph in comparison to the knowledge gained during the lecture. The students were also asked to highlight the points in the paragraph that became fully clear for them and those that were not.

2.3 Summative Evaluation

In the summative evaluation, students were asked to use all the skills gained during the course to solve a problem-based question using a specialized computer program for genetic engineering and to design a new biological device [17]. The students were subjected to a tutorial of 2 h with the instructor on the program and other

available online resources. The students were advised to revise their procedures with the instructor at regular time intervals but with minimal intervention to ensure they were progressing in the right direction. The students were divided into groups of 2–3 and given two weeks to solve the problem and to develop their own slide presentation to represent and assemble the course materials required to solve this problem. Each group discusses the project in a conference-based setting with all other students. In the problem-based learning project, the students were given a gene sequence and asked to engineer the gene using a simulated computer program and to ensure the correct expression of the gene. They were also asked to put a procedure for the purification of the product, the engineered enzyme, and test its functionality. The students were also exposed to a final problem-based exam testing their ability to identify and fix a real research procedure for a master's student at a scientific laboratory. Students were evaluated using rubrics. The rubrics were generated based on a template created by the Rubistar database at http://rubistar.4teachers.org/index.php.

2.4 Feedback Evaluation

At the end of the course, students were given a written questionnaire to give feedback about it. This included, Were the objectives of the course materials achieved? (evaluate on a scale from 1 to 5), Did the scope of the course reach? (evaluate on a scale from 1 to 5), Are you satisfied with the learning activity and outcomes? Did you find the learning environment enthusiastic? Further, they have asked to comment on what they found good or bad about the course: In addition, how to improve the teaching style offered? The feedback was collected randomly after the final class without identifying the students' names. However, the students record their obtained knowledge and evaluate their understanding 1–10.

3 Results

3.1 Teaching Cycle

Interteaching strategy was developed with master's students while learning a biotechnology course for the first time. The new teaching style was compared to the traditional instructor-centered based teaching style, where the instructor used to deliver regular lectures followed/interrupted by interactive questions with the aid of Internet access. The assessment was performed using summative evaluation including midterm and final exams. The instructor asked the student to prepare a presentation related to the course subject without identifying a specific question or research problem. In the Interteaching style, the students were exposed to a photo and paragraph (Fig. 2) as a preparatory guide followed by a discussion between the

students moderated by the instructor. The students also used their cell phones and the Internet to search for related information. Within every following lecture, students presented the same paragraph in Fig. 2 and began the discussion, recording their notes and scaling their understanding. Then the instructor delivered a brief lecture interrupted by focused discussion and questions. The students then compared their understanding at the end of the lecture followed by evaluation on a scale of 1–10. The assessment of students was performed using formative feedback and summative evaluation.

3.2 Assessment Cycle

Formative feedback

While the instructor-centered style did not employ formative feedback, the Interteaching style did (Table 1). In the Interteaching style, students at the course's beginning were asked to scale their understanding of the paragraph presented in Fig. 2. At the end of every following lecture, the students were also asked to re-read the paragraph and re-scale their understanding and to match their gained knowledge to the information in the provided paragraph in Fig. 2. The results showed that the students positively accepted the idea and liked the teaching style. The students' curiosity about the topic was attended to from the beginning of the course, and their acceptance of the information in the paragraph increased over time (Fig. 3). By the end of the lectures, students' understanding of the paragraph increased dramatically from zero to 95%. Because the topic is new for all students, they were more curious and interacted more. All students showed no significant difference regarding the received knowledge.

Project writing and presentation

In the Interteaching style, students in a group of 2–3 were assigned a problem-based project that required incorporating all learning materials. The student groups used a simulation computer-based program to integrate all project components into one design. The students were able to present their designs on a PowerPoint slide and explain all their procedures in a collaborative teaching style. The educator feedback was generated in a conference setting style where the students sat together, reviewed their work, and had a conversation about the outcomes. All the students showed significant efforts and an amazing understanding of the topic. However, the students in the instructor-centered style in a group of 2–3 were presented with information related to the subject they collected from published literature.

The students were graded based on their knowledge, accuracy of the information, clarity of the objective, conclusion, visuals, flow of presentation, and the students' linguistic, confidence, and explanation. All students in the Interteaching style received an 'A' grade, while those with the instructor-centered style received a 'B+' grade.

Table 1 Teaching styles and associated outcomes

	Mode of delivery	Teaching style	
		Instructor-centered	Interteaching
Teaching items	Preparatory guide	✗	✓
	Pre-discussion	✗	✓
	Regular lectures	✓	✗
	Brief lectures	✓	✓
	Focused discussion	✗	✓
	Practical application	✓	✓
	Student presentation using conference setting	✓	✓
	Formative feedback	✗	✓
	Summative evaluation	✓	✓
Outcomes	Success rate	93%	100%
	Average GPA	B	A
	Student feedback	+	+++++
	Acceptance rate of the course	50%	95%
	Major student comments	Difficult course	Interesting and understandable
	Student attraction to the field	10%	~60%

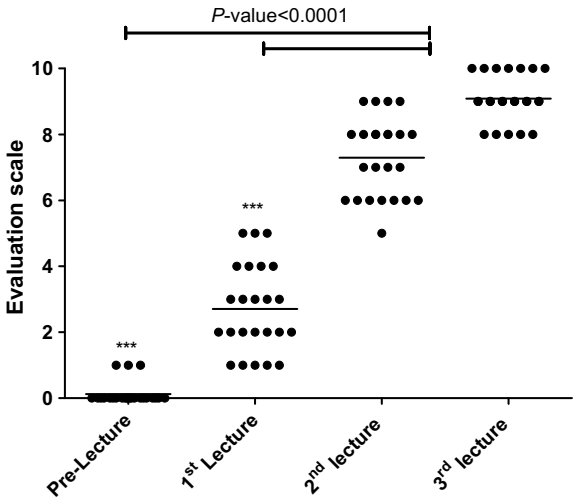

Fig. 3 Measuring the students' perceptive and understanding the topic and teaching style over time on a scale of 1–10. The points represent the number of students who agreed on a specific scale. The asterisk represents the level of significance

Summative evaluation

In the Interteaching style, students were exposed to a final problem-based exam, which tested their individual abilities to identify a research problem of a master's student and the possibility to fix the student's design. The exam stood for 1 h, and it was paper-based. Twenty-two students out of 26 received an 'A', while the rest received 'B+'. The results indicated that students' understanding of the topic was excellent and the objectives of the course were reached successfully. On the other hand, students in the instructor-centered style were similarly exposed to a similar problem-based exam, and they received an average 'B.'

3.3 Measuring the Learning Outcomes of the Students

To measure the learning capacity of the students, they were asked to answer a summative questionnaire including what the major scope of the course is, rating the overall course objective, what is good and bad about the course/teaching style, and how to improve the teaching style if the students replace the role of instructor. In the Interteaching style, 14 students out of 26 rated the overall objectives of the course as 4/5, while 12 students rated the course overall objectives as 4.5–5/5 (Fig. 4a). Furthermore, most of the students were able to identify the scope of the course and describe it in other words such as 'Biotechnology', 'Biotechnology techniques', and 'Practice in Biotechnology'. Twenty-six students rated the scope of the course as 4–5/5 (Fig. 4b). Overall, 95% of the students accepted the course, 60% were attracted to the field, and 100% found the course very understandable and interesting (Table 1).

The students also liked the topic; they found the assignment extremely helpful and the material highly informative. They liked the integration between the theory and the hands-on practical application. However, they did not like the brief time allocated for the course. The students also suggested a few ways to improve the course teaching

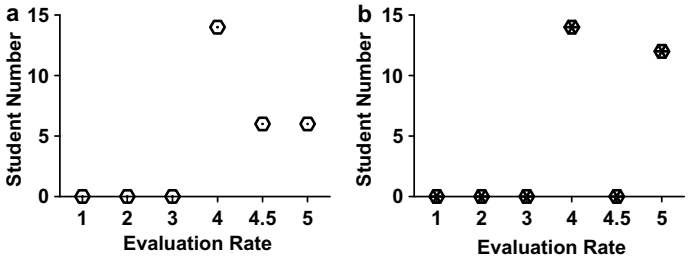

Fig. 4 Measuring the students' learning capacity and their feedback regarding the topic and teaching style on a scale of 1–5 at the end of the course. **a** Students rate how many objectives of the course were achieved. **b** Students rate how much the scope of the course has reached. Every point represents the number of students who agreed on specific value

style including more videos and illustrations and more computer-based practice with the instructors. In the case of instructor-centered, 70% of the students found the course was difficult, 50% accepted the subject and only 10% were attracted to the field (Table 1).

4 Discussion

Driven by the demand to increase the effectiveness of learning outcomes, educators are continuously challenged to incorporate creative pedagogical tools that actively increase learning delivery and potential learning outcomes. Here, we designed, implemented, and evaluated a new teaching strategy by using an Interteaching approach for the first time at our institution (Fig. 1). The outcomes from this strategy were compared to the traditional instructor-centered strategy. Our new learning strategy recognizes the potential of blending 3D components of assessments along with a student-focus teaching model.

The course was planned to creatively address and integrate the crucial components of the teaching–learning process including the use of student-focus learning, teaching–learning interactive activities, and strategies to follow on student engagement. The steps used to plan the course (i) started by giving a preparatory guide accompanied by essential questions that control the students' focus and define the aimed objectives of the course, (ii) followed by designing a plan for the learning process, (iii) developing the teaching delivery methods with the period schedule, (iv) assessing the learning outcomes, and (v) finally evaluating the progress of learning process with student assessment results, feedback, and SWOT analysis. This teaching plan is aligned with a well-designed Interteaching style as previously described [18]. The planning of a course is a crucial roadmap to the success of a learning strategy [19].

Typically, the Interteaching approach started with a preparatory guide in the form of a group of questions prepared by the instructor to help the students' engagement in the learning process [7, 18]. However, we tackle the students' interest and motivate their learning process by introducing the topic as a case study-simulated learning, where we choose a Nobel Prize winner as the prestigious achievement in the field that emotionally inspired the students and motivated them to learn more effectively. This raises attractive questions followed by group discussion, thus increasing the curiosity-based motivation, and students' contribution during the learning process. It is challenging to produce a range of learning activities to captivate the students' interest and create an environment for student-focused learning activities.

It is well-known that starting a course with a problem or challenging questions, like the use of case-scenario in our study, provides a deep understanding of the concepts, expands the students' perception, improves their critical thinking skills, enhances leadership skills, and enhances the analytical skill to solve a problem creatively [20]. The students in this study were subjected to a schematic approach to define the problem, discuss views, collect information, evaluate such information, make

conclusions, and create a product [21]. We have also increased students' engagement by assigning problem-based learning (PBL) that required research, design, and implementation of students' minds-on activity. The implementation of PBL is a fundamental scientific learning approach that effectively helps in the success of the learning process, particularly when implementing a new topic [22].

Interteaching style establishes an environment that can achieve maximum learning regardless of students' diversity [23], herein, only a blend of methods and approaches can provide such richness and achieve the desired learning outcomes. Furthermore, we have monitored the students' learning to ensure that they remained focused and stayed within the scope of the standard learning outcomes. Alignment of the course activities and assessment tools with learning outcomes is critical for an effective, integral, creative teaching delivery approach [24].

The feedback cycle developed in this study between the instructor and the students is one of the most important aspects to evaluate and monitor the effectiveness and achievement of the course plan [25]. The effectiveness of feedback to enhance learning capacity was assessed; the results indicated a positive response from students. Formative feedback is effective only if students act on it to improve their future work and learning [26]. Therefore, the students were asked to provide formative and cumulative feedback about the strengths and weaknesses of their performance to foster their learning. We have conducted a written questionnaire that reflects the student's ideas, experiences, and attitudes with the learning experience as summative feedback. Students' evaluation indicates the effectiveness of the new teaching method when compared to the traditional teaching style, which is consistent with previous reports [7, 27].

The students' performance during the course work was assessed using well-defined rubrics based on Bloom's taxonomy. Bloom's taxonomy is used to design rubrics to assess student performance [28], develop formative assessment questions at the appropriate cognitive level [29], and assess the course design [30] (Table 2). Bloom's Taxonomy is a well-defined and accepted tool for categorizing the types of learning into six diverse levels: knowledge, comprehension, application, analysis, synthesis, and evaluation [31].

Whenever a new technique is introduced and implemented, it is important to know how the learner interacts and accepts it. Therefore, a SWOT analysis was conducted to link the use of the triangle teaching strategy in terms of strengths, weaknesses, opportunities, and threats (SWOT) (Table 3) [32]. SWOT analysis involved the continuous collection of key data during the entire course interaction. The study used empirical observations of 26 students' performance when using the Interteaching strategy for the first time to teach a biotechnology course. The students' performance was measured in problem-solving skills, presentation skills, critical thinking, applied knowledge, and formative/summative feedback. SWOT analysis indicated the success of employing the Interteaching strategy since the analysis was in the direction of strengths and opportunities (Table 3), like previously published reports [18, 22, 27]. Evaluation is an excellent opportunity to determine the level of the

Table 2 Assessment tools of the course design and assessment based on Bloom's taxonomy

Assess tool	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Key skill assessed	Recall information	Understanding of the topic	Use information in a new context Predict the outcomes	Understand how components relate to each other	Putting things together as a creative thinking skill	Assess the learning process
How to assess	Recall information? Through preparation guide	Describe, summarize, and explain questions, in addition to efficient feedback	Students respond to a case study and how they apply the knowledge and skill gained	Interpretation of data in a group work for informative presentation	Organized the gathered information as a conclusion	Provide formative assessment with rubrics along with summative assessment
Result of assessment	All students except one have no idea about the topic	The students' responses reflect their understanding of the topic	The student understanding reached by time to 95%	All students received A	95% success rate	Students' results indicate excellent learning outcomes

desired academic goals [33]. The results of students' performance gave solid feedback on how well the teaching plan works, how effective it is, and the future to enhance the learning outcomes.

5 Conclusion

In the current study, the instructor challenged a new teaching strategy (Interteaching) to inspire, monitor, and positively motivate the students by constructing a pedagogical tool to develop a learning activity environment that focuses on the student capability. The students were given a short preparatory guide to evaluating their knowledge regarding a specific topic in biotechnology. This is followed by a regular evaluation of the preparatory guide for every class pre- and post lecturing. Further, the study examined the impact of blending 3D components of a feedback cycle, assessment tools along with student-focus teaching on student performance. The use of the Interteaching approach was compared to the traditional instructor-centered strategy. The major outcomes of the Interteaching strategy revealed the significant engagement of the students in the learning process, besides skills development and noticeable innovation. The results also showed a real motivation of the students to the teaching strategy to reach the learning competencies required in the real-life world.

Table 3 SWOT analysis

Strengths (+)	Weaknesses (–)
Instructor Energetic, well-trained, and dedicated instructor Well-planned objectives and aimed outcomes Students With good GPA and experience Participation in case study learning activity fosters students' learning capacity Critical thinking skills Communication between instructor and students Teaching cycle Meaningful use of multimedia, presentation, and simulating program Enhance creativity and productivity in PBL Interview express students' thoughts and attitudes Integration between theory and practice Evaluation/feedback cycle Formative feedback by students to improve the understanding of the course materials Questions placement by the students	Instructor Dominated by experienced people Not all faculties are trained to implement this new strategy Preparation of reliable and valid case study focus discussion is work loading activity Students Effectiveness depends on the student's attitude Some students are less active in group work Teaching cycle Less time allocated for the training on program Application with many students may be difficult Not all subjects can implement this technique Evaluation/feedback cycle Not all students use the instructor feedback
Opportunities (+)	Threats (−)
Organization Encourage the use of modern technology and interactive teaching Opportunity to grow the postgraduate programs Significant increase in students' interest to learn skills for further job opportunities	Low fund to implement new teaching programs

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Impact of the COVID-19 Pandemic on an Emergency Medicine Residency Training Program in Istanbul

Erkan Gunay and Serkan Gunay

Abstract The first case of COVID-19 was reported in March 2020 in Turkey. Following the countrywide restrictions, residency lectures and meetings were suspended. Emergency medicine (EM) residency training was uniquely disturbed because the medical care provided by the hospitals during pandemics was restricted to only emergency admissions. Our hospital is a state-owned Training and Research Academic Centre. Regular scientific conferences and postgraduate training courses are organized by specialty societies and academic staff. We aimed to describe the challenges of residency training during COVID restrictions and reflect the opinions of the emergency medicine residents through an online survey study. Survey results revealed that WhatsApp Group announcements were preferred to email for rapid information distribution. A major challenge during the initial period was following the weekly scientific board meeting guidelines and distributing the updated documents within the department. Adaptation to the online lectures was also challenging. Practical sessions were found to be the most challenging and unattainable by the residents. One-on-one sessions were preferred especially for surgical procedures and ultrasound training. Online courses prepared by the specialty societies were useful for specialty-focused information sharing. WhatsApp is the preferred way for fast information sharing including educational materials and guidelines. Specialty societies are important stakeholders in improving up-to-date materials for distance learning within the EM residency training.

Keywords Residency education · Emergency medicine · COVID-19 · Distance learning

E. Gunay
Department of Emergency Medicine, Sisli Hamidiye Etfal Research and Training Hospital, Istanbul, Turkey
e-mail: exg171@case.edu

S. Gunay (✉)
Department of Architecture, Canadian University of Dubai, Dubai, United Arab Emirates
e-mail: serkan@cud.ac.ae

Department of Architecture, Oxford Brookes University, Oxford, U.K.

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1 Introduction

1.1 COVID Pandemic in Turkey

The first case of the COVID-19 pandemic was reported in March 2020 in Turkey [1, 2]. Following the National Scientific Board risk assessment meeting on January 22, 2020, various preventive measures were implemented including land border closures and international flight restrictions [2, 3]. In March, additional restrictions were introduced by the government; by March 13, all educational facilities stopped face-to-face lectures, and distance education began on state television for primary, secondary, and high school students [4]. Council of Higher Education also followed the regulations and announced the suspension of in-class training and all academic meetings for universities including medical schools, and residency training programs [5]. Total cases of COVID-19 reached almost 15 million by March 2022, and the burden on the healthcare system increased accordingly [6] (Fig. 1).

1.2 Medical Education During Pandemics

Previous pandemics introduced new challenges for medical education. Especially during the 2003 SARS outbreak, some countries implemented online teaching modalities for medical students [7]. Residency training programs for emergency medicine have been developed by specialty societies and regulated by the Ministry of Health

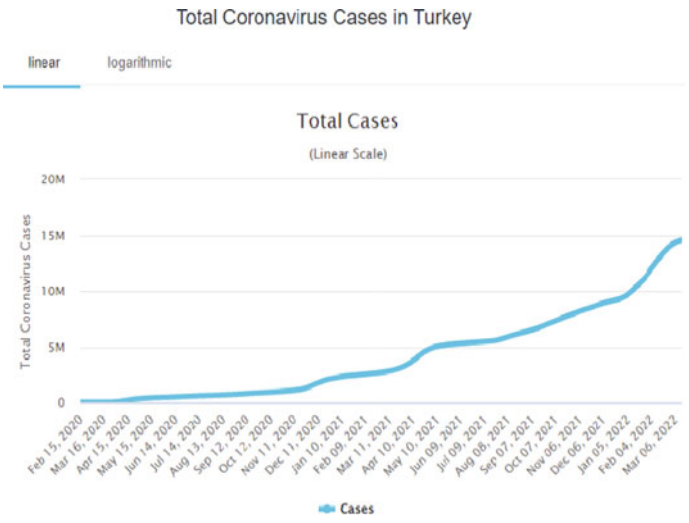

Fig. 1 Total coronavirus cases in Turkey

(MOH). Residency programs were also affected by the pandemic. Especially, emergency medicine residency training was uniquely disturbed because the medical care provided by the hospitals during pandemics was restricted to only emergency admissions [2].

1.3 Emergency Medicine Residency Training in Turkey

Emergency medicine training started in 1994 at some of the university hospitals in Turkey. In 2006, state-owned public hospitals started their own emergency medicine residency training programs. Two emergency medicine specialty societies support academic facilities for a standard residency education system. The duration of the emergency medicine residency is planned as a four-year training at accredited facilities. At the end of the residency training, every resident is expected to finish an academic research project following an oral exam in front of a jury of academics. Regular scientific conferences and postgraduate training courses are organized by both societies to support scientific improvement within the field [8].

1.4 Study Aim

We aimed to describe the challenges of residency training during COVID restrictions and reflect the opinions of the emergency medicine residents through an online survey study.

2 Methods

A questionnaire with 15 questions was administered to the emergency medicine residents that participated in online training sessions and worked at the ED during pandemic restrictions. The questionnaire was prepared by the research team which included a survey specialist with an MPH degree and emergency medicine residency training. Survey topics were selected by the research team and piloted on a group of emergency physicians before distribution. The survey questionnaire was improved based on their responses for measurement accuracy and internal consistency. The survey was implemented using Google Forms and survey results were analyzed accordingly. In 2020, there were 18 attending and 21 resident physicians in the emergency department (ED) [9]. An electronic survey invitation was sent to all 21 residents.

3 Survey Results

The Likert scale was used for the questionnaire, and the data were analyzed. There were 21 responses out of 21 invitations, and the survey response rate was 100%.

3.1 Preferences on Document Sharing

Participants were asked to rate the usefulness of various methods during the restrictions (Fig. 2).

As an important aspect of educational training, sharing the information was questioned in this part of the survey questionnaire, and easily accessible methods were preferred by the participants. More than 80% preferred email and WhatsApp as useful for document sharing in comparison to printed documents.

Participants were asked to rate various tools as a communication method during COVID restrictions (Fig. 3).

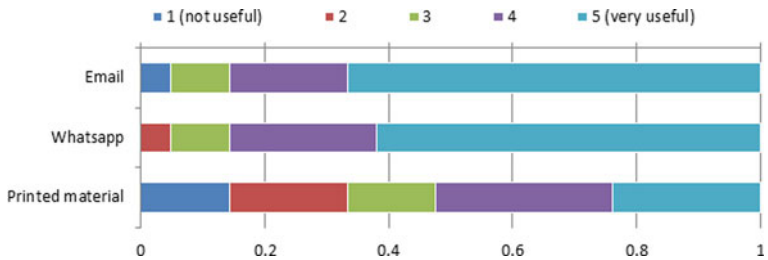

Fig. 2 Usefulness of different methods for document sharing during restrictions

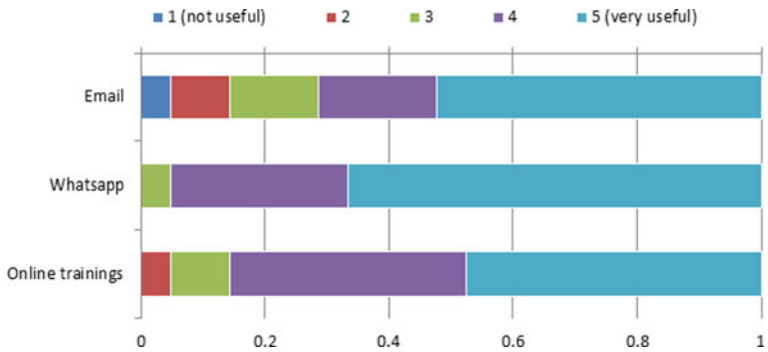

Fig. 3 The usefulness of various tools as a communication method during restrictions (1 = not useful; 5 = very useful)

Communication is an important part of medical practice, especially during emergency situations. All three communication tools were found to be useful by the participants, and WhatsApp was described as useful or very useful by 20 of the 21 participants (95.2%).

3.2 *Preferences for Online Training*

Participants were asked to rate online training during COVID restrictions for various aspects (Figs. 4 and 5).

Online training was evaluated for their usefulness, and as a practical method more than 40% described it as not useful (n = 9). One-on-one sessions were preferred, especially for surgical procedures and ultrasound training.

The residents were asked about the responsible organizer of the online training during the pandemic. More than 50% agreed to specialty societies as the organizing body, while MOH was preferred by only 28% (n = 6). Overall, 80% of the participants agreed that department academic staff should organize online training (n = 17).

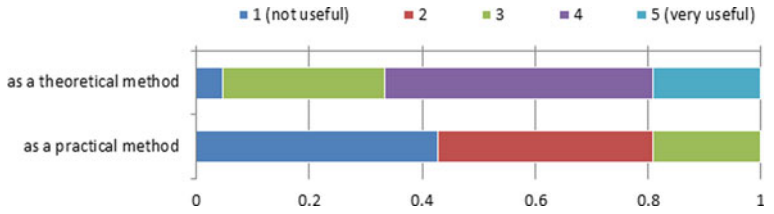

Fig. 4 The usefulness of online training as a practical versus theoretical method (1 = not useful; 5 = very useful)

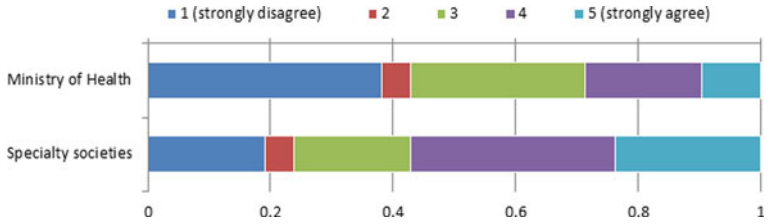

Fig. 5 Who should organize online training? (1 = strongly disagree; 5 = strongly agree)

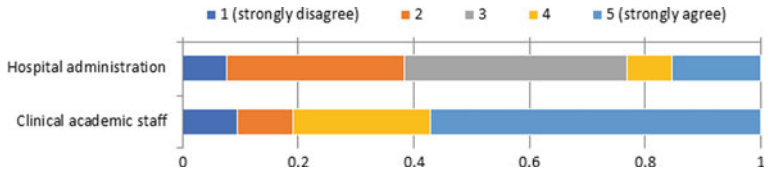

Fig. 6 Who should organize the required training during COVID at the hospital? (1 = strongly disagree; 5 = strongly agree)

3.3 Preferences for Residency Training

The preferences of the residents regarding their residency training are another important aspect. To understand their views on the party responsible for implementing the training during the restrictions, the last part of the questionnaire asked who should organize the required training (Fig. 6).

Clinical academic staff was preferred over the hospital administration for the required training. Of the participants, 80% (n = 17) agreed that the clinical department should organize the required training during restrictions.

4 Discussion

4.1 Adaption of the Emergency Department for Residency Training

Our hospital is a state-owned Training and Research Academic facility. Emergency Medicine residency training was established in 2011 at our department. In 2020, there were 18 attending and 19 resident physicians in the emergency department. Educational residency lectures were planned for every academic year starting from September to June. These educational plans included weekly faculty lectures, mortality morbidity meetings, and monthly journal clubs. The academic program also included specialty society training courses throughout the academic calendar including two scientific meetings every year.

Following the countrywide restrictions, residency lectures and meetings were suspended in March 2020. The academic faculty of the emergency department began organizing the upcoming lectures and meetings in accordance with the suggestions of the specialty societies and the ministry of health. But these online teaching programs did not start until the end of May 2020. The organization of these training was preferred to be the departmental staff by our responders. Similarly, a nationwide survey on disaster medicine needs assessment for Turkish emergency physicians from 2016 revealed that physicians prefer these training to be organized by the clinical academic staff [8].

Additionally, hospital-wide meetings and educational programs were also suspended. Medical care within the healthcare system was regulated by the guidelines provided by the scientific committee board meeting [2]. In accordance with the guidelines, all non-emergency procedures and hospital admissions were suspended. Emergency medical care was planned to handle an additional patient load due to the pandemic. Patient care sections within the emergency department were increased and hospital-wide COVID patient guidelines were implemented in accordance with the ministry of health recommendations. The literature review revealed that it is important to follow the guidelines implemented by the governmental organization to manage resident satisfaction and mental health [10, 11].

Our Survey results revealed that WhatsApp Group announcements were preferred to email for rapid information distribution. This is in accordance with the literature; a 2003 study by Maunder et al. emphasizes the requirement of clear communication methods during the 2003 SARS pandemic [10]. To achieve that, additional groups were created among physicians of the emergency medicine department for better management of the pandemic surge.

A survey study on the effects of the COVID pandemic on orthopedic resident education from Romania emphasizes the importance of electronic document sharing tools [12]. Similarly, our responders preferred electronic methods to printed documents for information sharing. Initially, document sharing within the Whatsapp groups was the only educational activity for the department.

According to another survey study on the effects of the COVID pandemic on resident physicians in Jordan, it is important to have mental health support for the residents during these types of crises [13]. Additional online meetings were planned for resident motivation during the first months of the pandemic for improving the mental health of our residents. After the summer break, weekly academic educational meetings were planned online via Google Meet. Additionally, Ministry of Health introduced distance learning programs for COVID management and patient care. Specialty societies also introduced online versions of their regular post-graduation courses. Online-only lectures were practiced until the end of September 2020 after the restrictions were eased within the country. Our survey results revealed that resident physicians prefer online meetings organized by specialty societies. The importance of the adoption of similar smart educational techniques was also emphasized by previous survey studies [8, 12, 13].

4.2 Challenges During the Pandemic

The major challenge during the initial period was following the weekly scientific board meeting guidelines and distributing the updated documents within the department to follow the latest knowledge.

Social interaction was the main aim of the initial online meetings to keep up the morale of the physicians. Adaptation to the online lectures was also challenging for the faculty and residents. Additional video and audio materials were implemented to increase motivation during the online lectures. These were all in accordance with previous survey studies that emphasize the importance of keeping high mental status for physicians during the pandemic [10–13].

Small online group sessions limited to 5–6 residents were also useful for better interaction within the group. Rapidly developed online courses had also introduced additional problems. Practical sessions were found to be the most challenging and unattainable by the residents. Similarly, the 2016 survey study revealed the same results regarding the lack of effectiveness of practical sessions of online training [8]. One-on-one sessions were preferred especially for surgical procedures and ultrasound training. Online courses prepared by the specialty societies were found to be useful for specialty-focused information sharing.

4.3 Impact of the Pandemic on Residency Training

The importance of communication during the pandemic is well described in the literature. Electronic methods are the preferred tools for information sharing like our survey findings [8, 10, 12]. The emergency department faculty introduced different methods in order to improve communication within the department as well as the hospital. Initially, emergency department physicians and intensive care doctors were the only parts of the hospital serving the entire COVID patients. This put pressure on the department faculty who were also responsible for resident education. Additional online training sessions and improved communication among the doctors were key factors during the initial phases of the pandemic.

4.4 Limitations

This was a single-center study and therefore generalizability of the results is limited. Our study additionally has limitations regarding the online survey methodology.

5 Conclusion

Online education has been used and proved to be effective during pandemics. Our survey revealed that WhatsApp can be used as the preferred way for fast information sharing including educational materials and guidelines, but practical educational sessions are not easy to implement online. Specialty societies are seen as an important stakeholder in improving the up-to-date materials for distance learning

within emergency medicine residency training. Additional research implementing this survey questionnaire may improve the generalizability of the results to refine our understanding of the effects of the COVID pandemic on residency training and education.

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Lessons from Graduation Project During COVID-19 Pandemic for Future Applications, Methods, and Tools

Lindita Bande

Abstract United Arab Emirates University (UAEU), located in the city of AL Ain, is a well-established institution since 1976. The department of Architectural Engineering within the College of Engineering is ABET credited. The Graduating Projects (GP) are part of this curriculum. In pre-pandemic conditions, the students had regular weekly meetings with several faculty based on the project needs. During COVID-19 pandemic, the full program went into online mode. During this change, the students, faculty, and staff had to adapt to new teaching methods in a noticeably short time. This research aims to find and highlight the lessons learned during this change to the GP. The methodology starts with the analysis of two main case studies. Case study A started in fall of 2019 and ended in the spring of 2020 (partially developed in face-to-face mode (in person, on the campus) and partially online mode). Case Study B started in the fall of 2020 and ended in the spring of 2021 (online mode). The case study analysis describes the project's main objectives and the steps taken by the students to achieve these objectives. The methodology follows the tool analysis. Since the tool used is innovative and complex, in addition to the program, the process of learning, application, and outcomes is crucial. The pandemic's impact on students' psychology and productivity is the following step that helps understand how the changes in society and the extensive use of virtual tools helped the students cooperate with the situation. The results showed an improvement in the student's skills in using advanced tools to achieve the project goal. This research is an attempt in understanding how the pandemic impacted GP work. The outcomes of this study might improve the GP program in the AE Department by integrating a hybrid approach with face-to-face meetings and online training for students to achieve the project targets with more advanced tools.

L. Bande (✉)
United Arab Emirates University, Al Ain, UAE
e-mail: lindita.bande@uaeu.ac.ae

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1 Introduction

The UAE, College of Engineering, Architectural Engineering program has the graduating projects as the last task before the exit exam and then graduating. The students in their fifth year of study learn how to design a building with sustainable architectural principles and calculate structural systems and MEP. The GP covers two semesters. The first semester is related mainly to the main goals of the project, literature review, case study analysis, and initial concept design. The second semester advances with the selected design into structural details and MEP analysis. The minimum number of faculty following the students is three. Due to the complexity of the GP, the students can contact additional faculty based on their needs. The GP shall not only have innovative thinking in terms of design and structure, but also shall have tools for the students to bring to life their ideas based on all the studies done previously [1, 2].

1.1 Advanced Design and Impact on Energy Reduction

The application of sustainable measures in building design has proven to have a major impact on energy saving in buildings. The building design through active and passive systems contributes to a sustainable environment from the initial stages of the design. Considering that UAE has a hot arid climate, finding innovative ideas for building design to reduce energy consumption is part of the local authorities initiatives. Through the application of the standards, architects and other professionals are encouraged to contribute to this aspect. Referring to recent studies, the cooling load in buildings is a major issue in energy consumption in the middle east and in UAE specifically. Due to the excessive use of the air conditioner in the summertime, energy consumption reaches the value of 70%. This energy consumption can be reduced through passive or active strategies applied in buildings [3–5].

The elements of sustainable design vary from one region to another. In the Middle East, one of the most used elements is shading devices, which combined with the building design can achieve elevated levels of sustainability. The design of these devices, based on the architectural heritage of the region, connects the building to the area where it is built. Al Baher Towers in Abu Dhabi have a dynamic parametric façade that opens and closes according to the movement of the sun. This application reduces energy consumption by 20%. The design of the shading structure was done by using advanced tools [6].

Applying shading devices in many areas can lead to more energy consumption due to artificial lighting in the building. So, when installing a shading device on a building, it is important to choose the best elevation and direction to have enough natural lighting entering the building to reduce electricity use. Shading devices are the best choice regarding retrofit strategies. The shading devices have been used historically in the region not only to have a passive cooling strategy, but also in creating privacy in internal spaces. Based on the above literature analysis, there is

a large space for improvement in retrofit strategies for low-rise buildings. Shading devices are an efficient strategy (among others) [7, 8].

1.2 Advanced Tools

Due to the application of advanced tools such as rhino/grasshopper, the design of shading devices can be parametrized by adding parameters to the design and optimizing the function of such structures. There are several plug-ins to the software that can have an impact in optimizing the design of the traditional geometric shapes or even improve the current ones. It is defined as the use of complex shapes and curved geometry with material optimization or design iterations integrated with the functional process. Parameterization allows the integration of envelope, shape, and performance variables in one single and transparent process, making it difficult to separate them. The reliance on computational strategies for the design process is to enhance that process by encoding design decisions using computer power and language and through Building Information Modeling (BIM) [9, 10].

The introduction to advanced tools in academia is a process that helps students integrate into the industrial environment. In a recent study, parametric architecture was introduced as a separate course. For the students to design buildings with advanced structures, they need to apply the knowledge that they have to practical solutions. Tools such as Rhino/Grasshopper help visualize and calculate the advanced design by adding parameters set by the user. Creativity connects with the calculations, helping the students express their ideas more clearly [11, 12].

1.3 Pandemic Impact on Academia

The academic environment was impacted by COVID-19. The pandemic brought changes to the education system in terms of the teaching mode and adapting to the new virtual environment during the lockdown. The demanding situation of moving from face-to-face classes to online mode was challenging for everyone, particularly for the students. Difficulties in concentrating, difficulties in collaborating in groups, and challenges in finishing the tasks on time were encountered. Even though the technology was available, adapting on such short notice was difficult to comprehend and adapt. These changes impacted the wellbeing of the students [13].

However, the changes during the pandemic for the academic environment are a digital revolution. The months and years in some countries spent in and out of the quarantine gave time for web developers to increase the speed of digitalization. Many tasks would take several months or years to be finalized, now it is just a matter of days or weeks. Innovation in several aspects of the academic environment has increased. Researchers have increased the number of publications. Faculty have become more creative in including new tools in teaching online. The students have

more possibilities in taking more free online courses, and due to the time, they must understand better their future careers. Also, online support has increased drastically. Several tools that have open forums have enabled students to advance more with their tools and discuss any difficulty online. This made it possible to have replies in real time and advance more with the projects [14].

2 Methodology

The methodology of this research follows a linear path. The first step is the case study analysis where two projects are compared and evaluated. Case study A refers to a parametric shading structure in a residential building in the Mreifa Compound in AL Ain. Meanwhile, case study B refers to the dynamic/parametric façade of the library extension building on the UAEU (United Arab Emirates University) Campus. Both projects used advanced tools such as Rhino (modeling environment) and several plug-ins such as: Grasshopper, Ladybug, and Honeybee. This defines the second step in this research. Afterward, describes the pandemic's impact on student psychology and productivity. This step is connected to the adaptation period needed from students and faculty in the online training.

The last step is the results, and the findings of this study (Fig. 1) shows a schematic view of the methodology, and below are mentioned the main steps followed:

- Case Study Analysis,
- Advanced Software Evaluation,
- Pandemic's impact on students' psychology and productivity.

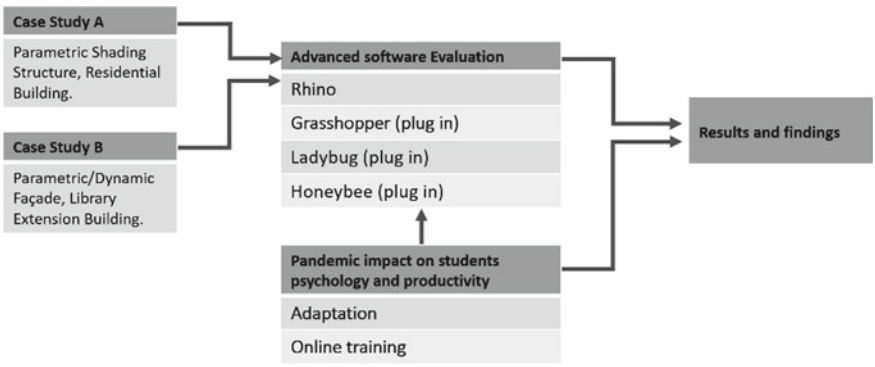


Fig. 1 Schematic image of the methodology followed in this study

3 Results

3.1 Case Study Analysis

Case Study A: Parametric Design Structures in Low-Rise Buildings in relation to the urban context in UAE. This case study refers to the retrofit analysis of a low-rise building by applying parametric design to it. The case study is in the City of Al Ain. This selection was done after evaluating several projects in Abu Dhabi, Dubai, and Al Ain. Due to available data for the building construction materials and the energy consumption, the selected building was in Al Ain. This case study had the aim to not only reduce energy consumption inside the building, but also create shade in the outdoor area in front of the building. The structure was designed through the tool of rhino grasshoppers. Based on a traditional Arabic mashrabiya pattern, there was a design optimization process in the software to achieve the aims of the project [15].

Moreover, the advanced design used aimed to create a link between the UAE heritage in the use of the mashrabiya patterns. In Fig. 2, the location of the analyzed house and an image of the unit are shown. Figure 3 shows the complexity of the structure with several layers overlapping and creating the desired design. The connection to the ground is done by the steel columns. Afterward, an aluminum supportive structure made of 3D-printed sand molds lays on top of the columns. The upper layer is a customized BIPV for the structure to produce its own electricity for the night lights' energy consumption. Linked to this layer, there is GKD Metal Fabric/Solar Omega, advanced material applied in several projects.

Case Study B: Design of Library Extension Featuring a Parametric/Dynamic Façade and Integrated with the Landscape in UAEU Campus. This case study was performed on the campus of United Arab Emirates University. The aim was to design a library extension by creating an integration to the landscape oriented in the south of the current library. The sustainability of the projects followed the Estidama code. For the façade of the building to integrate into the landscape of green areas, the floral shape of the building was only one side of the integration. The use of glazing in the façade was crucial for the library users to connect with the outdoors. Therefore, the

Fig. 2 Building location in Mreifa compound

Fig. 3 Materials applied based on our Façade design

Fig. 4 Site plan of the project

use of parametric design in the façade to optimize the view not only from indoors was crucial. Additionally, the energy consumption in the cooling load, due to high glazing exposure was very important in the study. New software such as Rhino and plug-ins like Grasshopper make calculations of parametric façade that previously were proven difficult to apply. Dynamic/parametric façade optimizes solar gains in internal spaces. The study of the façade through the advanced software making the elements dynamic concluded with high values of energy saving in the interior. This was one of the initial goals. Also, the integration of indoor and outdoor was achieved due to the advanced analysis of the façade. Figure 4 shows the site plan of the project, and Fig. 5 shows that the ground floor is integrated into the landscape. Figure 6 shows the ground floor, and Fig. 7 the first floor [16].

3.2 Advanced Software Comparison

In both case studies, rhino and grasshopper were used to model the complex structures. Rhino is designed to work on complex structures. Grasshopper is a plug-in that

Fig. 5 Site Plan

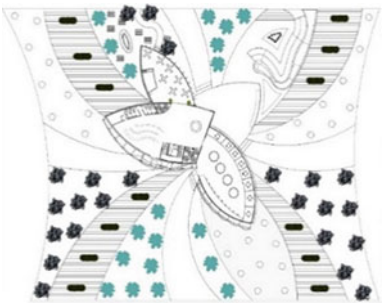


Fig. 6 Ground floor

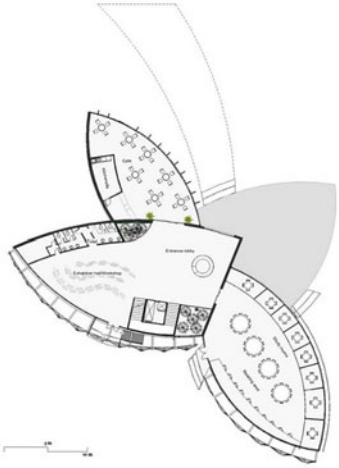
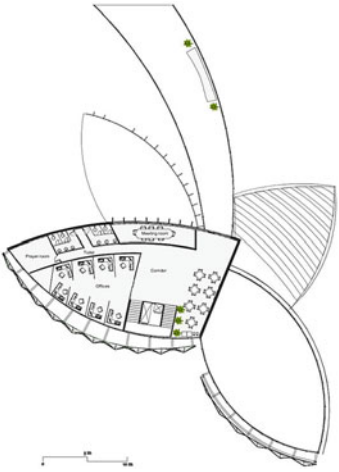


Fig. 7 First floor



enables parametrization to happen. For each stage of this research, different software programs are used. Alignment of the plug-ins was difficult due to the python language, the building geometry, and the pattern design [17, 18].

In case study A, the modeling of the unit used for this study was conducted in Rhino software. The energy simulation and the validation were done using Grasshopper as a plug-in. the python language was modified as per the building energy zones. The structure was afterward introduced to the base model where the energy consumption was re-calculated (Figs. 8 and 9). Figures 10 and 11 show the calculation of the UTCI, where the structure has a positive impact on improving the outdoor conditions. Figure 12 shows the solar radiation analysis of the facade. Figure 13 shows the Parametric/dynamic façade closed and Fig. 14 opened. Figure 15 shows the Parametric/dynamic façade closed and the connection nodes. Figure 16 shows the same but opened.

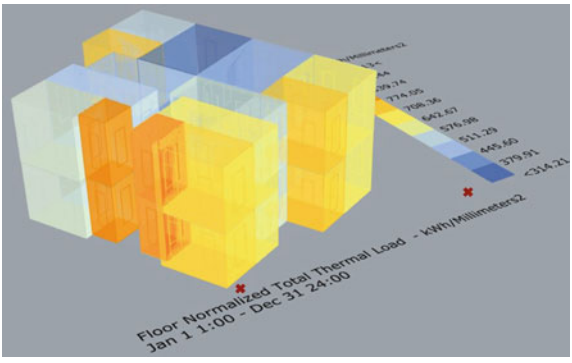


Fig. 8 Energy model before shading, 3D

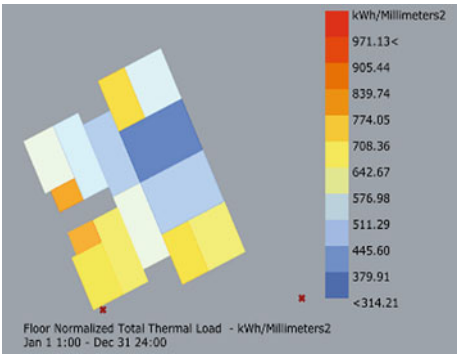


Fig. 9 Energy model before shading, 2D

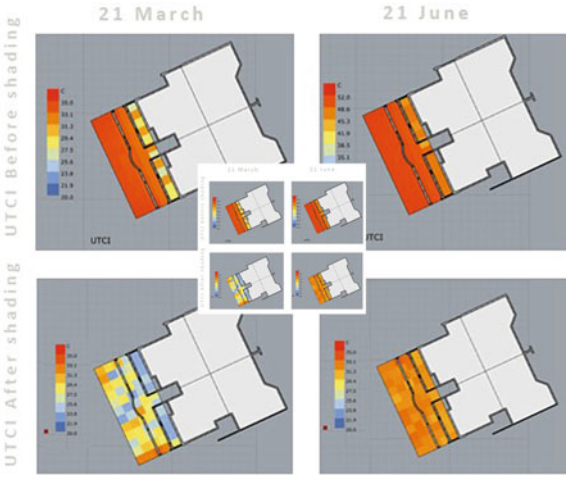


Fig. 10 UTCI calculations in September and December

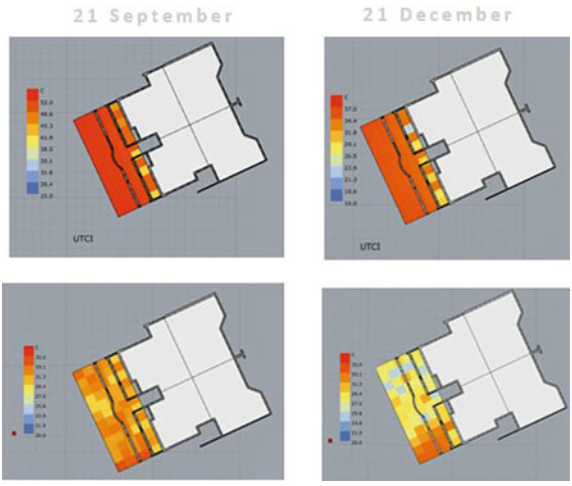


Fig. 11 UTCI calculations in March and June

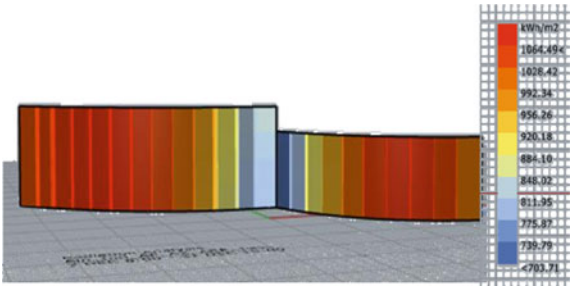


Fig. 12 Solar radiation analysis of the facade

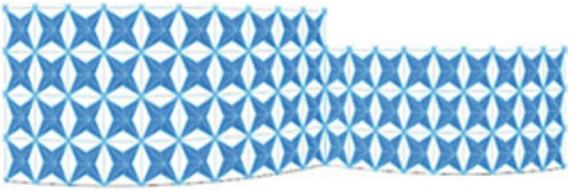


Fig. 13 Parametric/dynamic façade closed

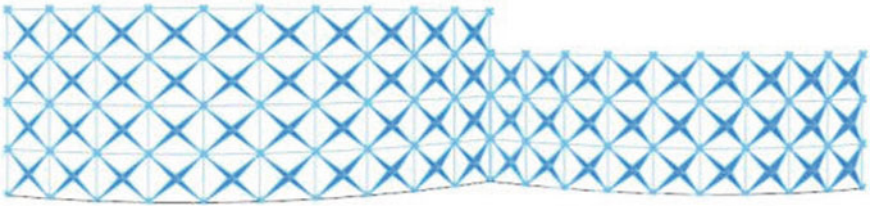


Fig. 14 Parametric/dynamic façade opened

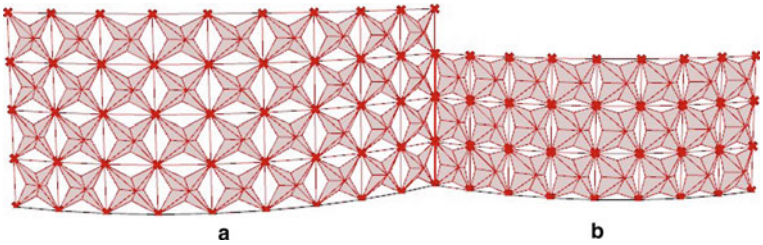


Fig. 15 Parametric/dynamic façade opened (frontal view) (**a**) and closed (**b**) showing the connection nodes

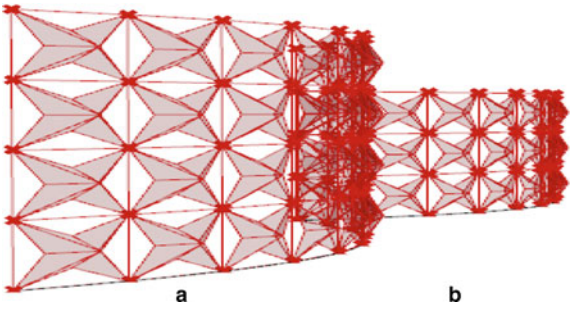


Fig. 16 Parametric/dynamic façade opened (perspective) (**a**) and closed (**b**) showing the connection nodes

3.3 Pandemic Impact on Students' Psychology and Productivity

The pandemic was difficult to manage not only for the authorities, but also for the people. In the academic environment, the sudden change brought difficulties in understanding the teaching procedures' applications; students were expected to adapt immediately. It took more time also to process the changes in society. Student wellbeing was also an important responsibility for the faculty, therefore, in many online classes, there was an initial motivation for encouraging the students to try to adapt to the new reality.

When the change started, the students had initially difficulties following long hours of project correction. Working in teams was also challenging. The time for the execution of several tasks initially was longer than the face-to-face classes. The productivity in the initial stages of the design was slow. However, the tools used even though they were advanced were taken as a challenge by the students. The faculty guidance helped them find the right resources for this transitioning phase.

4 Results

The results of this study are in three aspects: the GP goals achievement, the advanced tools, and the pandemic impact overall.

4.1 GP Goals Achievement

Case study A results were following the initial goal. The aim was to design and evaluate a parametric structure through the advanced tool of rhino/grasshopper. The design of the parametric structure was achieved based on many parameters that were considered in this study. The base model was validated with site data. Based on the energy simulations, there was a saving of 10% on the energy bill. The GP ware published online to show the work done and help other research in the same field. Figure x shows the 3D of the project (Fig. 17) [15].

Fig. 17 3D images of the parametric structure in case study A [15]

Fig. 18 3D of the case study B, dynamic/parametric façade of the library extension building [16]

Case study B achieved the initial goals set in the GP which was to design an innovative dynamic/parametric façade for the library extension in the UAEU Campus. The students, with the guidance and support of the faculty, managed to design the library extension building together with the façade. The results from the simulations showed a reduction of 25% in energy consumption. The students received second place in the CISBE CIBSE Building Simulation Awards 2021 for the innovative work done in the modeling of such a complex façade. Furthermore, this GP was also published online. The efforts done in such advanced design were also recognized by UAEU (Fig. 18) [16].

4.2 Advanced Tools

Based on this project results the use of advanced tools during the pandemic gave students more time to experiment. The methodology followed in these two Graduate Projects is to introduce the advanced architectural tools since the initial stage of the project, considering that the deadlines of the midterms and finals are quite close. Moreover, additional online sessions in consulting and guiding students into parametric architecture brought better results. Also, additional workshops outside the GP program were helpful to the students.

The pandemic impacted the use of advanced tools. Several steps were taken to teach and motivate the students to learn new tools. There were additional classes through the blackboard to guide the students in each step of the project while using the new tools. There were online workshops added to the class schedule followed by the students and guided by the instructors. Moreover, additional tutorials on the python scripting language were shared from the instructors to the students. Also, the students made individual investigations on online; opened data on scripts adaptable to the project analysis. Figure 19 shows the python language used in case study B.

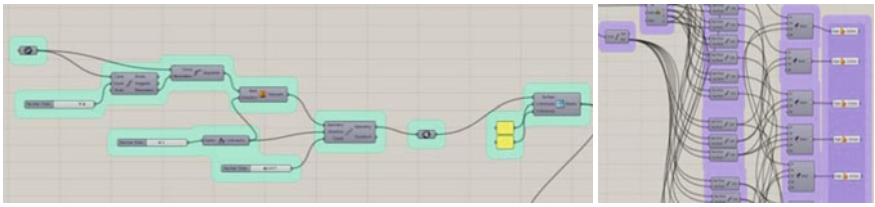


Fig. 19 Python language used in case study B

4.3 Pandemic Impact

The pandemic impact on the graduation projects was major. The initial transition between face-to-face classes was proven difficult. Modifying the teaching tools and methods was challenging. The students' initial reaction to the change of the study mode delayed the initial design project of the GP. However, due to the ability to adapt, the students with the assistance of faculty managed to get training online on the advanced tools and conclude the projects successfully within the deadlines. The additional work done with the online studies, tutorials, and training was shown in the final GP results. Furthermore, due to the efforts done in the modeling and simulation in case study B, an international award was achieved.

5 Conclusions and Future Work

This study aimed to analyze and highlight the results of the analysis of two GP projects done during the pandemic. Based on the results, even though the transition from the face-to-face classes to the online mode was initially difficult and time-consuming, it improved the students' ability with the advanced tools. In case study A, the change of the study mode was after the design phase was done in the phase-to-phase classes, therefore, the time dedicated to exploring the advanced tool was minor compared to case study B. In the second case, both semesters were done online, therefore, the students had more time to practice the tools and the faculty managed to guide the students in the online mode. The pandemic helped the faculty improve their teaching skills during the online mode and guide the students into different online learning platforms and forums such as Rhino Grasshopper open forum. Furthermore, the award given to case study B is an additional achievement on the complex modeling done with the dynamic/parametric façade.

The findings of this research can help the GP program introduce a hybrid mode of teaching. Students can be encouraged to follow online free courses, have advanced training in innovative tools, and advance more in architecture and engineering. The pandemic increased the online connection in forums related to open tools. This progress into the connectivity of research can help students enhance advanced virtual tools and practices.

Further studies need to be conducted in the future to investigate the post pandemic GP work and compare it with the findings of this study, in the same field. Also, due to the complexity of the architectural and structural aspects of such structures, further investigation is needed to connect the parametric language to the history of the region in the use of shading structures.

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Job Shadowing: An Evaluation of a Training Program for Enhancing the Communication Skills of Students During Covid-19 in Sharjah, UAE

Ahmed Farouk Radwan and Sheren Ali Mousa

Abstract This study aims to explore how the job shadowing program offered by the Sharjah government media bureau was experienced by communication and media students and professionals, and how it develops students' skills and experience. The study also explores the impacts of the program during the Covid-19 period and the expectations from the program after the pandemic. The study works to help in creating effective training programs for media students with collaboration between universities and media organizations. A group discussion was conducted with 12 trainers and an online questionnaire was distributed to a sample of program attendees to monitor their viewpoints. 100 students responded to the survey. Results revealed that the job shadowing program has an effective role in developing students' skills by enabling them to interact with professionals and benefiting from their experience. Students considered the program as an integrated way with the academic courses to support their practical skills. Results assured the need to design programs concerned with new topics, skills, and perspectives in media production to meet the needs of the media profession and academic requirements. Results revealed that coexistence and integration between academic programs and media institutions will be effective methods to develop the program.

Keywords Communication and media students · Job shadowing program · Experiential learning · Training

1 Introduction

Job shadowing training programs are considered a way for youth to become aware of the requirements of the careers' skills and professional requirements. Many organizations sponsored that program as a part of social responsibility. The job shadowing

A. F. Radwan (✉)
University of Sharjah, Sharjah, UAE
e-mail: aradwan@sharjah.ac.ae

S. A. Mousa
Khawarizmi International College, Abu Dhabi, UAE

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program creates an experience through direct participation as students spend time with experts and professionals, giving them the opportunity to observe and gain skills. It expedites the student's understanding of the overall industry and the role of positions within the organization [1, 2]. Sharjah media bureau launched the 2019 job shadowing program as a form of training and continuous education. Staff, specialists, and professionals contributed to delivering many workshops in various media fields. The program aims to train and prepare employees from various government and private entities and students from various communication colleges in UAE for professional media work. The Sharjah media bureau offers several free programs and workshops to develop the core skills for future jobs and careers. Many employees in all the bureau sections and departments present these practical workshops by face-to-face method and the online distance method during the Corona pandemic. Over 8000 students from 20 universities have been trained under the program's umbrella. This study aims to measure the impact of professional training programs offered by institutions and media agencies to develop the skills and experience of communication and media students by evaluating the impacts of the job shadowing program offered by the Sharjah government media bureau during and after the Covid-19 pandemic period. The study monitors the topics, the training methods, and the student evaluation of these programs. The study relies on both quantitative and qualitative approaches to data collection and analysis by conducting an in-depth interview with a sample of program instructors to explore their vision of the student's needs, and the program's future. The study also conducts a survey with a sample of students enrolled in the programs to explore their program evaluation. Many organizations give students an opportunity to train and learn by offering practical workshops. It is considered collaborative cooperation and engagement between the universities and professional bodies.

2 Literature Review

Job shadowing is a work experience activity where the employees learn about another position from other employees. It provides many practices in areas of interest such as continuous professional development. Many benefits were gained from the program, such as learning potential new methods and solutions in working, understanding more about management, developing contacts with experts, encouraging cooperation ion, and establishing understanding between diverse backgrounds and perspectives. The purposes of the Job shadowing program are to provide learning experiences, enable a better understanding of the role of other employees, improve communication and enhance networking opportunities, share good practices to enhance individual self-development, and assist ongoing professional development [3–5]. The training aims at developing trainees' knowledge, skills, and attitudes or beliefs [6]. Many theories can be described in the training process, one of them is the Self-directed learning theory focused on the process where trainees take control of their own learning goals, resources, and methods, and evaluate their progress. The second one is the

constructivist learning theory which emphasizes the impact of constructed knowledge on trainees' active and reflective thinking. Learners and Trainees have been encouraged to be involved in learning activities by discussing ideas, arguing, negotiating, and collaborating to solve problems [7, 8]. In the students' training process, the ADDIE model develops the training stages in analysis, design, development, implementation, and evaluation [9]. It involves four stages: defining the participating trainee, defining the course objective, strategizing, and implementing the methods; developing the content; implementing the training; and evaluating all stages and outcomes [10]. Constructivist learning is very productive in online and distance training programs to facilitate active learning and interaction. It also supports the training process by using discussion boards, video, and audio discussions, live chat, and emails. That method is concerned with the materials delivery, and communications between instructors and participants. Several advantages can be attributed to online and distance learning, including the ability to provide effective learning styles, the ability to incorporate interactive learning tools, and the ability to facilitate collaborative learning experiences [11, 12].

3 Experiential Learning Model

Scholars from a variety of fields who focus on learning and training development within higher education use Kolb's Experiential Learning Model as a framework. In 1984, David Kolb introduced the learning model to develop learning styles and methods. The model provides a powerful theoretical and practical framework for learning and training planning, in which four roles are assigned for effective learning: reflector, theorist, pragmatist, and activist [13]. Kolb (2009) defines learning as a process through which knowledge is created by the transformation of experience. Kolb argued that the model is a useful basis for planning, implementation, and evaluation of learning and training. The model helps in helping and enhancing career planning, skills training, and improving experience, it also helps in providing an instructional foundation for the process. Hedin [14] defined experiential learning as the "active participation of learners in events or activities which leads to the accumulation of knowledge or skill". The model discusses that knowledge is generated by a dynamic cycle that is driven by the intention of dual dialectics of action/reflection and experience/abstraction. Experiential learning is a process whereby knowledge is created through the transformation of experience [15]. The model provides a holistic view of the learning process; it emphasizes the role that experience plays in the learning and training process. The model gave importance to activities such as internships, simulations, on-the-job training, and learning [16].

The model describes learning and training by following an integrated cycle of experiencing, reflecting, thinking, and acting. The model explains Two controversial related modes of gaining experience: Concrete Experience (CE), Abstract Conceptualization (AC), and two dialectically related modes of transforming experience: Reflective Observation (RO), Active Experimentation (AE) [17]. This process is

described as an idealized learning cycle that qualifies the learner to benefit from all the sources of experiencing, thinking, creating, and acting. This process enables the instructors and learners to be responsive to the learning process. Concrete or immediate experiences are the basis for monitoring and reflections. These reflections are interpreted into abstract concepts from which new implications for action can be exercised. These implications can be tested and implemented as guides in creating new experiences [17]. According to the model, the learning process consists of these four modes which build upon each other in stages. Concrete Experience (CE) represents the new experience or condition encountered, or a reinterpretation of existing experience. It also endorses a receptive and experience-based approach to learning, Reflective Observation (RO): which represents the particular importance of any inconsistencies between experience and understanding or scrutinizes the thoughts and behaviors that emerge during the concrete experience. Abstract Conceptualization (AC): gives rise to a new idea, or a modification of an existing abstract concept. It uses personal observation to develop an idea or generalized theory from which new action can be formulated. Active Experimentation (AE): tests hypotheses to implement new knowledge into future situations and experiences [18, 19]. Accordingly, Concrete experience implicates emotional and feeling engagement in the learning process. Reflective observation consists of listening, watching, recording, discussing, and presenting the experience. It also involves making connections across experiences. Abstract conceptualization involves holistic concepts in the learning process. The active experimentation phase is where learners engage in an exercise process that accumulates experience during the learning process [20]. Job shadowing programs may consider a method for professional skills development methods based on the model.

4 Study Design

4.1 Study Statement

The study works on presenting an integrated vision of collaboration between the academic and professional sectors in qualifying communication and media students for the labor market. The main question of the study is “What is the evaluation of both students and professional instructors for the Job Shadowing program presented to communication and media students as an experimental training method during the Corona pandemic, and what are their expectations for the program after the pandemic?”. This study aims to understand the students’ training needs and expectations from the professional market and to shed light on the exact skills they need to improve their experience. The study concluded that many additional skills should be given through practical training to media students in content production and using new media digital platforms.

4.2 Research Questions

- What are the reasons that motivate students to participate in the job shadowing program?
- What are the benefits that students and instructors gained from the job shadowing program?
- What are the preferred topics that students want the program to focus on?
- What are the preferred training methods that students and instructors want the program to focus on?
- How are the students and instructors evaluating the program during the Corona pandemic?
- What are the expectations toward the program after the Corona pandemic?
- How are the instructors evaluating their role in the program?

4.3 Methodology

In this study, qualitative and quantitative approaches were approached relied on discussion groups and surveys. These approaches were used because of their effectiveness in understanding how both students and experts evaluate the program. The research was conducted in the United Arab Emirates on a sample of media students who enrolled in the program from two universities; the University of Sharjah and Ajman University. A link for an online questionnaire was sent to their emails. From a total of 150 respondents, 100 completed the survey. By using a purposive sampling approach, 12 experts were selected for discussion from the trainers who delivered the workshops for Sharjah Media Bureau.

4.4 Instruments and Data Collection

Data were collected using semi-structured interviews for the discussion with the 12 experts and trainers who participated in the program from Sharjah media bureau through open-ended questions. The discussion was carried out via zoom meeting for 2 h. At the beginning of each discussion, the respondents were asked about their job title details, the meeting then was guided by the following questions:

- What are the reasons for organizing and implementing the program?
- What is the instructor's role in defining program topics?
- What are the students' preferred training topics?
- What are the benefits of delivering the program to students?
- What are the difficulties faced by the trainers?
- What are the expectations from the program in the future after Covid-19?
- What are the program's appropriate training methods?

5 Results

5.1 Discussion Group Results

Trainers indicated that there are many reasons for organizing the 'job shadowing' program such as preparing students for the media market with different specializations, transferring professional skills to students, being a part of the media organization's social responsibility, collaborating with universities, interacting with the new generations, and responding to their inquiries about the profession. They agreed that the instructors' role in defining program topics may include Suggesting topics, preparing materials, leading the discussions, creating effective training methods, and choosing talented students for part-time jobs. They also indicated that Students preferred many topics such as new media, Photo shooting, social media content creation, Writing, and Using smartphones in media work. Regarding the benefits of delivering the program, they summarized them as benefiting from the digital platforms during the Corona period to reach the largest number of students, knowing the students' interests and expectations, developing the instructor's experience and knowledge, discovering talented students, and developing innovative ideas and practices by interacting with the youth. For the program difficulties, they indicated some challenges such as some students attending just for the certificate, moving from place to place to deliver the program, and coordinating with universities in distinct locations. Trainers also agreed that the program's future after Covid-19 is very promising in delivering different topics, offering continuous training for skilled students, using online platforms in delivering the program in conjunction with the onsite methods, and depending on coexistence and integration with the trainers in their real working life, inviting students from universities in other countries. It should focus on different methods including case studies, onsite visiting, practical workshops, and roleplay.

5.2 Students' Viewpoints

The next table summarizes the students' viewpoints about the program regarding many points.

Reasons behind joining the program

Table 1 indicates that the first reason that pushes students to join the program is acquitting new skills in different areas. Getting additional marks to raise their grade is the second reason which gives attention to the importance of coordination between the academic instructors and trainers. Defining market and career requirements is the third reason which indicates the students' need to collect information about their future careers and expected jobs. Experience, college requests, enrollment procedures, and certificates are the other reasons that come behind their joining the program.

Table 1 Reasons behind joining the program

Reasons behind joining the program	Frequency
1. Acquiring new skills in media writing, production, and management	82
2. Obtaining additional marks	62
3. Knowing the professional market requirements	61
4. Benefiting from the trainers' experiences	52
5. Responding to my college's request to join in	44
6. Easy enrollment procedures	36
7. Obtaining certificates of participation	19

Preferred training topics

Table 2 shows that the most important topic students are interested in is new media technologies and applications. Production, ethics, and management come from the second to fourth topics. While editing comes fifth. This result refers to many efforts to raise the students' willingness to learn writing and editing skills.

Training methods

Table 3 indicates that roleplay is the first training method students prefer. In role-playing, students practice real missions in the field and receive advice from experts. The second and third preferred methods are training in labs and studios and site visits. That gives indications about the importance of activities and exercises in training.

Table 2 Preferred topics in training

Preferred topics in training	Frequency
1. New media technologies and applications	61
2. Media production	53
3. Communication and media ethics	51
4. Media and social media management	47
5. Writing and editing	41

Table 3 Preferred training methods

Preferred training methods	Frequency
1. Roleplay	74
2. Practices in labs and studios	61
3. Site visits	58
4. Case studies	46
5. Projects	40
6. Real stories from the field	38

Table 4 Benefits of the program

Benefits from the program	Mean	SD
1. Developing new practical skills	2.83	0.451
2. Be convinced that communication students should develop skills	2.82	0.614
3. Understanding the new requirements in media careers	2.80	0.534
4. Developing practical skills in media production and communication	2.76	0.402
5. Interaction with professionals	2.73	0.575
6. Decide the appropriate media field I can work in	2.65	0.491
7. Understanding academic courses' topics and materials	2.63	0.589
8. Determine the skills which should be developed	2.67	0.460

Benefits from the program

Table 4 refers to the earned benefits from the program. The means of sentences assure that the importance of developing skills and knowing the requirements of the media market and profession are visible benefits of the program.

Benefits of joining the program during Covid-9

Table 5 refers that there are many reasons that pushed students to join the program during the Covid period. The Ease of use of digital platforms and timing are important factors behind the program's success. Students also find the workshop materials helpful in gaining information in the courses they study.

Students' needs after Covid

Table 6 refers to the fact that after the Covid period students will keep joining the program, and more new skills are needed in the profession. The integration between onsite and online training is also a preferred way. The collaboration and coordination between colleges and media institutions will support the quality of the program and introduce new subjects and methods.

Table 5 Benefits of joining the program during Covid-19

Benefits of joining the program during Covid-19	Mean	SD
Platforms were easy to use and join	2.83	0.522
Workshops' durations were appropriate	2.82	0.386
Workshops' dates were appropriate	2.79	0.409
Workshops' materials were helpful	2.77	0.468
I participated in many online workshops	2.70	0.473

Table 6 Students' needs after Covid

Students' needs after Covid	Mean	SD
1. I became more convinced with the importance of the program	2.88	0.574
2. I prefer to join both onsite and online programs	2.80	0.356
3. There is a need for more collaboration between college and training institutions	2.74	0.449
4. I will join the program after Covid	2.71	0.542
5. There is a need to discuss new topics	2.70	0.503
6. There is a need to use new training methods	2.64	0.505

6 Discussion and Conclusion

The study concluded the importance of the training programs offered by media organizations to communication and media students. By analyzing the results of the study according to the experiential learning model in education and training and to answer the study questions, researchers found that determining the students' training needs by continuous contacting and coordinating with colleges to provide the skills that students need is a key component for the success of the job shadowing program (Concrete experience). Delivering the program through various methods contributed to increasing the benefits obtained from it, so there is a need to depend on new and different methods after the Corona period (Reflective observation). In addition, the integrated knowledge and skills presented in workshops contributed to raising the students' desire to enroll in the program (Abstract conceptualization). The practical and applied practices supported the positive impacts of the program (Active Experimentation). Workshops presented to students should help in acquiring many skills such as media management, organizing events and forums, ensuring media coverage through social media, designing publications and websites, editing, and television direction. Besides, offering skills in administration, job interviews, official e-mail, and essential legal awareness. To sum up, job shadowing is considered a training way for students to become aware of professional work through workshops sponsored by media organizations. It depends on different forms of training methods that might be used in job shadowing such as field visits, project implementation, simulations, exercises, observations, and case studies as part of experiential learning. Many benefits have been recognized from the program which include gaining a better understanding of what is needed to become a journalist, media content production, and public relations practitioner. New topics, methods, and content should be developed to improve the program's effectiveness with a collaboration between media and communication colleges and media institutions.

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Hands-on Teaching: The Significance of Introductory Courses in Building Architectural Engineering Curriculum

Sahera Bleibleh, Lindita Bande, and Rahma Adan

Abstract The implications of hands-on introductory courses in architectural engineering (AE) discipline influence students' comprehension of the interdisciplinary nature of the field and help them build basic needed skills. This chapter reviews the recent inclusion of an introductory course to the Architectural Engineering Curriculum (AEC), at the United Arab Emirates University (UAEU), to provide general insights and to effectively engage teaching tools. Based on the program assessment in Spring 2018, a three credits course Arch 302: Introduction to Architectural Engineering, designed to be taught in a studio format, has been added to the AE program. The course includes a brief introduction to the AE professions, AE design process, and communication skills and digital tools. Through small project design exercises, the course applies multiple hands-on teaching methods to provide students with basic design skills and formal visual principles with an emphasis on developing creativity and effective communication. In addition to instructors' experience in teaching the course, a survey has been conducted with AE students to collect insights on the course's impact on their understanding of the interdisciplinary nature of the AE, and the subsequent design and building construction courses. This paper evaluates the course development, significance, and interrelationships with other courses aligned with the achievement of the course learning outcomes. The outcomes of this assessment shed light on the significance of introductory courses in improving students' achievement in subsequent courses in terms of understanding the AE interdisciplinary scope of work and gained skills.

S. Bleibleh (✉) · L. Bande · R. Adan
Architectural Engineering Department, United Arab Emirates University, Al Ain, Abu Dhabi, UAE
e-mail: sahera.bleibleh@uaeu.ac.ae

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1 Introduction

This study aims to assess the inclusion of the hands-on-introductory course significance at the undergraduate level of the Architectural Engineering (AE) Department at United Arab University (UAEU). The course is structured to offer interactive teaching of intertwined disciplines for the students to have a general overview of the AE discipline's nature and content. Although it has no prerequisite, the course is a core prerequisite to enroll in the AE program. It provides basic practical experience for the students to understand the complexity of the AE program. To meet ABET accreditation continuous improvement requirements of the AE program curriculum, a balance is needed between the engineering and the architectural courses. In addition to raising students' visual analytical and communication skills, Arch 302 is a stepping stone for the students to understand core concepts of AE discipline such as design, design tools, architecture, form, structure, construction method and systems, design process, design management, tools of design and design standards. As explained in the course syllabus, these concepts and processes are integrated into the course design and segmented into numerous exercises and assignments to apply the hands-on-teaching. The term project serves as an application of the course's overall contents. By applying multiple hands-on-teaching and digital tools, the inclusion of design thinking to teach architectural design and skills develops students' critical thinking to adapt to the complexity of the discipline, and AE program in general.

The course is taught in stages where the initial phase intents to focus on building students' own skills to comprehend what AE discipline is by focusing on the visualization of the architectural side of existing projects, and by building in hand LEGO blocks and drawing the outcomes. Creativity in AE is the core and is emphasized to gradually build and integrate into certain doses based on each course level starting from the introductory level until it is capitalized in the capstone graduate project. To understand the constructs of space and buildings, the students are challenged with three different tasks in the form of practical exercises about form and building components. As such, the project focuses on the construction systems, structure, form, and construction materials. The exercises of the second phase of the course are also practical, putting students in a critical thinking mode to understand the impact of applying alternative scenarios of design conceptualizations. In the discourse of this chapter, the proposed introductory course was examined on four main themes that include perception of AE, hands-on teaching, student engagement and communication skills, and curiosity to knowledge.

1. Perception of Architectural Engineering

Creativity is a relative perception from the side of the students and instructors. The course content was balanced between mini-lectures and assigned coursework to apply. Having basic information about the schools of architecture is a relevant point in creating projects and finding structural solutions. Schools such as Bauhaus had a significant impact in improving functional and structural skills in students [4]. The students should be able to realize and solve complexity in the architectural

and construction parts of a project. The AE provides the needed skills to develop a student analytical thinking approach is another relevant topic in the early stages of education. In multidisciplinary courses, knowledge and skills are intertwined and supported by theory and practice. This process is also supported by relevant tools such as BIM (Building Information Modeling) and DecidrchV2. These tools give a general overview of the problematic and viable solutions. Focusing on problems to simulate students' critical thinking process enables them to define specific evaluation criteria toward decision-making through established matrix to assess alternative scenarios, [3, 5].

2. Hands-on exercise and diverse teaching

In addition to hands-on teaching to provide learning by doing approach, the use of BIM in the diverse types of AE courses is gradually integrated and coordinated with the application in each course as applicable to its content level. Based on a study done at Penn State University, the implementation of BIM in the AE Department is based on a quality analysis of how the software enters each course (Construction, Lighting/Electrical, Mechanical, and Structural Engineering). This analysis is based on the collaboration integration and technology used in distinct levels throughout the AE program [1].

3. Student engagement and communication skills

The blended learning approach is found productive in the transformation of design courses in the AE program from face-to-face to mixed learning with the online system. Based on case study methodology, this investigation finds out that there was no loss of academic conceptualization when face-to-face teaching is replaced as it introduces a new form of engagement. This has been achieved by maintaining the balance between independent and group learning to bring a successful transformation of the conventional teaching approach (face-to-face teaching) [8]. The practice of conventional 'design tools' to create a new generation of skilled professionals is changing. Looking at case studies and applications in different worldwide architectural schools, teaching in academia is focusing more on the industry market. This is due to the need for adaptation to the growing speed of technology. By introducing the students to different problematic and practical obstacles, along with updated technology, they not only adapt faster, but also moderate their behavior in gaining more confidence in solving presumed problems. This is a crucial element in creating professionals with strong ethics and discipline knowledge [6].

4. Curiosity to knowledge

Understanding spatial geometry in AE courses is a challenging process. Since this profession is mainly integrated with building form, volume, façade, structural elements, geometry, and the physics behind it, are relevant to students imaginative capabilities. At the University of Texas at Austin, an introduction to Euclidean and Parabolic geometries has been organized in content units and showed to be a productive tool in strengthening AEs' skills in the understanding of geometric concepts and

approaches [2]. Such elements are fundamental toward increasing students' comprehension of sustainable development of the AE field, and urban plans of cities in general. Introducing sustainable design in the AE courses with a different level of implementation is crucial and could also contribute to building efficiency all over the world. According to a study at the University of Nebraska, Lincoln, the introduction to such courses prepares the students to work in careers in sustainable development. In this program, the institution connects to the local community and the students try to solve real-world problems. This integration happens on two levels, the first within the curriculum of the university, and the second in the larger scale community and industry [7].

2 Methodology

As mentioned, the Arch 302 introductory course was introduced in the spring of 2018 based on AE program assessment and continuous improvement. After eight semesters of teaching the course between the classroom environment and the online format, reflection is needed to assess how this course is contributing to enhancing students' performance and perception of the AE discipline. For this, the instructors' observations, regular course assessments, and the inclusion of students' opinion were carried out. A survey was designed to find out how this new course has facilitated the overall understanding of the AE discipline. It was structured to collect details on the main four themes regarding students' perception of the introduced course, the impact of it on their skills and communication, their curiosity about knowledge and engagement, and the ways in which hands-on teaching approach is perceived. The survey was distributed after six semesters of teaching the course. To allow for a better understanding of the impact of this course from the students' perspective, the collected sample included two groups of AE students, those who have finished Arch 302 and those who have not taken Arch 302. The survey outcomes revealed that AE students who have finished the introductory course require less time to develop the conceptualization of the design projects; they are able to explain and articulate the context analysis and easily perform individually and in groups. Interestingly, many students mentioned that they encouraged their fellows to apply to AE after taking Arch 302. The fact that it does not have any prerequisites makes it lighter and more appealing. The course has contributed to gradually building the students' basic skills and made them able to deal with technology and needed software to apply and master in the subsequent courses. The gradual build up approach and the segmentation of the applied coursework were customized to meet the various students' levels.

2.1 Survey

As mentioned, an online survey was designed and distributed to investigate the impact on the student understanding of the interdisciplinary nature of the AE, and the subsequent design and building construction courses. The included questions were structured to evaluate the interrelationships of ARCH 302 with other courses aligned with the achievement of the course learning outcomes, especially in basic design skills and formal visual principles. Based on the methods discussed by Oppenheim [9], the survey is designed following the stages of identifying the questions to be answered, generating questions, testing and altering the questions as necessary, distribution of the questionnaire, collection of responses, and analysis of data. The participants were 90 AE students who took the course in different semesters. The survey was anonymous to improve response rates and minimize ethical issues associated with data protection. It was built using online survey software called SurveyMonkey (2011), which was also used for distribution and response collection. The software increases the efficiency of the process, by storing the responses automatically and improving accuracy by eliminating the risk of transcription errors.

The research applied a mixed-method approach. For the quantitative part of the survey, 65 responses were received, whereas 32 responses were received for the qualitative part. According to Creswell (2013), sufficient saturation was achieved within the number of responses typically ranging from 20 to 30 participants as the sample size of qualitative research, which was applied in this study. Quantitative and qualitative data were collected from the survey, in this study, the qualitative results of the survey were used to explore students' perspectives on the outcomes of the ARCH 302 and their educational experience. A qualitative method was applied in this study, to address research problems to fill a gap in the literature where the researchers need to learn more from participants through exploration (Creswell, 2013). In the current study, data were collected by using an electronic questionnaire divided into two parts: the first part contained 20 required multiple choice and checkboxes questions to provide quantitative data, whereas the second part contained four optional open-ended questions to elicit information regarding experiences in ARCH 302. The texts of the four open-ended questions were structured to capture specific comments about Arch 302 in relation to areas of basic skills achievement; basic understanding of design process; basic understanding of engineering system integration; and communication and presentation skills. The open-ended questions were structured to collect students' inputs on areas related to student perception and comprehension of AE's interdisciplinary nature.

Many researchers used open-ended questionnaires as a tool to conduct qualitative studies (Orme, 2013). In this study, the results of the four open-ended questions in the survey were used as qualitative data. For the qualitative data analysis, sequential steps were followed, from the specific to the general, and involving multiple levels of analysis (Creswell, 2013):

Step 1: organize and prepare the data for analysis.
Step 2: read or look at all the data.

Step 3: start coding all the data.
Step 4: generate a description and themes
Step 5: representing the description and themes

In the coding process, the participants' comments were organized into categories and labeled to generate descriptions and themes, that validate the findings (Anderson, 2007). In the discussion and results section of this paper, codes from participants' comments demonstrate the qualitative interpretation of responses and generated codes and themes. Considering that qualitative analysis is characterized by subjectivity, the findings will indicate not only the data, but also their frequency, thus supporting their validity and reliability.

2.2 Course Proposal

The course was proposed based on the AE curriculum assessment and the observed weakness in students' performance in terms of skills, tools, and communication. Based on benchmarking the program with other similar international programs, a proposal was developed and submitted to the university curriculum committee for approval. The course was approved and included in the AE program in Spring 2018. Since then, the course has evolved in multiple cycles of improvement, as explained in the next section.

2.3 Course Evolution

In the first three semesters of offering, the Arch 302 course has been assessed in terms of level of challenge, assignments and exercises contents, weight distributions, and projects. It was also evaluated to make sure it is linked with other basic courses such as building construction and the AE curriculum in general, as shown in Fig. 1. The fact that the course is based on hands-on teaching requires more integration of small problems to train the student to think independently while developing their knowledge and skills. This has contributed to enhancing not only the course content but also the delivery and inclusion of tools and basic skills. The course is taught in a studio format with mini lectures to introduce preliminary information on design concepts, site analysis, drawing techniques and projects, presentation skills and communication.

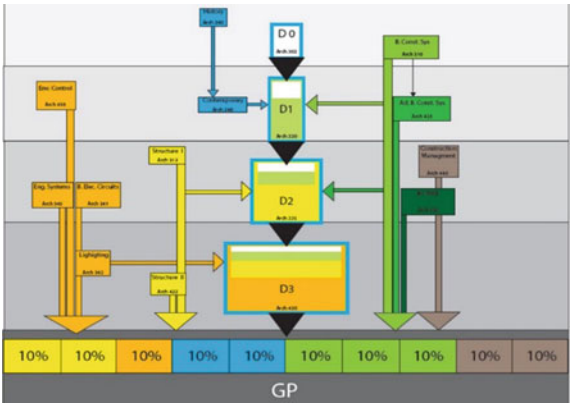

Fig. 1 The relation of Arch 302 with the other courses in the AE curriculum. Source, Rashed AlShaali

3 Best Practice

Regular course assessment is required by the UAEU system and ABET accreditation each semester. Accordingly, any changes in course syllabus are performed based on a systematic and thorough evaluation that includes student work, student feedback, faculty proposals, and other relevant criteria. The Arch 302 course has gone through multiple changes based on the evaluation outcomes, which were reflected on the course content, exercises, assignments, and the final projects to better familiarize students with the AE field and gradually build their skills. The presented case studies show two examples of the assigned final projects in different semesters. The project in both cases was an Exhibition Hall within the campus to reflect the EXPO 2020 theme. The sustainable elements of both projects were: increase of shading structures, recycled materials, and more openings on the north side rather than south. The project was divided into three main requirements: site analysis and the concepts, the case study analysis, and the project development. The site analysis enabled the students to understand the relevance of the location within the country, within the city and then the neighborhood. The SWOT analysis defined the advantages and disadvantages of each site to help the student develop a more practical idea.

As shown in Fig. 2, the first case reflects the invested effort into the design analysis of the project from Fall 2019 in the conventional face-to-face teaching and the second case study belongs to the online offering in spring 2020. Obviously, the students presented more alternatives by sketches or by using Revit and Sketchup tools, while alternatives were limited in the second case. However, the second case shows clearer organization and better function distribution of the project. In the Concept development, the students were asked to work on two alternatives and based on critical thinking to select one that is better integrating the requirements and to the location. The case studies helped the students understand how the function is distributed in the plan, how each zone interacts with the other, the scale of the project, the elevations and sections, the 3D development, and the material selection etch. The project development then starts with the site location, the functional plan, section and elevations,

3D, and interiors. The students were encouraged to add the structural system to the plan to apply and connect with other corequisite building construction course, as part of the course objectives. The analysis of the site helped the students in considering the contextual and environmental elements to achieve sustainability projects, as an overarching concept. A similar pattern is observed in Figs. 2, 3 and 4.

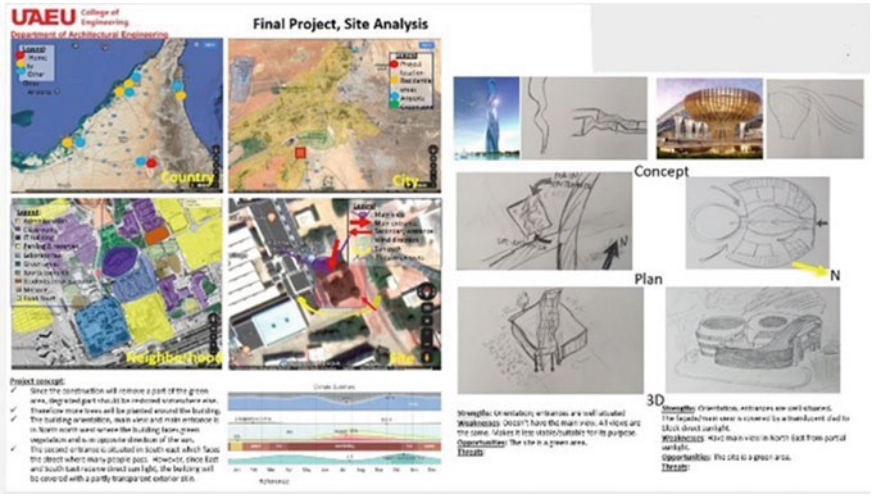

Fig. 2 Site analysis and concept development

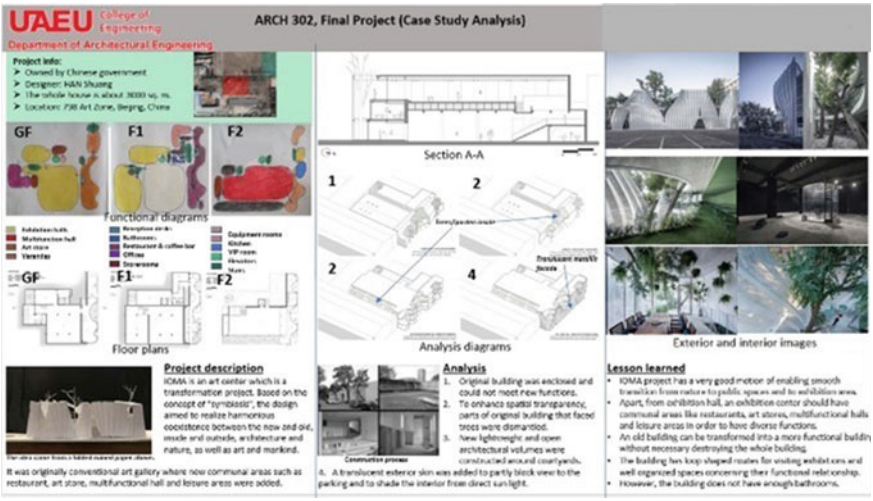

Fig. 3 Case study analysis phases

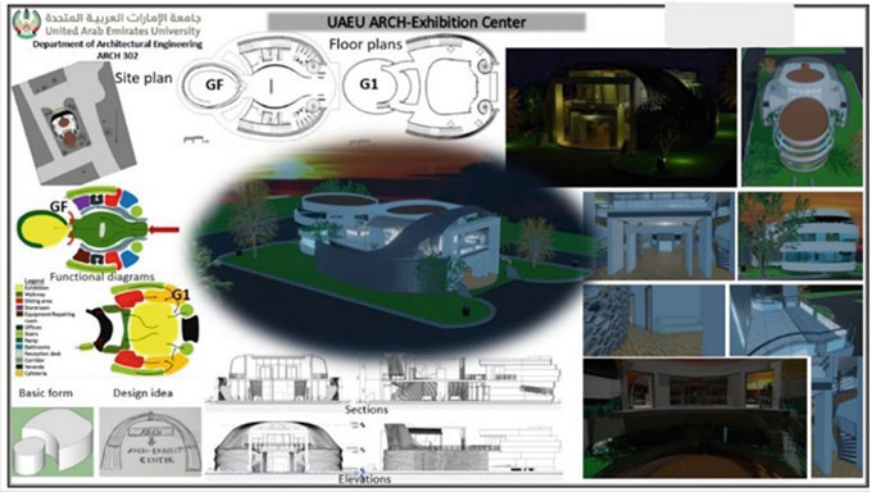

Fig. 4 Project development phase

4 Remote Teaching

Due to the pandemic worldwide, the UAE University decided to shift to remote teaching model for the remaining time of the spring/summer semester of 2020. The various challenges of online teaching were witnessed in areas related to design concept explanation; teaching design tools; individual work and teamwork; and presentations. Therefore, additional tablets devices were provided by the UAE University, based on the instructors' request, to fill in the gap and provide alternative to class environment by sharing screen to work on one-to-one with the students.

The first phase of the project is the design concept. The conventional face-to-face teaching enables the faculty to closely interact with each student. In the remote system, this interaction became more challenging, and the explanation of sketches and geometry was complex and required longer time and alternative approach. Furthermore, teaching Revit online was a learning process. In conventional teaching, the students would be more flexible with the class assignments. While in online teaching, the same task would take more time. In the physical class, due to the interaction between the students, the learning of the tool would be more practical, meanwhile in online class, the individual work of each student is relevant. The individual work was slightly more productive in the online teaching based on the final project results, as discussed in the above Sect. 3. Moreover, the teamwork was a little complicated, especially in the assessment of each student's contribution and amount of effort in each task.

However, the individual and teamwork would be evaluated and compared in the submitted files through the system and through the online presentations. The presentations of the individual tasks and the final project helped the student have a better

terminology in the field of architecture and build a strong ethic. The integration of face-to-face classes with the remote teaching, as later applied by the UAE University after securing safe environment and vaccination, was applied in Fall 2020 to assist the students in comprehending practical skills such as critical/design thinking, sketching, understanding the site, and developing a concept. The earlier stage of the term project was done in the face-to-face sessions and the advanced stage was done by remote teaching. Additional remote sessions were considered to assist the students in learning the design tools (in this case REVIT), as shown in some examples on student term project, graded A, in Figs. 5, 6, 7 and 8, for illustration purposes the concept page and the final page will be shown.

The introductory course has improved in adapting and maintaining the balance between architectural and engineering courses, as verified in the results of each semester assessment. The exercises and assignments are designed to help the students understand the basics of the AE Program. To keep up with the continuous improvement, a detailed assessment report is done at the end of each semester to take the needed based on the evaluation of the course learning outcomes. More examples of student work over different semesters are shown in Figs. 5, 6, 7 and 8. As per the UAEU assessement requirement LOAMs, the course is assessed every semester based on collecting the involved instructors inputs and the students survey. However, the

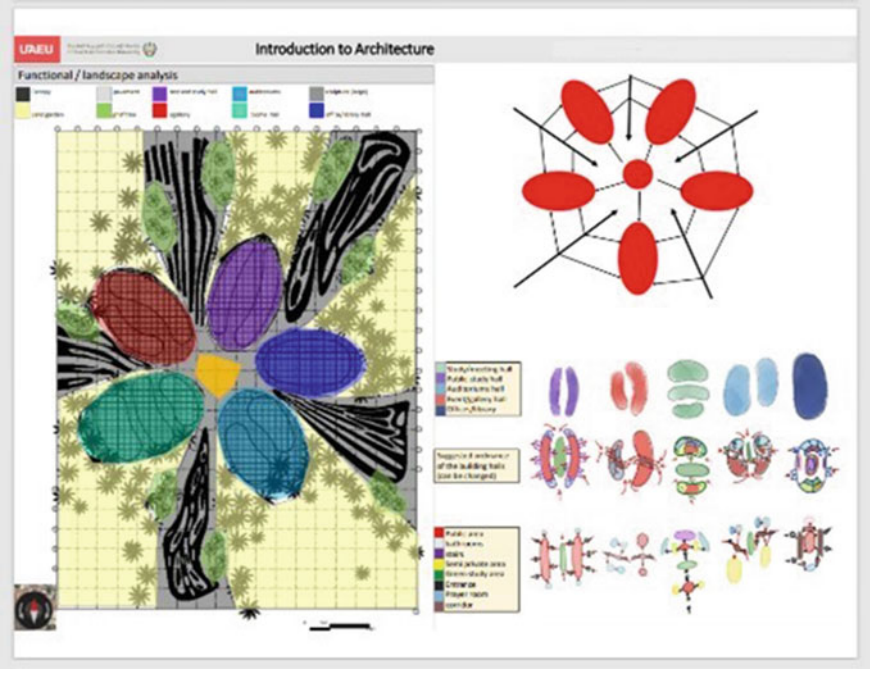

Fig. 5 Site plan and concept development

Fig. 6 Project A 3D

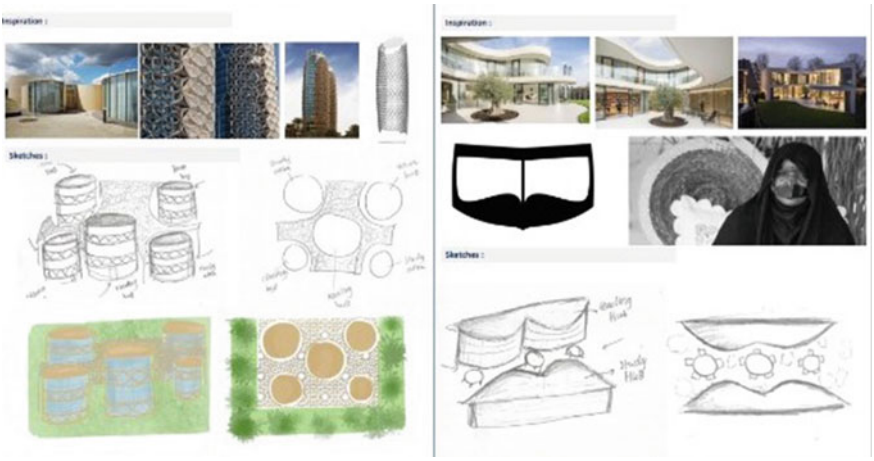

Fig. 7 Concept development and inspiration

Fig. 8 Project B 3D

improvement is a continuous process and a work in progress to further strengthen the course content and teaching tools.

5 Results and Discussion

As verified in the collected survey, the course outcomes meet both the AE program and the student's expectations. The survey shows that further integration with the construction aspects of the buildings is needed to confirm the alignment of basic courses at earlier stages of the curriculum. Therefore, the specialized clusters, as per the interdisciplinary focus of the AE program, are considering joint assignments that include components of each area. The survey outcomes were insightful in terms of the applied tools taught; however, the speed change of such tools requires continuous update as per the industry demand. Approximately, 85% of the students who participated in the survey confirmed that the course has been informative and inspiring to get them more engaged and interested in the AE discipline. This also makes them more aware of the relevant industry and the specialized technology. While online teaching opens opportunities of diverse teaching and more inclusion of software, it also imposed certain limitations on the full implementation of the hands-on teaching. Therefore, the integration of additional platforms such as Miro helps in overcoming such unavoidable pandemic challenge.

6 Conclusion

The course has been proved informative and continues to attract students to the AE discipline. Fundamentally, the course continues to go through cycles of continuous improvement to further strengthening the course content, teaching tools, and technology in relation to industry. For this, the multiple offered exercises and assignments are always assessed to keep this course actively engaging. The several meetings and discussions of all engaged faculty who have taught the course keep the course alive and maintain the level of content simplified and updated to meet the expected benefits of its creation. Therefore, the introductory courses are essential elements to consider simplifying the complexity of the AE interdisciplinary field. Such courses bring life to the classroom environment and the student community in general, and prepare them to handle the gradual development of their skills and future professions.

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Objectives of Using Massive Open Online Courses (MOOCs) by Omani Teachers During the Covid-19

Aaisha Al-Badi, Nabahan Al Harassi, and Hussain Alkharusi

Abstract This paper aimed to explore the objectives of the Omani teachers' use of MOOCs during the pandemic of Covid-19. The quantitative approach was applied to collect the data through questionnaires to reveal the teachers' objectives and reasons for using MOOCs during Covid-19. Therefore, the population of this study was the Omani teachers who teach in the Muscat Governorate, in public schools, and from different subject specializations, with various years of teaching experience. The findings of this study showed that the majority (97%) of the Omani teachers, in Muscat specifically, use MOOCs during the Covid-19 pandemic as MOOCs give a meaningful learning through providing access to good quality education with no fees given, following with (94.7%) use MOOCs to get new insights and experiences in their teaching subject. The same percentage (#%) use MOOCs to update their knowledge and skills related to innovative technologies and teaching strategies. However, 31.5% of the participants disagree with using MOOCs for enhancing peer support. In addition, 26% of them disagree with using MOOCs because of encouraging peer support. Also, the study revealed no significant gender differences in the objectives of the Omani teachers' use of MOOCs during the pandemic of Covid-19. This study recommended having a database of the MOOCs learners' profiles to make it easier to reach them, analyze their needs, and develop MOOCs for them to make their learning more effective and meaningful.

Keywords Omani · MOOCs · COVID-19

1 Introduction

Massive Open Online Courses (MOOCs) are one of the open online environments, which provide mostly free self-learning environments and are used during Covid-19 which affects different life aspects and educational institutions. COVID-19 shifts all activities online from social gatherings, shopping, entertainment activities, and

A. Al-Badi (✉) · N. Al Harassi · H. Alkharusi
Sultan Qaboos University, Sultanate of Oman, Muscat, Oman
e-mail: s68701@student.squ.edu.om

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obviously teaching and learning. According to [30], the requirement of social distance drives educational institutions to choose between closing their doors or going online. This leads to a sudden alteration in different new online environments to maintain their business or fulfilling their duties [39]. For instance, different training centers encourage teachers and institutions to use various technologies that facilitate large-scale professional development to enhance the unanticipated requirements to update teachers' knowledge and skills to teach remotely. This update was necessary and mostly applied by teachers in an individual and self-customized manner to apply technologies appropriately to deliver the teaching materials using interactive and effective strategies.

One of these technologies is MOOOCs. MOOCs were a powerful and potential solution for learning, teaching, and training during the closure of schools and institutions during the COVID-19 pandemic lockdown [28] in Oman and worldwide. More empirical studies are needed to understand it [12], especially with teachers as they were encouraged to provide online teaching in unexpected situations to reduce the negative effect of the schools' closure on the students learning and performance. Moreover, in general, the teaching practices and the motivations that drive specific actions during covid19 need more studies. This study aims to reveal the objectives of Omani teachers who used MOOCs during the Covid-19 pandemic either for personal reasons or because of the features of MOOCs themselves.

1.1 Statement of the Problem

There are many reasons and objectives for using MOOCs which can be varied depending on many factors such as the encouragement of stakeholders, social institutions, and peer feedback. Gillani and Eynon [16] arrested that there is no single reason why people enroll in MOOCs. Their reasons will differ depending on the course and their individual backgrounds and experiences. In addition, in 2020, and as a response from educators to the COVID-19 pandemic and the effects of lockdowns, closure of countries and various institutions including schools, and the shift toward online education, MOOC platforms were consistently used in the teaching and learning process in various countries such as China and India [6, 47]. In Oman, besides teachers' individual efforts to cope with the situation and their self-training using MOOCs and other technologies, the Omani Society for Educational Technology announced, via their social media accounts, a partnership with Coursera, one of the MOOC platforms, to provide professional training development programs in various skills and disciplines to foster the learning and teaching process [34]. Moreover, different findings showed that MOOCs have significantly affected teachers' careers and developed their teaching skills [35]. Despite this, moving rapidly toward online teaching and using various technologies, including MOOCs, during the COVID-19 pandemic, came as a shock for teachers, and directed them to review their online teaching skills and technical competencies to apply in their teaching and may try to update them to be more capable for the online teaching. Moreover,

teachers are driven by different objectives to use MOOCs, which need investigation. Furthermore, the organizational culture of the Sultanate of Oman may affect the educational system and teachers' different practices and motivations for using such technology.

1.2 Significance of the Study

The findings of this study are expected to provide significant contributions, both theoretically and practically. The findings and recommendations may help to design and develop training programs for the teachers that align with their objectives and needs. This paper may encourage stakeholders to give more attention to the advantages of MOOCs for beneficial effects. In addition, the Ministry of Education may benefit from using MOOC platforms to deliver the training programs to save money, effort, and time, and enable access to the institution's training programs. Instead of paying for teachers' accommodation, transportation, and other services in face-to-face training, MOOCs as online platforms can direct these resources to other aspects of education. Furthermore, teachers may take advantage of the valuable features of MOOCs. Teachers' objectives and more attention getting to use MOOCs may drive teachers' self-regulation learning and help transmit these skills to their students to be more skillful and qualified to adapt to different changes in the digital age and innovative technologies world.

1.3 What Are MOOCs?

UNESCO [43] emphasized that everyone has the right to access a high-quality learning, which can be acquired digitally or in traditional forms. This guide focuses on the universal opportunities to access the learning materials to enhance peace and sustainability of human and economic to learn and to be accessed by different people regardless of their gender, experiences, backgrounds and other characteristics. Open Educational Resources (OER) contribute to sharing knowledge formally or otherwise in a cost-effective and high-quality manner [25]. One of these open educational resources shapes are MOOCs. They are platforms for e-learning that allow many learners to join online courses in various subjects regardless of their demographic differences [10]. Besides, mostly without fees to attending the lectures exclusively online and within the specified start and end dates to provide social interaction, whereas the lessons can be archived for future retrieval by the learners or other users [7, 24, 25, 27]. These are available in different languages, but the majority are in English [8]. MOOCs' characteristics help learners individualize their learning, build collaboration, network online, and empower their lifelong learning competencies [27, 32]. Moreover, MOOCs can be found in assorted designs and types based on different pedagogical and technological issues.

1.4 MOOCs Types

MOOCs have various characteristics and features based on the different learning approaches they apply, leading to two categories. The first is xMOOC, which refers to an extended Massive Open Online Course. It is an extended version of traditional face-to-face instruction modes like lectures [2, 17, 29, 32]. In this type, interaction is around the content and reflects behaviorist learning theory [8]. This type of MOOC deals with the learners as consumers of the knowledge, while the lecturers are the experts, using primarily recorded videos and applying automated graded assignments [10]. The content of these courses is well structured, controlled, and launched by a collaborative team of co-workers from prestigious and esteemed universities, leading to financial support [35]. Udacity, for example, was launched by Professor Sebastian Thrun, working at Stanford University, while Coursera was started by Daphne Koller and Andrew Ng, who tend to make diverse partnerships with various prestigious universities; which facilitates Coursera the grow up in terms of students' numbers, partnership universities, and are available in various languages and subjects. Following Coursera, edX was launched by Harvard and MIT [32].

The second type is cMOOC, in which the 'c' stands for connectivism [14]. These MOOCs apply the theory of connectivism, focusing on the interaction between the learners, and making networks between them [38]. The cMOOC is based on learning from peers [17], and all the participants can be both creators of the knowledge and teachers for other participants. Learners play a significant role in the learning process, leading to enhanced creativity, ample non-structured information, and less control by several educational community volunteers without any financial support [35]. The cMOOCs take the interactive social media power of platforms such as Twitter, Facebook, and blogs, and apply them in their courses [20]. Both types of MOOCs are used by learners for varied reasons and objectives.

1.5 Objectives of Using MOOCs

Learners utilize MOOCs for assorted reasons, and different motivations drive them to use MOOCs. The objectives can be categorized into three main categories: *personal issues, technological issues, and pedagogical issues.* The personal issues may leed to the use MOOCs as they be the effective context of the learners' to align their needs and personal development objectives and learning goals [12, 26]. In addition, some MOOCs enable learners to customize the learning environment based on the learners' preferences [10] and to fit their learning styles. Furthermore, the learners can be self-pacing and more flexible in their learning [3]. This can help learners to learn in their own preferred time and place. In addition, they can repeat the lessons as many times as they want.

Falconer et al. [13] and Balaji and Sayed [3] arrested the importance of recognition for MOOCs by many institutions and universities. This may encourage learners to

take MOOCs and get a recognized certificate to reflect their self-regulated, lifelong learning, and autonomy. This motivates the learners to use MOOCs to develop their career and use it as a means for their professional development. For instance, teachers can use it for their in-service development and show it as proof of their self-directed development, especially during Covid-19 pandemic which results in unanticipated closures of training centers and a special need for use of e-learning and teaching.

Moreover, *the pedagogical issues* include MOOCs providing access to quality education at no fee [4, 10]. Meaningful quality education can be linked to another issue in which different institutions participate to develop MOOCs such as high-reputation universities. Furthermore, this can be a significant reason for learners who live in remote or underserved areas to bridge the gap which may happen because of a lack of quality education [3]. Having access to quality education was considered by [43] as one of the significant reasons for peace and human sustainability. In addition, MOOCs provide learners with new experiences and insights related to their interests and specialization and can also enhance their share of experiences and information through discussions [9, 26]. The learners engage with relevant knowledge resources and individuals, and link them to develop their information skills, improve their cumulative knowledge, and inspire knowledge creation through the process called 4Cs of learning behaviors that include consuming, connecting, creating, and then contributing the new knowledge. For instance, [23] claimed that MOOCs foster teachers' communication, reflection, and cooperation within a community of peers and active learners to share technical information and skills, encourage innovation, and eventually integrate new pedagogical and technology knowledge with classroom practices. This can help teachers to improve their knowledge in different areas such as teaching strategies and improve their skills either technical or other more specific skills related to their subjects in a powerful environment mostly with flexible discussion platforms and easy communication. Furthermore, [36] considered MOOCs as a tool to enrich teachers' instructional practices and facilitate the development of digital skills.

The *technological issues* can cover that MOOCs enhance learners to use open-access software and accomplish their assignments using a simple and unsophisticated application considering that learners are from various specializations and have different technical knowledge and skills [3].

Not only the literature presents many reasons for using MOOCs but also many studies recommended further investigation of learners' and educators' objectives for using MOOCs. For instance, [46] pointed out that there is little understanding of the learners' objectives for using MOOCs, and more investigation will significantly affect the MOOCs' development and implementation [12] emphasize the need for more investigation and research on the reasons that influence learners to take a MOOC. This study tried to discover this gap and focus specifically on the Omani teachers' objectives of using MOOCs during Covid-19 as the pandemic affects teachers' practices and use of MOOCs for many reasons which need to be revealed.

2 Materials and Methods

Veletsianos and Shepherdson [44] highlighted that most MOOCs research and studies employed a quantitative approach. Neuman [31] underlined that quantitative data can be used to measure things objectively and avoid researcher bias. Thus, this study used a quantitative method to explore Omani teachers in the Muscat governate who used MOOCs by using a questionnaire that contained 20 statements using a 5-point Likert scale of agreement. In addition, Akinci and Saunders [1] pointed out that quantitative research may use questionnaires to show the relationships and differences between the variables which will be used in this study to study the differences between males and females in their objectives of using MOOCs.

Thirty-eight Omani teachers from Muscat who are MOOC users and learners through these platforms participated in this study and they were chosen randomly. The participants are from different specializations comprising both genders. The percentage of both genders is equal to 50%. In addition, they are from various subject specializations as shown in Table 1.

Furthermore, the participants are from different years of experience as presented in Table 2.

Table 1 The percentages of participants' subject specialization

Subject	Percentage (%)
Social studies	10.5
Science	13.2
Information technology	10.5
First field	2.6
Islamic education	7.9
Arabic language	13.2
English language	26.3
Math	15.8

Table 2 The distribution of the participants' years of experience

Years of experience	Percentage (%)
0–5	18.4
6–10	31.6
11–15	26.3
16–20	10.5
More than 20	13.2

3 Results and Discussion

The finding of this study regarding the reasons that motivated Omani teachers to use the MOOCs during the Covid-19 pandemic can be presented in Table 3.

Table 3 shows that the majority (97.3%) of the Omani teachers in the Muscat governate used MOOCs during the Covid-19 pandemic because they provided access to a quality education that is free. This was the result of schools getting closed during the pandemic and teachers were forced to look for free and professional resources to upgrade their skills to deal with online teaching and learning [19]. This can also be reflected in the following reason for using MOOCs by the Omani teachers, which was to get new insights and experiences in their teaching subjects. Gao and Zhang [15] claimed that teachers were familiar with traditional teaching in face-to-face classrooms, with limited information literacy in technology integration in their teaching and an infrequent experience with distance and online teaching. The online platforms have different patterns of information delivery for the students [2, 22], which require the teachers to discover interactive technologies for their students to engage them in the online classes [33], to understand their needs, and to reduce their feeling of isolation.

This challenge makes it a compulsory requirement for teachers to update their technical skills to be able to upgrade their skills and knowledge in the technologies related to learning and teaching in the online environment [15], and to reflect on the self-development process in the collaborative online environment [11, 45]. This was reflected by 94.7% of the Omani teachers in Muscat who used MOOCs to get new insights and experiences in their teaching subjects. Furthermore, the same percentage used MOOCs to update their knowledge and skills particularly needed to learn about innovative technologies and instructional strategies. Furthermore, this result aligns with [42] finding about the information science professionals' reasons to use MOOCs during Covid-19. They used MOOCs to acquire skills and update knowledge. In addition, they found that half of the participants signed up for MOOCs to update their knowledge, and one-third of them signed up to improve their skills.

About 92% of the participants used MOOCs as they raise their awareness about self-learning and learning autonomously. This can be reflected in the need during the covid19 to be self-learners to update themselves with the required skills and knowledge. In addition, the closure of traditional face-to-face learning institutions based on the social distance requirements led to change the way of knowledge acquiring and raised the need of using more educational technologies in the educational setting [15].

An equal percentage of the participants (92%) used MOOCs to facilitate learning with people from diverse backgrounds and regions, which highlights their need to exchange experiences much wider. This can reflect the searching of the learning for two main things collaboration and openness [40]. Learners of all backgrounds and races may communicate and learn on a similar topic of interest through collaboration. MOOCs, in terms of openness, give a platform for specialists to share their

Table 3 The percentages of teachers' reasons for using MOOCS during Covid-19

Statement	Strongly agree + Agree (%)	Strongly disagree + Disagree (%)
Provide Access to quality education with no fee	97.36	2.63
Give new insights and experiences in my teaching subject	94.73	2.63
Update my knowledge and skills related to modern technologies and teaching strategies	94.73	2.63
Raise my awareness of the self-learning	92.10	2.63
Facilitate learning with people from diverse backgrounds and regions	92.10	2.63
Give the learner control over his learning	89.47	7.89
Provide self-paced learning	86.84	5.26
Exchange experiences through training provided by a high-reputation university	81.57	15.78
Can drop out at any time	78.94	7.89
Help me to achieve personal goals	78.94	13.15
Enable interactions and build networks	78.94	13.15
Encourage me to review my knowledge and skills	78.94	15.78
Encourage self-organizing of the learning	76.31	15.78
Encourage applying knowledge and skills in a wider context than courses would otherwise	76.31	15.78
Able to test the courses before the enrollment	71.05	18.42
Reflect on developing course partnerships with industry between different experts	71.05	21.05
Applies different learning modes such as self-directed learning, informal learning, and peer-peer	68.42	21.05
Answer my curiosity questions about something	55.26316	23.68421
Enhance peer support	52.63158	31.57895
Allow the peer reviews	52.63158	26.31579

expertise with a diverse group of learners, regardless of their background or location, democratizing knowledge.

Moreover, 89% of the teachers agreed that they used MOOCs during Covid-19 because they give them control over their learning. They can learn at their preferred time and place. Cormier and Siemens [9] stressed the merits of MOOCs as they facilitate access to new knowledge and the engagement technologies being within the power of the student. This open learning changes the educator's position. In addition, MOOCs were recommended to be used in Omani teachers' professional development to enable them to control their learning [5]. In addition, 86% used MOOCs as they are a self-paced environment. They can learn at their pace and repeat the lessons many times and retake quizzes and assignments. Self-pacing makes them feel more comfortable and less worried about their learning [3, 21]. In addition, the following agreed reason was exchanging experiences through training, which is provided from high reputation universities such as Harvard, Stanford, and others.

In addition, the next agreed objective of using MOOCs by the Omani teachers during the Covid-19 pandemic was encouraging them to review their knowledge and skills represented by 78.9%. This was a compulsory requirement for the teachers to be able to provide online teaching [15]. Furthermore, the same percentage represents three other reasons for using MOOCs by Omani teachers during the Covid-19 pandemic as follows; MOOCs helped teachers to achieve their personal goals, which cannot be related to their careers and teachers' professional development. This finding also corresponds with Tsabedze and Tella [42] as they found that 16.7% of the librarians said they studied through MOOCs to get a certificate that would help them get better employment opportunities. However, there are many other personal objectives of Omani teachers' enrollment in MOOCs that need more investigation.

The same percentage (78.9%) used MOOCs because they enable them to interact with others and build networks. Furthermore, the freedom of dropping out from the course at any time without any restrictions gets the same percentage. These findings correspond with the evaluation of MOOCs from the perspective of the learner which was conducted by Nkuyubwatsi [32]. He found the openness reflected in MOOCs in means of pace, control, free, drop out, and enrolling without any prerequisites, which attract many learners to take this advantage into account. However, high rates of dropout were highlighted by Hew and Cheung [18] as a significant challenge in MOOCs because around 90% of the participants drop out. However, this percentage can give an indicator of one of the merits of these platforms. It reflects that learners enroll to get knowledge and skills and when this is achieved, they leave the course. Moreover, this kind of openness from the perspective of the learners is an advantage.

Omani teachers used MOOCs to support their self-organization needs of their learning and an equal percentage used MOOCs because they encouraged them to apply knowledge and skills in a wider context than the course, in their real teaching practices. The feeling of control over the learning and studying each section of the course in their prepared order or way and then the ability to customized it to fit their needs driven 76.3% of the Omani teachers from The Muscat governate to use MOOCs during Covid-19. This result may be linked with [10, 37] recommendations to use MOOCs agents to customize the course based on the learner's profile data.

This can include adjusting the content of the course based on the learners' academic background, their location, and environment as well as their origin. In addition, the course setting can be adapted based on the learner's preferences of colures and organization of the objects in the MOOC environment. Besides, based on the learner analytics the presented content in MOOCs can be personalized or suggest for the learner special courses and resources.

On the contrary, the highest number of participants (31.5%) disagreed with using MOOCs because of enhancing peer support. Following by 26% of the teachers disagreed with using MOOCs as a tool that help to learn from peer reviews. This can raise a need to explore the type of courses that Omani teachers use to learn and assess five aspects related to this area as investigated by Syahrin [41] and include the study of MOOCs participants' style of learning, the kind of learning environment in MOOCs, types of activities, mode of content delivery, and the instructor style. In addition, 23% of the Omani teachers in Muscat disagreed with learning through MOOCs to answer their curious questions.

About 21% disagreed with using MOOCs as they reflect developing courses partnerships with industry between different experts. The same percentage of disagreeing with using MOOCs as a tool which present different learning modes such as peer-peer or interactive learning or flipped learning experience. This can lead to a clear need to study the kind of courses they study and analyze.

Moreover, one of the major results of this study is that there were no significant differences between male and female teachers in their objectives of using MOOCs during the covid19 pandemic as presented in Table 4.

This can be from the same reasons and challenges that drive them to use MOOCs. In addition, they might have been following the same regional place and educational system which affected their responses and objectives of using MOOCs and this can be investigated deeply in future studies.

Table 4 t-Test: two-sample assuming unequal variances

	Females	Males
Mean	3.810526	4.234210526
Variance	0.308325	0.744561889
Observations	20	20
Hypothesized mean difference	0	
Df	32	
t Stat	−1.84657	
P(T < = t) one-tail	0.037038	
t Critical one-tail	1.693889	
P(T < = t) two-tail	0.074076	
t Critical two-tail	2.036933	

3.1 Implications and Recommendations:

The finding of this study cannot be generalized because of many challenges. This can be a result of there being no data about the teachers who use MOOCs in Oman or particularly in Muscat. This can inspire the institution and stakeholders to build a local database to know the users of MOOCs and help the researchers and MOOCs developers to reach them much easier and conduct analytical analyses of the learners to develop courses that can fit their needs. Many studies focus on the alignment of MOOCs to learners' needs such as [12]. They underlined that only in the context of the learners' objectives and needs can MOOCs be effectively interpreted. This may lead also to focus on the importance of studying the need to develop a specialized educational MOOCs platform that is more related to the teacher's profession and the possibility to use it as a professional development venue for the teachers in Oman. This also raises the need for more Arabic content and MOOCs to encourage all teachers to enroll and take benefits of them as most of the MOOCs are available in English [8].

In addition, some of the objectives of using MOOCs by the participants need more clarifications such as the personal goals that lead them to enroll in MOOCs which may need to use qualitative research methods to get a deeper understanding of their reasons and motivation to use MOOCs. Furthered, the most used MOOCs of the Omani teachers needs to be sorted and analyzed to give more comprehensive insights into their types and fit the expectations of the teachers, and content analysis of MOOCs to reveal their content and how it follows the instructional design approaches, the assessments and supports available such as student support, teacher support and technical support or administrative support.

This study also recommends studying the frequency of using MOOCs by Omani teachers and comparing their sources of getting training in their professional development and their preferences for MOOCs and traditional training through face-to-face or blended. Furthermore, this study suggests studying the effect of MOOCs on teachers' practice and teaching. This can include studying the areas most enriched by MOOCs such as their specialization knowledge, their teaching strategies or the development of their teaching materials. This study recommends studying the relationships between the objectives of using MOOCs by teachers and their schools' objectives, principals' backgrounds, and many other factors such as years of experience and the subject of specialization. In addition, the researchers can compare the results of this study with the objectives of other teachers locally and internationally.

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Cognitive Empowerment of Students with Disabilities and Its Impact on Academic Self-Efficacy and Mental Health During the COVID-19 Pandemic—the University of Sharjah as a Model

Ahmad Falah Alomosh and Ahmed Mahmoud Sallam

Abstract *Objective*: This study aims to document the interventions implemented at the University of Sharjah (Disability Resource Center) to enhance learning processes to achieve cognitive empowerment for students living with disabilities during COVID-19 and its impact on academic self-efficacy, psychological well-being, and health from their point of view. *Methods*: The descriptive-analytical approach was used. The study tools applied include the academic self-efficacy scale, the cognitive empowerment scale, and the mental health scale: R-SCL-90. Dimensions (anxiety, depression, and phobia), (n = 120). *Results*: A statistically significant inverse correlation at the level (0.01) between cognitive empowerment (cognitive awareness, information availability, training and empowerment, independence, and commitment) and mental health (depression, anxiety, and phobia), where the correlation coefficients amounted to –0.522, –0.534, and –0.512 was noted. There is a positive, statistically significant correlation at the level of significance (0.01) between the dimensions of cognitive empowerment and academic self-efficacy, where the correlation coefficient reached 0.549. A statistically significant inverse correlation at 0.01 between mental health (anxiety, depression, and phobia) and academic self-efficacy, as the correlation coefficients amounted to –0.605, –0.558, and –0.557. There are no statistically significant differences between average females and males in cognitive empowerment. There is a statistically significant difference in the dimensions of cognitive and empowerment according to the disability category's variable. The order of the categories of disability came according to the degree of response to cognitive empowerment: Physical disability, visual disability, hearing disability, and learning difficulties.

A. F. Alomosh (✉)
Professor and Director of Disability Resource Center, University of Sharjah, Sharjah, United Arab Emirates
e-mail: alomosh@sharjah.ac.ae

A. M. Sallam
Psychological Counselor, Disability Resource Center, University of Sharjah, Sharjah, United Arab Emirates

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Keywords Cognitive empowerment · Higher education · COVID-19 · Academic self-efficacy · Mental health

1 Introduction

In many countries, people living with disabilities experience marginalization and apathy regularly. This is a situation that the Covid-19 virus has exacerbated. The pandemic has negatively affected them and their families, especially in our Arab region, because of wars, disasters, and other crises. The Human Rights Foundation stated in a previous report that "the new Covid-19 virus poses significant risks to many people with disabilities worldwide. The government must do its utmost to provide all the rights and protection of persons with disabilities during the pandemic" [31].

Persons with disabilities are most at risk of infection with the emerging coronavirus (Covid-19). They are extremely vulnerable to diseases of respiration and the complications that usually emerge from their infection with diseases linked to disability. Also, persons with disabilities may face specific obstacles that make it challenging to follow precautionary measures to prevent the virus, such as washing hands, as it may be difficult to rub hands carefully. They sometimes need to touch things to identify them, obtain information, and provide physical support. This can expose them to infection [20].

International laws and legislation have long been concerned with recognizing the right of persons with disabilities to public and university education. It is worth noting that both Article (504) of the American Rehabilitation Act 1973 and the American Act on the Representation of Persons with Disabilities (ADA) dealt with university education. For students with disabilities, Sect. 504 of the Rehabilitation Law of 1973, as amended, prohibits discrimination based on disability in any activity or program funded by the federal government.

The responsibility of educational institutions, in general, and higher education institutions, in particular, increases in these current circumstances. These institutions need to enable people with disabilities to have informational, technical, and cognitive empowerment for easy access to knowledge through the distance learning system and the hybrid system, which is one of the most critical repercussions of the Covid-19 pandemic,

There are enormous challenges faced by people with disabilities concerning their technical empowerment and the inequality in providing them with opportunities to access knowledge in various formats. This is the case whether one considers the individuals with disabilities or their families. These effects extend to institutions and countries because of the diversity in the categories of disabilities and their classifications and a parallel diversity in methods of dealing with them. Flexible education to achieve equal opportunities for people with disabilities during distance learning, especially under the current circumstances, becomes a requirement.

Empowerment denotes "the ability of socially excluded and marginalized individuals and groups to better control their lives, achieve their goals, gain valuable

resources, and reach their basic rights. It is a development process based on cooperative work, which contributes to reducing marginalization and social exclusion" [25]. Empowerment was used as a theory; as a basis for promoting health practices and interventions to support minorities at all individual, organizational, and social levels [22]. Therefore, because of the importance of empowerment, it must include all levels of society, and a positive relationship exists between learning and empowerment. Learning can improve cognitive models, thinking, developing capabilities, and self- and societal development ([25], p. 42). This is confirmed by [13], (pp. 605–610), who refer empowerment as a cognitive process that enhances the ability to make self-choices and achieve goals. Empowerment is an educational process that promotes critical thinking and independent work and enhances a sense of self-efficacy (Anderson and Funnel, 2010, p. 1).

Conceptualizes empowerment as a complex process based on the interaction between internal psychological and external social factors [22]. Examples include psychological factors (feeling of control and responsibility, participation, and future orientation) as well as external social factors (personal, social, and organizational skills, nature of work, and resource management)."

Empowerment is also examined by [35] (p.8), who describes it as a guiding philosophy that emphasizes the rights of individuals with disabilities regarding making decisions and overcoming challenges. He identified the internal and external factors related to empowerment, such as the concept of healthy self, self-respect, and positive, purposeful relationships. He stressed that the responsibility of those in charge of support and rehabilitation is to improve the opportunities for people with disabilities to control their lives' affairs.

Public administrators, providers of healthcare services, and the public must be conscious of the lived experiences of people with disabilities so that they can support them to meet their needs with acceptable policies. For example, this could mean guaranteeing that the basic community-based social services continue, accessing critical information, and developing adapted guidelines [10].

Since the beginning of the pandemic, the University of Sharjah has taken necessary measures to recognize the right of people with disabilities to university empowerment. The university has provided them equal opportunities in university education through an integrated support system and programs for cognitive, informational, psychological, and social empowerment. This is accomplished through interventions that affect all psychological aspects and the Academy for Students with Disabilities. The current study deals with the nature of these interventions, their role in achieving cognitive empowerment, and their impact on the mental health and academic self-efficacy of diverse groups of people with disabilities enrolled in university studies at the University of Sharjah (Fig. 1).

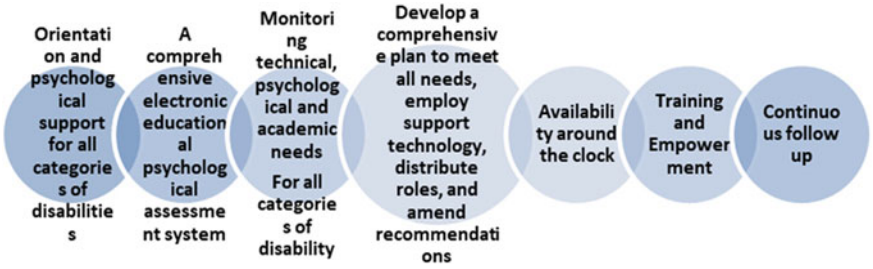

Fig. 1 Cognitive empowerment interventions for people with disabilities at the University of Sharjah

1.1 Cognitive Empowerment Interventions for People with Disabilities at the University of Sharjah

Preparation and Psychological Support for All Categories of Disabilities. Students with disabilities faced the repercussions of the pandemic and its impact. Many suffered from adverse effects that could be noted in their ehaviour, academic performance, and psychological lives, and the University of Sharjah worked to support them through:

- The existence of a database for all students with disabilities, their categories of disabilities, their needs, and their social and economic conditions.
- Studying the social, economic, and academic conditions and providing the necessary support.
- Providing sources of knowledge and information in formats appropriate to each disability.
- Guidance and psychological counseling to develop their personal and scientific skills and a sense of quality of life.
- Implementing a comprehensive electronic educational and psychological assessment system and the comprehensive transformation of providing services online.
- Monitoring the technical and academic needs of all categories of disabilities.
- Developing a comprehensive plan to meet all needs, employ support technology, distribute roles, and amend recommendations to coincide with new needs.
- Adopting a system of information available around the clock in numerous ways and suitable for all categories of disabilities.
- Training and Empowerment: Working on developing their technological skills through specialized programs and providing an experimental system for exams to enhance the skills of students with disabilities in dealing with electronic exams.
- Continuous follow-up.

2 Literature Review

The World Health Organization emphasizes that people with disabilities lack equal opportunities in health services, education, and career opportunities and experience inadequate support services and a feeling of marginalization and exclusion from various activities.

According to the World Bank (2017), one-fifth of people with disabilities globally, ranging from about 110 million to 190 million people with severe disabilities, are more vulnerable than others to adverse social and economic effects, including a high rate of poverty, lack of health care, poor health conditions, less education, and lower employment rates.

People with disabilities may benefit from strategies involving self-care as proposed for the general population during the pandemic. Examples of such strategies include providing information without overemphasizing it or statics, facilitating online connections with other community members, loved ones, and friends, accessing mental health professionals through technologies like telehealth, participating in physical activities, and exhibiting self-compassion [26].

"Empowerment is a tool to unleash the inner strength and capabilities of people to achieve prosperity and success. In his idea, empowerment also means empowering people to help enhance self-confidence, overcome disability, and create enthusiasm to perform the task assigned to them" (Blanchard et al., 2003, p 39).

Cognitive empowerment is particularly important for people with disabilities during the Covid-19 pandemic. It helps them access knowledge and information related to academic, health, psychological, and social aspects through the employment of assistive technology. It also enables people with disabilities to use such technology, as it helps students with disabilities improve their quality of life. Using e-education, teacher training and rehabilitation, curriculum development, and virtual centers can assist in teaching students with special needs (Daoud, 2021, pp. 373–388).

The University of Sharjah has emphasized the importance of students with disabilities. It has provided many interventions based on an integrated program for cognitive empowerment. This study answers some of the questions related to these interventions and their effects on mental health and academic self-efficacy by focusing on the study hypotheses:

- There is a significant correlation between cognitive and informational empowerment and mental health dimensions (anxiety-depression-phobia) for people with disabilities enrolled in university studies.
- There is a statistically significant correlation between cognitive and academic self-efficacy for people with disabilities enrolled in university studies.
- There is a statistically significant correlation between mental health and academic self-efficacy for people with disabilities enrolled in university studies.
- There are no significant differences in the degree of cognitive empowerment due to the variable of the disability category (physical-auditory-visual-learning difficulties).

- No statistically significant differences were noted in the degree of cognitive empowerment for people with disabilities because of the gender variable.

2.1 Objective

This study's aim was to identify the cognitive empowerment program for people with disabilities in university education at the University of Sharjah and its impact on academic self-efficacy and mental health during the COVID-19 pandemic, in addition to some other sub-goals.

2.2 Ethical Issues

All participants in the study agreed to implement all study procedures. The confidentiality of data was guaranteed by not collecting or processing any personal data that could link personal files and e-mails to identifiers.

3 Materials and Methods

3.1 Participants

The exploratory sample comprised university students of both sexes (n = 150). The research tools were applied to ensure their psychometric characteristics. The main research sample also included (n = 120) male and female students with disabilities (physical, hearing, visual, and learning difficulties) at the University of Sharjah. The distribution of the sample by gender and disability category is presented in Table 1.

Table 1 Distribution of sample members according to gender and disability category

Gender		Disability category				Total
Male	Female	Physical	Hearing	Visual impairment	Learning difficulties	
66	54	36	47	20	17	120
Percentage						
55%	45%	30%	39.16	16.6	14.16	100%

3.2 Measures

Cognitive Empowerment Questionnaire for Students with Disabilities

The researchers prepared a questionnaire to measure the degree of cognitive and informational empowerment among the sample. It was designed after referring to previous studies and some scales that aimed to measure the degree of psychological and cognitive empowerment (Abdullah and Muhammad, 2020; Al-Qatawneh et al., 2018; Ullah, 2014) [6, 7]. Based on these and other studies, the questionnaire was designed to include four main axes according to the nature of the sample and the interventions included (cognitive and psychological awareness information availability, training and empowerment, independence, and commitment), and it consisted of 26 phrases in its final form.

The psychometric properties of the scale were calculated in diverse ways, including computing the Pearson coefficient between each item of the questionnaire and the aggregate score of the dimension it belongs to and between the score of each dimension and the questionnaire's aggregate score to determine the extent of the correlation and consistency of the questionnaire items with the total score of the questionnaire and the dimensions of the questionnaire. It has substantial and statistically significant correlation coefficients at the level of 0.01 with the aggregate degree of the dimension it belongs to. The correlation of each dimension with the total degree of the scale is strong and statistically significant at 0.01. This indicates that the questionnaire with its items enjoys high internal consistency. Stability was also calculated using the (alpha, omega, and gtman coefficients). All these values came greater than 0.7, as shown in Table 2.

The researchers also calculated the validity of the arbitrators using the Loach equation to compute the validity percentage of the Lawshe Ratio Validity Content (CVR) content. It was found that the percentages of the arbitrators' reliability on the scale statements by the Loach method ranged between 0.88–1. All of them are greater than the critical value identified by Loach for validity. Which is equal to 0.62, and the scale indicated 26, indicating the scale's validity.

Table 2 Calculation of stability using (Alpha, Omega, and Getman coefficients)

Factor	Cognitive and psychological awareness	Availability of information	Training and empowerment	Independence and commitment
Alpha	0.91	0.95	0.88	0.94
Getman(6)	0.91	0.95	0.87	0.95
Omega hierarchical ($\omega H($	0.78	0.91	0.05	0.83
Omega H asymptotic	0.83	0.94	0.06	0.87
Omega total	0.94	0.97	0.9	0.96

Table 3 Correlation coefficients between the score of each item and the overall score for the dimension to which it belongs (n = 150)

Item	Correlation coefficient	Item	Correlation coefficient	Item	Correlation coefficient	Item	Correlation coefficient
1	0.741**	6	0.767**	11	0.792**	16	0.744**
2	0.777**	7	0.732**	12	0.786**	17	0.537**
3	0.800**	8	0.705**	13	0.813**	18	0.749**
4	0.719**	9	0.775**	14	0.834**	19	0.749**
5	0.795**	10	0.789**	15	0.741**	20	0.748**

The Academic Self-Efficacy Scale. The researchers prepared a measure of academic self-efficacy after referring to several studies and measures (Abdo, 2013; Abdel-Hakim, 2010; Aziza, 2016). To calculate the scale's psychometric properties, internal consistency was checked. This was achieved by calculating the Pearson coefficient between each item of the scale and the overall score to determine the extent of correlation and consistency between the items of the scale. It was found that the scale items have strong correlation coefficients (greater than 0.7) and are statistically significant at the level of 0.01 with the scale's total score, which indicates that the questionnaire with its items has a high internal consistency. The researchers confirmed the scale's stability using the Alpha Cronbach coefficient. The reliability coefficient was (0.950), with a high stability coefficient (greater than 0.7), which indicates the scale's stability (Table 3).

Mental health scale (anxiety–depression–phobia). The three dimensions were selected through the mental health scale developed by Derogatis, Lipman, and Linocov (1992). The R-SCL-90 Symptoms checklist was developed by Saud and Kharboush (2016). To verify the scale's psychometric properties, the internal consistency was determined by computing the Pearson coefficient between each item of the scale and the aggregate degree of the scale to determine the extent of the correlation and consistency of the scale items. It became clear that the scale items have strong correlation coefficients (greater than 0.7) and are statistically significant at a level of 0.01 with the aggregate score of the dimension to which it belongs. This indicates that the scale, with its items, has high internal consistency (Table 4).

The scale's stability was confirmed using Cronbach's alpha coefficient. The reliability coefficient reached depression = 0.983, anxiety = 0.979, and phobia = 0.980, which is a high stability coefficient (greater than 0.7) and indicates the scale's stability.

3.3 Statistical Processing

Tools including the R statistical analysis software [34], psych [18, 23, 29, 30], were employed for the data analysis. The selected data were processed using the Statistical Package for the Social Sciences (SPSS) (26). The following methods were used:

Table 4 Correlation coefficients between the score of each item and the total score of the dimension to which it belongs (n = 150)

Depression	Correlation coefficient	Anxiety	Correlation coefficient	Phobia	Correlation coefficient
1	0.939**	11	0.905**	20	0.947**
2	0.914**	12	0.953**	21	0.966**
3	0.948**	13	0.960**	22	0.952**
4	0.928**	14	0.939**	23	0.968**
5	0.890**	15	0.827**	24	0.878**
6	0.940**	16	0.925**	25	0.953**
7	0.950**	18	0.944**	26	0.957**
8	0.911**	19	0.959**		
9	0.949**				
10	0.940**				

mean, standard deviation, Pearson correlation coefficient, Cronbach's alpha coefficient, omega coefficient, Exploratory Factor Analysis, t-test for two independent samples, and one-way analysis of variance (ANOVA).

4 Results and Discussion

Table 5 shows the existence of a significant inverse correlation at the level of significance (0.01) between cognitive psychological awareness and mental health dimensions (depression, anxiety, and phobia), where the correlation coefficients amounted, respectively, to –0.553, –0.658, and –0.629). There is also a correlation relationship with inverse statistical significance at the level of significance (0.01) between the availability of information and the dimensions of mental health (depression, anxiety, and phobia), where the correlation coefficients were –0.510, –0.542, and –0.534, respectively.

Table 5 Pearson's correlation coefficients between informational cognitive empowerment and mental health

Factors	Depression	Anxiety	Phobia
Cognitive and psychological awareness	−0.553**	−0.658**	−0.629**
Availability of information	−0.510**	−0.542**	−0.534**
Training and empowerment	−0.731**	−0.679**	−0.711**
Independence and commitment	−0.679**	−0.566**	−0.646**
Cognitive empowerment (Total)	−0.522**	−0.534**	−0.512**

Also, there is a statistically significant inverse correlation at the level of significance (0.01) between training, empowerment, and mental health dimensions (depression, anxiety, and phobia), where the correlation coefficients amounted, respectively, to –0.731, –0.679, and –0.711). There is an inverse correlation statistically significant relationship at the level of significance (0.01) between independence, commitment, and mental health dimensions (depression, anxiety, and phobia), where the correlation coefficients were, respectively, at –0.679, –0.566, and –0.646).

Therefore, there is a statistically significant inverse correlation at the level of significance (0.01) between cognitive empowerment and the dimensions of mental health (depression, anxiety, and phobia), where the correlation coefficients, respectively, amounted to –0.522, –0.534, and –0.512.

These findings are consistent with Eleni and Nikos (2015). They proposed a study on patient empowerment as a cognitive process that can help improve medical outcomes while reducing treatment costs by facilitating self-directed behavior change, which implies its positive impact on mental health. Moreover, they suggest that patient empowerment should be treated as a formal cognitive process. Therefore, they proposed a cognitive model consisting of three primary levels of complexity and importance: awareness, participation, and control, and these levels have been addressed in the current model by researchers.

Table 6 shows that there is a positive, statistically significant correlation at the level of significance (0.01) between the dimensions of cognitive empowerment (cognitive and psychological awareness–informational availability–training and empowerment–independence and commitment) and academic self-efficacy, and the correlation coefficient is in order (0.542, –0.437, –0.589, and –0.635). A positive, statistically significant correlation was found at the significant level (0.01) between cognitive empowerment and academic self-efficacy, where the correlation coefficient was 0.549.

Table 7 shows the existence of a statistically significant inverse correlation at the level of significance (0.01) between mental health (depression, anxiety, and phobia) and academic self-efficacy, where the correlation coefficients, respectively, amounted to –0.605, –0.558, and –0.557.

Concerning Fig. 2, the researchers used the Independent Samples Test to determine the differences between males and females in response to cognitive empowerment and the differences between the averages of two independent groups. The

Table 6 Pearson's correlation coefficients between cognitive empowerment and academic self-efficacy

Factors	Academic self-efficacy
Cognitive and psychological awareness	0.542**
Availability of information	0.437**
Training and Empowerment	0.589**
Independence and commitment	0.635**
Cognitive empowerment (Total)	0.549**

Table 7 Pearson's correlation coefficients between mental health and academic self-efficacy

Factors	Academic self-efficacy
Depression	−0.605**
Anxiety	−0.558**
Phobia	−0.557**

results obtained are 0.533, 0.633, 0.491, 1.460, and 0.786, which are not statistically significant.

This indicates no statistically significant differences between average males and females in informational cognitive empowerment. Figure 2 illustrates these results.

The researchers used the ANOVA test to determine the differences between the averages of the independent groups. The value of F reached 6.897, which is a statistically significant value when the figure is above 0.01, indicating differences in cognitive empowerment due to the disability category. To determine the direction of influence according to the category of disability and the order of disabilities according to the degree of the average effect and calculate the average differences between the categories of disabilities according to the degree of cognitive empowerment, the Bonferroni test was used. The results show statistically significant differences in the cognitive and psychological awareness between the physical and educational disability categories in favor of the physical disability category and the availability of information between the physical and hearing disability category in favor of the physical disability category.

The available information between the physical disability category and learning difficulties favors the physical disability category. Moreover, the independence and commitment between the physical and hearing disability groups favor the physical disability group. In independence and commitment and between the physical disability category and learning difficulties in favor of it. The same applies to the category of visual impairment and learning difficulties, which favors the category of visual disability.

Statistically significant differences in cognitive empowerment exist between the physical and hearing disability category in favor of the physical disability category. The same applies to the physical disability and learning difficulties category, which favors the physical disability category. The statistically significant differences between the visual impairment and learning difficulty categories favor it.

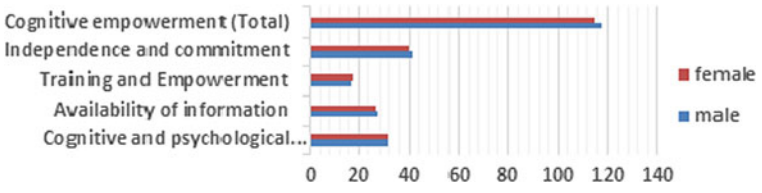

Fig. 2 The average of males and females in cognitive empowerment

Table 8 shows the differences in the averages according to the degree of cognitive empowerment and between the categories of disability. The categories of disability are arranged according to the response to cognitive empowerment (physical disability–visual disability–hearing disability–learning difficulties). Figure 3: The mean differences in cognitive empowerment according to the difference in the disability category.

5 Conclusions

Students with disabilities in university education have faced many challenges and difficulties during the COVID-19 pandemic and given the success of the University of Sharjah in empowering its students with disabilities cognitively, psychologically, and socially in all their categories through the Resource Center for People with Disabilities during the pandemic period and the transformation of distance education and its consequences. WHO made special arrangements in the methods and curricula of education, and this study may contribute to documenting these interventions and arrangements to improve university education practices toward students with disabilities at the academic level (academic self-efficacy) and psychological (mental health) in the Resource Center for Persons with Disabilities at the University of Sharjah In the United Arab Emirates, the study included (120) male and female students with various disabilities, including (physical disability–hearing disability–visual disability–Learning difficulties). Scales were applied: academic self-efficacy scale, cognitive empowerment scale, and mental health scale: R -SCL-90. Dimensions (anxiety, depression, phobias), and their validity and reliability were confirmed by various statistical methods. Quantitative and qualitative data were collected. The results included a statistically significant inverse relationship at the level (0.01) between cognitive empowerment (cognitive awareness, information availability, training and empowerment, independence, and commitment) and mental health (depression, anxiety, and phobias), with correlation coefficients amounting to –0.522, –0.534, and –0.512 were observed. There is a positive statistically significant correlation at the level of significance (0.01) between the dimensions of cognitive empowerment and academic self-efficacy, where the correlation coefficient reached 0.549. A statistically significant inverse relationship of 0.01 between mental health (anxiety, depression, and phobias) and academic self-efficacy, with correlation coefficients of 0.605, 0.558, and –0.557. There are no significant differences between the average of females and males in cognitive empowerment. There are statistically significant differences in the dimensions of cognitive empowerment according to the disability category variable. Disability categories were arranged according to the degree of response to cognitive empowerment: Physical disability, visual impairment, hearing disability, and learning difficulties. Because of the importance of the study to monitor interventions and their impact on students with disabilities, more studies must be conducted to achieve universal access to them in higher education institutions.

Table 8 Mean differences between disability groups according to cognitive empowerment using the Bonferroni test

Factor	The mean	Standard deviation	Standard error	Disability category	Physical	Hearing	Visual	Learning difficulties
Cognitive empowerment as a whole	122.47	10.391	1.732	Physical	–	8.217*	3.822	16.531*
	114.26	13.993	2.041	Hearing	−8.217*	–	−4.395	8.314
	118.65	10.353	2.315	Visual	−3.822	4.395		12.709*
	105.94	17.344	4.206	Learning difficulties	−16.531*	−8.314	−12.709*	–

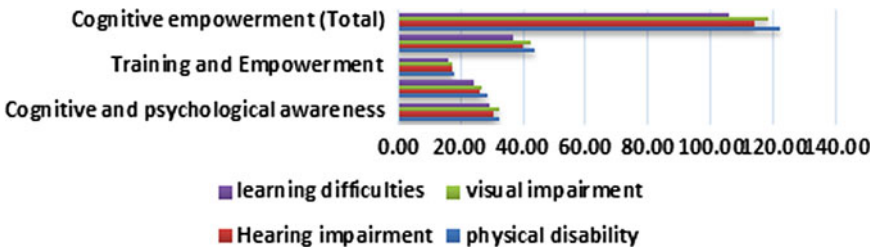

Fig. 3 Statistical differences in the degree of cognitive empowerment according to the variable of the disability category (physical–audiovisual–learning difficulties)

6 Recommendations

- Dissemination of the experience of the University of Sharjah in supporting and empowering students with disabilities of all categories.
- Ensuring that students with disabilities have access to all services in higher education through public policies set by states.
- The necessity of establishing specialized centers to support persons with disabilities in higher education and to facilitate the best means for them.
- Considering the individual differences of people with disabilities and adapting curricula and evaluation methods in line with their abilities and needs.
- Spreading societal awareness of the issues and rights of people with disabilities in higher education through the media and higher education institutions and its impact on their mental health and life orientations.
- Dissemination of the results of the study to institutions of higher education and institutions interested in supporting people with disabilities.

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How to Make Learning Process Smoother for Students Through Teaching Practices: Action Research

Nawaf Awadh Alreshidi

Abstract This action research seeks to make students' learning of mathematics smoother through teaching. This kind of research aims to improve students' learning by improving the teacher's performance. The study comprises two stages. In the first stage, the sample consisted of four students (age M = 12 years; SD = 1), who were taught about ratios, proportions, and percentages over a total of five lessons. Data were collected through field observations. The data were then thematically analyzed to develop an improvement plan for the next teaching session. The findings revealed that the students suffered from a lack of understanding, a lack of big ideas, a lack of necessary prior knowledge, and misconceptions. Planned improvements were implemented for four different students in the second stage, followed by reflection (age M = 12 years; SD = 1). In the second teaching session, students were taught the same topics over five lessons. The plan worked well, as no surface-level learning or learning difficulties emerged. The overall results suggested that posing questions in different learning situations, developing big ideas, and assessing prior knowledge are helpful in making students' learning deeper and easier.

Keywords Mathematics education · Prior knowledge · Learning difficulties · Teaching improvement · Posing questions

1 Introduction

Prior knowledge is not only a foundation for new learning; it also supports learning mathematics as grandiose ideas. Insufficient or inaccurate prior knowledge cannot support learning connections. As learning is a type of construction, necessary prior knowledge should be available for new learning to build on. To make learning deeper, relevant prior knowledge is needed that allows rich connections to be drawn with the new knowledge. Rich connections can be supported by posing purposeful questions. In this way, teachers could make mathematics learning deeper and easier for students.

N. A. Alreshidi (✉)
University of Hail, Hail, Saudi Arabia
e-mail: nawwaf2012@hotmail.com; n.alreshidi@uoh.edu.sa

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Little action research has been carried out seeking to improve mathematics teaching and learning in a Saudi context. The sample in this study is small, with only eight students in total. This is because the nature of the research requires observing student learning and stopping teaching at any time and talking with students who experience difficulties or have only a surface-level understanding of the knowledge. Therefore, a small sample was more appropriate. In addition, the aim of this action research is to improve a specific teacher's teaching, not to produce generalizable results. The goal of this study is to improve my teaching of mathematics to allow deeper and easier learning for my students.

1.1 Sufficient Prior Knowledge Serves as a Foundation for New Learning

Sufficient prior knowledge is a prerequisite for new learning. In other words, when knowledge C1 is necessary to understand knowledge C2, then knowledge C1 is a prerequisite to knowledge C2 [17]. For instance, a machine learning course requires the completion of a linear algebra course first. This is because there are numerous concepts in a course on linear algebra that are prerequisites to several concepts in machine learning courses (e.g., principal component analysis requires knowledge of Eigen analysis; [25]). Hence, ensuring necessary prior knowledge is important for learning. In a previous study, I found that students with more prior content knowledge were able to control their learning better than their peers with less [1]. This could be because the students then interact with new learning with a lower working memory load. For example, in a single session, if a learner is attempting to learn the new concept 'multiplication' but does not know what 'addition' or 'frequency' is, then the learner may be unable to assimilate the new concept. The student must learn the meaning of the foundational concepts alongside the new concept, which could overload the student's working memory.

In more detail, learning is a series of knowledge expansion processes carried out by a learner. When learners intend to learn new knowledge, they must activate and connect their existing knowledge to the latest information [19]. Activation of prior knowledge occurs when individuals bring relevant prior knowledge from their long-term memory to their working memory. Working memory capacity can be vastly increased when necessary relevant prior knowledge is stored and easily retrievable from long-term memory [22, 26]. However, if prior knowledge is insufficient, long-term memory cannot support new learning. This results in overloading working memory, giving up learning, or surface-level learning (e.g., rote memorization). Surface-level learning could occur if students cannot connect the new knowledge to their prior knowledge base [12].

Just as a lack of prerequisite knowledge or insufficient prior knowledge hinders the expansion of individuals' knowledge, inaccurate prior knowledge could hinder new learning. Due to inaccurate prior knowledge, learners may even resist new learning.

For example, when a student inaccurately counts numbers, it is impossible for the student to learn addition without correcting his mistakes. Indeed, several studies have indicated that the activation of inaccurate prior knowledge could impede new learning [3, 5]. Building on existing knowledge only works if the existing knowledge can be extended by new knowledge [20]. Thus, sufficient and accurate prior knowledge could contribute to making mathematics learning deeper and easier for students.

1.2 Relevant Prior Knowledge Supports Learning Mathematics as Grandiose Ideas

Students can learn when sufficient and accurate prior knowledge is available. However, the story does not end there. Prior knowledge must also relate to new knowledge to make learning deeper. In mathematics, this can be referred to as extensive ideas. Charles [9] defined a big idea as "a statement of an idea that is central to the learning of mathematics, one that links numerous mathematical understandings into a coherent whole" (p. 10).

The concept of grandiose ideas makes mathematics coherent and allows teachers to practice effective teaching. It also allows students to develop a deep understanding of and the ability to apply mathematics. Research on the brain has shown that ideas that are connected are more readily implemented in new situations than unconnected ideas [14].

Therefore, mathematics curricula and teaching practices should be based on extensive ideas. Mathematics learning will be deeper, richer, and longer lasting when students make connections between different mathematical ideas [15]. Thus, a conscious effort is required to help students see mathematics as a highly connected structure of concepts across numerous topics rather than viewing them as unrelated concepts [27].

Students' understanding of grandiose ideas results in more generalizable knowledge implementation and enables knowledge transfer [4, 10]. When learners provide explanations that apply ideas in several contexts, the ideas become less context-dependent and eventually more abstract [14]. Siemon [25] asserted that students' mathematical progress may be limited without the development of extensive ideas. He argued that big ideas provide organizing themes that support additional learning and generalizations.

As students become more advanced in mathematics, they might be able to use different methods to address mathematical situations. For example, students in grade 3 can use counting in more diverse ways than students in lower grades [21]. For example, when students intend to solve $15 + 7$, they can easily recall that $5 + 5 = 10$. They use this prior knowledge to determine that $15 + 5$ will result in 20, and then they add on the remaining 2 to make 22. These diverse ways of accounting are connected through the idea of equivalence. By regrouping the numbers into an equivalent representation, the students are using prior knowledge or known facts

to figure out the unknown fact. For effective teaching, teachers should make such connections explicit. When students lack prior knowledge regarding such equivalent concepts, they will find it difficult to make these types of connections. Working memory would then not be supported by long-term memory, as discussed above. Therefore, sufficient prior knowledge to learn new knowledge and to support the development of big ideas should make learning deeper and easier for students.

1.3 Posing Questions to Assess and Address Relevant and Necessary Prior Knowledge

Posing questions is a powerful tool for engaging students in learning processes. When students seek the answers to questions, they are learning. Therefore, the teacher could use questions to make students seek answers to learn. Questions can be used for several purposes, including prompting thinking, checking students' understanding, encouraging discussion, and facilitating critical thinking [18]. They can also be used for assessing prior knowledge [2]. Teachers can use questions not only to check for and address necessary prior knowledge, but also to make students connect relevant prior knowledge to learn and thereby develop extensive ideas.

Preparing a few key questions before class could be useful for assessing necessary prior knowledge, with other questions formulated on the spot in response to the discussion [18]. In this way, questions can be used for deeper learning. Posing questions stimulates the development of students' higher-level thinking processes. However, it is important that the questions are precise and clearly phrased [16].

2 Methodology

2.1 Participants and Design

The study included two stages. The first stage involved data collection and analysis regarding my own teaching to develop a plan for improvement. The second stage involved implementing the planned improvement and reflecting on it to assess its effectiveness.

The participants consisted of eight students: four seventh-grade students and four sixth-grade students (age $M = 12$ years; $SD = 1$). Two were my own children, and six were my nieces. All were female. Although they differed in terms of academic level, their math levels were similar, and they had achieved similar grades in math (90–94%). The sample of each stage was four students (two seventh-grade students and two sixth-grade students in each stage). In this research, the small sample size is important to derive useful data because it would provide a researcher with an opportunity to deeply explore a research problem [11].

This type of research is action research with a single researcher. According to Ferrance [13] "Action research is a process in which participants examine their own educational practice systematically and carefully, using the techniques of research" (p. 9). In this research, there are five phases of inquiry carried out: 1. Identification of problem area, 2. Collection and organization of data, 3. Interpretation of data, 4. Action based on data, and 5. Reflection [13]. In the present research, qualitative design was applied using field observation.

2.2 Materials

2.2.1 Topics

'Ratios, proportions, and percentages' were selected as the topic of study. Some content related to the topic was not new to the students, particularly the basic knowledge; however, the advanced content was new. The content was developed by the researcher and given to two experts for validation. The instruction lasted for almost 10 days and was carried out during 10 h-long sessions totaling 10 h (five lessons for each stage).

2.2.2 Field Notes

Field observation notes were taken during the teaching. As I am both a teacher and a researcher, my intention was to monitor the students' learning and document my observations, particularly difficulties the students encountered in learning as well as any surface-level learning. This was followed by reflecting on the notes and dialogs with the students about the reasons for their difficulties or surface-level learning. At the end of each lesson, students also received an assessment test. The teacher checked the assessment and discussed the answers with his students. The observation method used in this study consisted of two parts: descriptive followed by reflective information [23].

Data from the field observation notes were analyzed thematically. This involved the researcher becoming familiar with the data, generating the initial codes manually, searching for themes, reviewing the themes, defining, and naming the themes, and identifying emergent themes [6]. The data analysis examined learning problems, the reasons for those problems, and the plan for improving my own teaching based on the reasons for the learning problems. Then, planned teaching principles were extracted from the analysis.

2.3 Procedures

Although all participants were members of my family, formal consent to participate in the study was obtained. They were advised that they could withdraw from the study at any time with no explanation.

The content was developed by the researcher and validated by two experts. As noted above, the study included two stages. The first involved identifying surface learning and students' difficulties in learning and developing a plan for improvement of my own teaching in the second stage. In the second stage, I implemented the plan and reflected on its effectiveness.

2.4 Collection, Organization, and Interpretation of Data and Action Based on Data

The findings showed that the students suffered from a lack of understanding, a lack of extensive ideas, a lack of necessary prior knowledge, and misconceptions. The data relating to these problems were analyzed, and a plan for improving my own teaching was developed. An important part of the planned improvement was posing questions across sufficient learning situations to deepen students' learning, help them to develop extensive ideas, and assess prior knowledge to make their learning deeper and easier. The specific findings are presented and discussed in the following.

2.4.1 Lack of Understanding

As shown in Table 1, some students did not deeply understand the concept of percentage. For example, some did not understand what 10% means. It is possible that they did not understand the concept because they had not reflected on it. The teacher frequently found that some students would refocus on learning when they were asked to answer a question. When students are questioned, they must be active to respond to the question. When students seek the answers to questions, they are learning [18]. Thus, it is important to assess students' learning by posing questions to stimulate their thinking. Indeed, posing questions is critical for effective teaching [18]. Even when some students knew how to work out 10% of 100, they did not know how to work out 10% of 10 or 1000, or they did not know how to work out 100% or 200% of 20. They may not have grasped the concept deeply because they had not been exposed to sufficient learning situations. Similarly, the students could use multiplication with X:Y, but they could not use division when necessary. They only had experience with multiplication, that is, the examples they were given only involved multiplication. To correct this, they need to be given examples of all situations. When learners are provided with explanations that apply ideas in several contexts, the ideas become less context-dependent to eventually become more abstract [14]. Importantly, the

Table 1 Lack of understanding

N	Learning problems	Reasons	Plan to improve
1	Some students did not know what 10% means	They did not understand the concept because they had not reflected on it	Assessing students for learning by posing questions to encourage them to learn
2	They were all unable to abstract the concept of ratios. For example, while some knew how to work out 10% of 100, they did not know how to work out 10% of 10 or 1000, or they did not know how to work out 100% or 200% of 20	They did not grasp the concepts deeply because they had not been exposed to sufficient examples, and/or they had not reflected on the concept	Posing questions in a sufficient number of learning situations
3	They could use multiplication with X:Y, but they could not use division	They were only experienced with multiplication; the examples given only involved multiplication (they need examples of all possible situations)	Posing questions in a sufficient number of learning situations
Planned teaching principle		Provide sufficient examples in different real-life contexts and continue to assess students' learning by posing questions	

lack of conceptual knowledge of mathematics critically hinders students' ability to transfer and generalize mathematics knowledge. Posing questions in more learning situations might be a reasonable solution to this issue. In fact, this solution worked well when applied to other students and the same topics. The students grasped the concepts and were able to utilize them in different situations.

2.4.2 Lack of Big Ideas

Table 2 shows that the students only knew one way to solve problems. For example, when they needed to work out 25% of 1200, they considered the 1200 and/or 25%. They did not try another way even when I asked. For example, they did not divide 1200 into 1000 and 200 or divide 25% into 10% and 10% and 5% to make it easier. They did not understand how mathematics concepts were related (lack of big ideas). As another example, the students understood X:Y, but they did not understand X:Y = X/Y. Supporting big ideas by encouraging students to connect concepts to related concepts by posing questions could help improve their mathematics connections and lead to deeper understanding. Students should be able to view mathematics as a coherent whole to construct the meaning of concepts and principles. Charles [9] defined a big idea as "a statement of an idea that is central to the learning of mathematics, one that links numerous mathematical understandings into a coherent

Table 2 Lack of big ideas

N	Learning problems	Reasons	Plan to improve
1	They all knew one way to solve problems. For example, when they needed to work out 25% of 1200, they considered the 1200 and/or 25% as a whole. They did not divide 1200 into 1000 and 200 or divide 25% into 10% and 10% and 5%	They do not understand how mathematics concepts are related (lack of big ideas)	Posing questions to develop big ideas
2	They all did not able to understand the big idea of ratio, for example: they know X:Y, but they did not know X:Y = X/Y	Lack of big ideas	Posing questions to develop big ideas
Planned teaching principle		Posing questions to develop big ideas	

whole" (p. 10). Therefore, mathematics curriculum and teaching practices should be based on extensive ideas.

Developing extensive ideas can help students learn mathematics deeply. Indeed, mathematics learning is deeper, richer, and longer lasting when students make connections between different mathematical ideas [15]. Thus, teachers can use the concept of big ideas to make their mathematics teaching more effective. This can also help students to develop a deep understanding of and ability to apply mathematics. Studies of brain activity have shown that ideas that are connected are more readily implemented in new situations than unconnected ideas [14]. Siemon [25] argued that students' mathematical progress may be limited without the development of big ideas. Big ideas provide organizing themes that support additional learning and generalizations [25]. As students become more advanced in mathematics, they should be able to use different methods to address mathematical situations [21].

2.4.3 Lack of Necessary Prior Knowledge

As can be seen from Table 3, some students lacked the necessary prior knowledge. For example, they did not know how to read numbers, they did not know how to perform long division, they did not know that every number could be a rational number, and they had not memorized the multiplication table. This lack of necessary prior knowledge hindered their learning and kept the students dependent on the teacher. In a previous study, I found that students with more necessary prior knowledge were able to control their learning better than those with less [1]. This could be because the students are then able to engage in new learning with a lower working memory load. If prior knowledge is insufficient, long-term memory cannot support new learning. This leads to overloading working memory, giving up learning or surface-level learning

Table 3 Lack of necessary prior knowledge

N	Learning problems	Reasons	Plan to improve
1	They did not know how to read numbers	They lack the prerequisite knowledge	During teaching, the teacher must be ready to identify and address any problems arising from a lack of necessary prior knowledge that could hinder the acquisition of new knowledge
3	They did not know how to perform long division, for example, 453 ÷ 12		
4	They did not know that every number could be a rational number		
5	They had not memorized the multiplication table		
Planned teaching principle		Assessing and addressing necessary prior knowledge to facilitate the learning of new knowledge	

(e.g., rote memorization). Surface learning may occur if students cannot connect the new knowledge to their prior knowledge base [12]. Accordingly, teachers must assess students' prior knowledge related to the current learning by posing questions or asking them to solve certain problems. Continually assessing students' learning has been found not only to help identify a lack of necessary prior knowledge, but also to keep students focused, as discussed above [2, 16, 18].

2.4.4 Misconceptions

Table 4 shows that some students had inaccurate prior knowledge. For example, the students thought that dividing a number by a fraction would give us the fraction of the number (e.g., $100 \div 1/2 = 50$), whereas the correct method is to multiply 100 by the fraction. They also thought that dividing a number by a percentage would give us the percentage of the number (e.g., $120 \div 20\% = 24$), whereas the correct method is to multiply 100 by the percentage. Such inaccurate prior knowledge could hinder new learning. Moreover, due to inaccurate prior knowledge, learners might even resist new learning. Several studies have demonstrated that the activation of inaccurate prior knowledge could impede new learning [3, 5]. Building on existing knowledge only works if the existing knowledge can be extended by new knowledge [20].

Making students aware of the discrepancy between their thinking and correct concepts is important for addressing this problem [2]. Teachers cannot predict this problem, but they can identify it and help to prevent it in the future. Continually assessing students helps to discover such issues [2].

Table 4 Misconception

N	Learning problems	Reasons	Plan to improve
1	The students thought dividing a number by a percentage would give us the percentage of the number (e.g., 120 ÷ 20% = 24), whereas the correct method is to multiply 100 by the percentage	Misconception	During teaching, the teacher must be ready to check for and address any misconceptions that could lead to resistance to obtaining new knowledge
2	They thought that dividing a number by a fraction would give us the fraction of the number (e.g., 100 ÷ 1/2 = 50), whereas the correct method is to multiply 100 by the fraction		
	They thought that if we discount the price by 20% and then raise the price by 20%, the price will return to the original price	They took this for granted; they may not have reflected on it	
Planned teaching principle		During teaching, the teacher must be ready to check for and address any misconceptions that could lead to resistance to obtaining new knowledge	

3 Discussion

The planned improvement was posing questions across sufficient learning situations to deepen students' learning, help them to develop big ideas, and assess prior knowledge to make their learning deeper and easier. Subsequent reflection on the planned improvement in the next teaching sessions indicated that the plan worked well, as no learning difficulties or surface-level learning were identified. When the teacher applied this with different students and then reflected on his teaching, he found that the students' learning was smoother, the teacher became aware of the necessary prior knowledge and was able to address problems that emerged, and the students were able to deepen their learning. The aim of the research was achieved by making students' learning process smoother by improving the teacher's performance.

4 Conclusion and Limitations

In this research, I planned to improve my own teaching by using action research. The findings in this research are posing questions across sufficient learning situations to deepen students' learning, help them to develop big ideas, and assess prior knowledge

to make their learning deeper and easier. The sample was small for two reasons. First, a small sample was helpful for deeply assessing the students' learning, as it enabled individual and immediate discussions when problems arose related to the students' learning. Further, the students were all female and members of my family, and no high-stakes test was involved. This allowed me to discuss their understandings in a safe context. Second, the purpose of the research was to improve my own teaching, not to produce generalizable results.

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Graduation Project as an Application of COVID-19 Impact on Students' Experience—Case Study Medical Center Al Ain, UAE

Lindita Bande, Asma Mohamed Abdulla Alblooshi, Alyazeia Tahanoon Mohammed Alnehayan, Fatmah Saeed Rashed Alsereidi, Salma Salem Haidar, Ariel Gomez, Mohammed Albattah, and Kim Young

Abstract The pandemic had a significant impact on the medical environment. With a surge of patients and limited facilities, managing the patients was challenging. This pandemic taught us how to redesign medical facilities in our cities for future events of such magnitude. In the academic environment, especially in the architectural engineering field, designing facilities that can operate as per the needs of the population is crucial. Based on the students' individual experiences during the challenging time of COVID-19, Medical Center as a graduation project came to life. There are several Medical Center facilities in the UAE. Unfortunately, some of those facilities cannot provide enough treatment spaces, basic needs, and facilities that they would need. The project discussed in this report is COVID Ready Medical Facilities Construction Design and Management. The methodology follows the below main points:

- Define the project's objectives: This project's purpose is to provide medical facilities in UAE and build temporary Center that can be assembled on site and dismantled when required. The building must be assembled, dismantled, and removed easily and as fast as possible.
- Define the main points of sustainability and innovation: Innovative building technologies methods are intended to be used, as well as renewable sources of energy are applied. The building should be able to respond to various public health issues and future challenges.
- Based on the pandemic experience and the standards: Some suggested services are discussed as well to provide private, mediative, and natural light for patients and workers that intend to spend their time in the medical facility.
- Define construction systems for a sustainable building: Appropriate construction methods Analysis, risk management, and estimations for cost studies will be applied.
- Lessons learned and future applications in graduate project.

L. Bande (✉) · A. Gomez · M. Albattah · K. Young
Data and Resourses, Emirates University, Al Ain, UAE
e-mail: lindita.bande@uaeu.ac.ae

A. M. A. Alblooshi · A. T. M. Alnehayan · F. S. R. Alsereidi · S. S. Haidar
Design and Modelling, Emirates University, Al Ain, UAE

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The aim of this research is to show how the pandemic situation and the personal experience of students can have an impact on designing a Medical Center that can be moved and assembled in any site as required, also that can be dismantled later leaving the same condition of the site before assembly, the construction method should be easy and fast as the pandemic can occur at any time. The lessons learned and applied are an example of how experience can improve the academic environment.

Keywords Pandemic · Medical Center · Students experience

1 Introduction

The pandemic had an impact on everyone's life. In this study, the aim is to investigate the pandemic's impact on the design process of this graduate project. This project's purpose is to provide medical facilities in UAE and build a temporary center that can be assembled on site and dismantled when required. The building must be assembled, dismantled, and removed easily and as fast as possible.

There are several projects around the world that can be analyzed to understand better the typology of the graduate project.

The Puntukurnu Aboriginal Medical Service Healthcare Hub is the first primary healthcare facility constructed in Newman, Australia. It has an area of 970 sqm and was built and designed by Kaunitz Yeung Architecture. The project is Community-focused, connected to the country, incorporating culture, and provides a high standard of care. The material used for this project was all local material. The building is rammed with earth, the original building material, abundant, free, and sustainable. The embodied energy of the building was lowered by entirely using the earth available on the site itself, rather than being clad in manufactured materials transported from 1400 km (about 869.92 mi) away. One of the main goals of using this material is to reflect the different lights exposed to the building and absorb the rain. Moreover, 80% of the building's energy is taken from direct sunlight by Photovoltaic panels that completely cover the roof [7].

The University of Arizona Cancer Center represents the first clinical healthcare component on the Phoenix Biomedical Campus, United States. It has an area of 2050 sqm and was built and designed by ZGF Architects. The project's goal was to bring the highest standard of cancer care within an evidence-based, multidisciplinary model, using the most modern technologies in Phoenix. A unique identity is established by the comfort, privacy, and warmth provided through the interior and exterior facades of the building, which relates to the patient's experience. The building's architectural expression is formed through the layering of glass, copper-colored metal, and neutral stone. A solar shading system made up of rectangular aluminum composite panels perforated with half-inch diameter holes yielding a 40% openness factor was used to clad east and west facades. The panels are folded once bending outward to reveal a shaded view of the surrounding desert context from interior spaces. A contextual

aesthetic is added to the project by the copper-toned assembly that takes the coloration of the landscape [4].

The medical facility is located in Brugge, Belgium. It has an area of 215 sqm and was built and designed by Cristian Panaite and Katrien Devreese in 2012. The Architects replaced a modest existing house and connected it to a new building. The building was painted white and had a dynamic roof shape to be recognizable from a distance. The project offers extra urban depth to the main street by creating a fresh open visual perspective perpendicular to it. The proposal takes the form of a sequence of distinct volumes that obstruct the main street's linear progress. Four different volumetric entities emerge from a single constructed volume. The first borrows the adjacent context's low scale, the second reaches the highest point, providing the entire visual independence, and the final two gradually blend into the backyard's flat terrain [6].

The Medical campus with urgent care is in North Hollywood, California. It has an area of 3737 sqm and was built and designed by PATTERNS IN 2019. The project diagonally splits the original structure to create a green public space between the new medical facility and the adjacent block, creating a direct link between the parking lot and Victory Boulevard public access. Outdoor seating, bicycle parking, and a communal seating staircase are all available in this newly designed open-air area. The diagonal cut also permits a set of medical offices on the mezzanine level to face the open plaza, providing a unique spatial arrangement with terraced crystallized shapes. The project prioritizes outdoor spaces, natural lighting, and human contact through the building of the green plaza. On the ground floor, a glass storefront faces the plaza and welcomes guests with an indoor-outdoor blend. This glass storefront looks straight into the main lobby, which contains numerous medical services as well as a cafe. A new basement and a mezzanine were later added and expanded to the building [10].

2 Methodology

The methodology follows a linear path toward the main aims of this research. The site selection describes the initial investigation into the chosen location. The design development describes the stages of design including the pandemic lessons, the following step adds more information on the points considered and the influence of the pandemic. The project outcomes include the incorporated lessons. The below steps as mentioned above:

1. Site selection and climate analysis
2. Design development
3. Pandemic impact on Design Process
4. Project outcomes

2.1 Site Selection and Climate Analysis

The site is in Al tiwayyah, Alain. It is on a corner overviewing Tahnoon Bin Mohammed Alnahyan Road. The infrastructure is developed in that area. It is very accessible and surrounded by residential buildings, nurseries, schools, majlis, groceries, coffee shops, and more.

During most of the year, the chosen site has a hot and humid climate. The highest temperature attainable is around 48 °C, while the lowest is around 13 °C. December, January, and February are the coldest months of the year when the lowest temperatures are recorded (winter). While the maximum temperatures are reported during June, July, and August, which are the hottest months of the year (summer). There is a 13 mm difference in precipitation between the driest and wettest months. January is the month with the highest relative humidity (51.08%). The driest month of the year is may in terms of relative humidity (20.93%). March is the month with the largest number of rainy days (1.83 days). May is the month with the least number of rainy days. Wind speed and direction fluctuate more widely than hourly averages at any site due to local terrain and other factors, and instantaneous wind speed and direction vary more significantly than hourly averages. Over the year, the average hourly wind speed shows some seasonal variation. From January 17 to August 7, the windier half of the year lasts 6.7 months, with average wind speeds exceeding 7.5 miles per hour. The windiest day of the year is March 15, with an average hourly wind speed of 8.7 miles per hour, it is the windiest day of the year. From August 7 to January 17, the calmer time of year lasts 5.3 months. Having an average hourly wind speed of 6.3 miles per hour, November 1 is the calmest day of the year [1].

2.2 Design Development

The case study analysis was done to find the most appropriate architectural demands for the building in terms of function and movability to know what is necessary for our building. From design flexibility to comfort and privacy, the Medical center meets the visitor's basic needs and will be self-sufficient due to the lack of infrastructure on the site. The needs that the project must meet were confirmed by the earlier site analysis. As a result, the spaces required were identified to achieve the purpose of our project: Design a building that can provide visitors' basic demands. In addition, the medical center can be separated into three primary blocks: Block 1, Block 2, and the Emergency Block. To build and dismantle for future use. Figure 1 shows the initial plan designed; Fig. 2 shows the initial 3D of the project.

Fig. 1 Initial plan design

Fig. 2 Initial 3D design

2.3 Pandemic's Impact on Design Process

The pandemic had an important impact on the design process of this graduate project. The main points of influence:

Social Sustainability: the spaces were re-designed based on the student and faculty experience with the pandemic. The female and male areas were separated considering the local culture of AL Ain City.

Environmental Sustainability: The facility is designed to be built and dismantled for future use with self-sustained electricity generated from the roof PV Panels. The pandemic initially was supposed to end in one year, but the pandemic has not ended officially yet (after almost 3 years). This impacted the environmentally conscious design.

Indoor thermal comfort: after a few of the students and faculty went through the hospitalization experience of COVID, it was clear that physical wellbeing relates to psychological wellbeing. Therefore, the students added a separate chapter dedicated to the improvement of indoor conditions. Not only the materials, lighting, air temperature, but also colors in interiors, green, adaptive views from the windows.

Time management: time management was crucial in managing the pandemic. Therefore, the project is designed to be assembled in 13 days.

Tools improvement: to design a very efficient building it is especially important to have efficient tools for fast and reliable calculations.

2.4 Project Outcomes

The project outcomes reflect the lessons learned during the pandemic period. The figures below show the several steps taken until reaching the results, which is the final project. Figure 3: Solar radiation analysis for PV application. Figure 4: Energy evaluation of the 3D model. This shows the impact on sustainability due to the extended stay of the pandemic. In future applications, the time might not be noticeably clear, therefore, having a sustainable temporary structure is crucial [8].

Figure 5: Footings of the columns. Figure 6: Footings and columns. Figure 7: Structural 3D. Figure 8: Structural 3D including the roof and slab. Figure 9: Structural 3D including the walls; Fig. 10: Final 3D of the project.

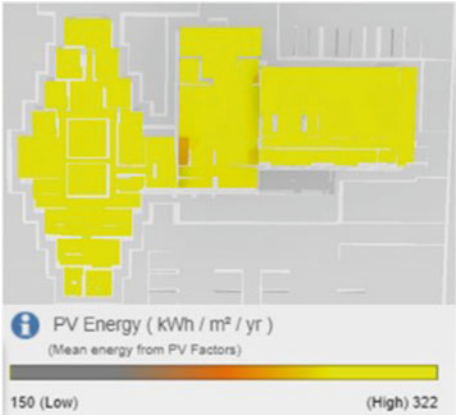

Fig. 3 Solar radiation analysis for PV application

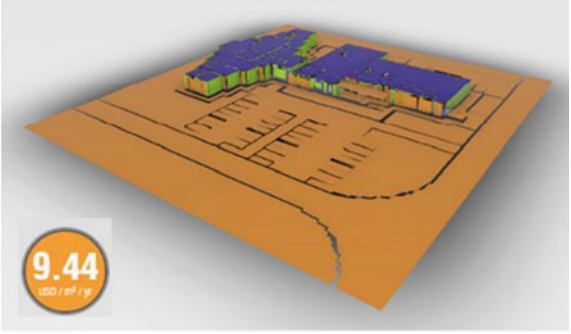

Fig. 4 Energy evaluation of the 3D model

Fig. 5 Footings of the columns

Fig. 6 Footings and columns

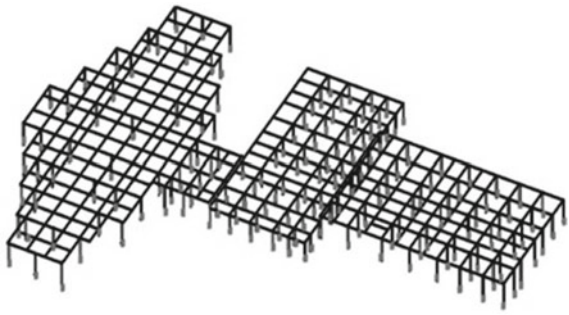

Fig. 7 Structural 3D

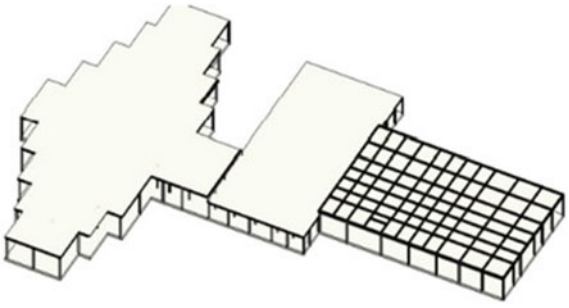

Fig. 8 Structural 3D including the roof and slab

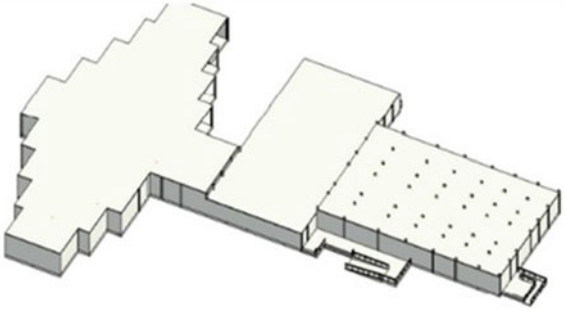

Fig. 9 Structural 3D including the walls

Fig. 10 Final 3D of the project

3 Results

The results are divided into three main points based on the above analysis. The students' experience through the pandemic impacted their approach toward the design of the graduation project. The selection of such a project related to fast medical response toward the virus was done based on the COVID-19's impact on society. The students reflected their ideas in the design process and the outcomes are as follows:

Social Sustainability: In a pandemic situation, the attention to this point was minor. The organization of the spaces strictly as per the standards in addition to the local culture was achieved. The students clearly separated the primary areas such as reception, waiting areas, bathrooms, and room door orientation to fulfill this point.

Environmental Sustainability: Referring to the project shown above and the class hours, the students were more conscious of climate change. All the news in the media about how the environment is cleaner due to the slowdown of human and industrial activities made the students more thoughtful about applying elements of sustainability in their design, such as the full structure idea of assembly and disassembly. Furthermore, louvers were applied to the windows to reduce energy consumption and PV panels were added to the roof and parking lot to increase energy production.

Indoor thermal comfort: This was a point personally linked not only to the students, but also to the faculty experience while in treatment for COVID-19 first wave. The project was assessed by analyzing the physical and psychological aspects of the patients. Based on the standards, several strategies such as color selection, adding greenery, and improving the air conditioning system design were included to improve indoor thermal comfort.

Time management: This was considered by minimizing the construction period to 13 days (about 2 weeks). The speed of construction of such a facility was linked to the need for new medical facilities during the lockdown in the first wave of COVID-19. In these extreme health situations, a fast-functioning facility is crucial.

Tools improvement: there was an improvement by the students in using tools to design efficiently the building. During the pandemic, the students had more time to explore tools online and learn more about different tasks. The open online forums assisted them in real time with difficulties encountered.

4 Conclusions and Future Work

This research aims to show how the pandemic situation and the personal experience of students can impact designing a Medical Center. This center shall be moved and assembled in any site as required, also that can be dismantled later leaving the same condition of the site before assembly, the construction method should be easy and fast as the pandemic can occur at any time.

The learning process during the pandemic was proven to be complex and challenging in the initial stage. The outcomes of this study can help other researchers in applying these lessons in future projects. This kind of experience helps build more efficient projects to help society in extreme events such as COVID-19.

However, more work needs to be done in using more advanced tools to reflect the data received from the pandemic, a real time assessment. Advanced software such as Rhino/Grasshopper [5, 9].

A larger application of Artificial Intelligence into managing data and patients. Due to the pandemic, the students had difficulties communicating and assessing the tasks. There is space for investigating virtual reality in teamwork for graduate projects [2, 3].

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Evaluating the Effectiveness of E-Learning in Private Schools of Amman, Jordan During and After the Corona Pandemic

Nivin Hasan and Emran Abu Murshid

Abstract This paper aimed to measure the impact of COVID-19 on education in private schools of Amman, Jordan during and after corona pandemic. A questionnaire consisting of (10) paragraphs aimed to answer the study's questions and hypotheses. The study population consisted of (20) private schools in Jordan distributed in the capital city of Amman, where they were selected using the simple random method. Results show that the effectiveness of e-learning during corona pandemic was ranging from medium to low and there is no noticeable difference of teacher's gender on the effectiveness of e-learning, teacher's years of experiences has a positive relationship with the effectiveness of e-learning. As for the success of e-learning during corona pandemic, results show that it was low due to the presence of several challenges, the most important of which are technical, social, economic, and infrastructural challenges. The study recommended that e-learning could act as a support education system to the traditional (face-to-face) education, and it could be more effective when applied to literary courses, in addition to promoting the efficiency and readiness of teaching staff, students and parents to implement e-learning through holding workshops in this regard.

Keyword E-Learning

1 Introduction

The spread of "COVID-19" around the world has negatively affected all aspects of life, especially the education process. Education during the Corona pandemic period was a great challenge for both teachers and students. To meet this challenge, attention must be paid to developing students' scientific skills in the various fields of science

N. Hasan (✉)
Beihang University (Beijing)- Royal Jordanian Geographic Center, Amman, Jordan
e-mail: nivin1000@yahoo.com

E. A. Murshid
Department of Water and Environment Management, Hashemite University, Zarqa, Jordan

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and technology. This requires focusing on technology education because of its crucial role in developing and building the educational process during the pandemic [1].

The educational development initiatives have been implemented in Jordan for years now, and were represented by education development projects toward a knowledge economy, along with the accompanying development of curricula in general, and the development of teachers' capabilities professionally and technologically, but all that was not quickly reflected during the emergence of the pandemic [2]. In the e-learning process, there are many students in school, but they are not obtaining the basic skills they need in the working field, and the World Bank index shows the percentage of students who cannot read or understand at the age of ten, the percentage of these students in low- and middle-income countries before the outbreak of the Coronavirus reached about 53%, and if we do not take an action, this pandemic may lead to an expansion in that percentage [3].

One of the ways to overcome the repercussions of the Corona pandemic is to use distance learning. One of the ways to overcome the repercussions of the Corona pandemic is to use distance learning, where distance education has been linked to the educational process in the presence of emergency situations, and distance learning tools have become an integral part of the entire educational process at the level of education using modern technologies such as multimedia that makes the educational process more realistic and interesting through audio-visual interaction and supportive videos related to the curriculum and its themes [4].

The outbreak of the Corona epidemic forced decision makers to take some measures to limit its spread, such as Lockdown and a shifting to e-learning in schools and universities as an alternative to face-to-face (traditional) education; where the Ministry of Education in Jordan created the educational platform "DARSAK", which was a platform for e-learning in public schools, that relied on broadcasting lessons for different curricula using TV channels and Web-based platforms, while private schools used other education platforms such as Microsoft Teams, Google Classroom and social media services (WhatsApp, Facebook, etc.) by which the teachers and the students interact directly and simultaneously.

Shifting to e-learning was sudden and unexpected, so some challenges and obstacles were observed during the e-learning implementation process, which led to a decline in the efficiency of the educational process. From this point of view, this study was focusing on clarifying the problems and obstacles that faced the e-learning process and identifying the extent of their impact on the overall educational process in private schools in Amman Governorate (private schools were included in this study because public schools depended on the "DARSAK" platform to record and broadcast lessons digitally and did not rely on interactive live broadcasts in teaching using the platforms that allow this).

This study aimed to a set of goals, namely,

First: Shedding light on the impact of the Corona pandemic on education in private schools.

Second: Keeping up with researchers and their trends in measuring the effects of the Corona pandemic on several sectors, including education.

Third: Providing decision makers with the necessary ideas and proposals to deal with the Corona pandemic in the context of education.

Fourth: To highlight the obstacles and problems that resulted from the sudden shift from face-to-face education to e-learning.

Since the beginning of COVID-19 pandemic, several studies around the world tried to measure the effect of shifting to e-learning on students and learning process. For example, in Malaysia a study aimed to assess the success of E-learning portals, the research contrasted the use of E-learning portals by male and female students. The study's goal was to see whether there was a difference in accessibility between male and female E-learning portals from the students' viewpoint. Service quality, system quality, information quality, user satisfaction, system utilization, and E-learning portal success were all included in the research. The empirical data of 280 students who engaged in Google surveys from various Malaysian colleges was examined using Partial Least Squares Structural Equation Modeling. The outcomes of the research show that in Malaysian universities, males and females have varied levels of utilization of E-learning portals [5]. In the same context, Liang, L., et al. study's goals were to examine youth mental health in China following COVID-19 and to research youth mental health issues. The research included 584 youth students who completed the COVID-19 cognitive status question, the GHQ-12, the PTSD Checklist-Civilian Version (PCL-C), and the Negative Coping Styles Scale were used. COVID-19's impact on youth mental health was assessed using univariate analysis and univariate logistic regression. Results show that 40% of the sampled students had psychiatric issues, with 14% having PTSD symptoms. Thus, viral disorders like COVID-19 may have an enormous impact on young people's mental health [6]. Moreover, to investigate the consequences of Australia's system-wide disruption, Gore, J., et al. evaluated student performance in a sample of matched schools in 2019 and 2020. According to the report, there are no significant variations in student accomplishment increase indicated by progressive achievement exams in mathematics or reading between 2019 and 2020. There were no significant differences seen for Indigenous pupils or students from rural areas [7].

2 Methodology

In this section, we will discuss a comprehensive description of the study methodology, the study population, sample, and the procedures that were followed in the study.

A questionnaire consisting of (10) qualitative questions was used. It was developed by reviewing previous studies and choosing the most suitable questions to test the study hypotheses. This questionnaire was distributed to the study population, which was the private schools in Amman governorate. The study population consists of (50) male and (37) female teachers working in private schools in Amman governorate, and those schools were randomly selected using the simple random method. A questionnaire consisting of (10) paragraphs was developed to achieve the objectives of this study, as the questionnaire's paragraphs focused on measuring

the effectiveness of e-learning during the Corona pandemic and measuring teachers' expectations and attitudes regarding e-learning in the future. The study included the Corona pandemic as an independent variable and effectiveness, expectations, and readiness of educational systems as a dependent variable. The extent of the study was determined spatially in the Amman governorate. The time extent of the study was for the academic year of 2020–2021.

Below is the list of questions used in this study questionnaire:

1. What is the degree of effectiveness of distance education practices in your school?
2. Does the effectiveness of distance education practices in your school differ according to the teacher's gender (male, female) and teaching experience (less than 10 years, and 10 years or more)?
3. What are schoolteachers in your school beliefs about distance learning?
4. Is there a correlation between the effectiveness of distance education practices and the beliefs of schoolteachers about distance learning?
5. How successful was the distance learning experience during the last semester (2020–2021)?
6. What are the factors affecting the success of the distance education experience during the last semester (2020–2021)?
7. What is the effective and proper way to be followed to use technology in education?
8. What is the readiness of the existing educational systems to implement distance education?
9. What are the teachers' expectations regarding the electronic curriculum used during the last semester (2020–2021)?
10. In your opinion, what are Teachers' suggestions for teaching methods after the end of the Corona pandemic?

3 Results

The results of the study and the field survey of the selected schools showed that the effectiveness of e-learning in the study sample ranged from low to medium effectiveness, as the opinions of the study community focused on e-learning that it has advantages in one hand, such as saving time and effort and providing new methods of teaching, on the other hand it has constraints such as the lack of seriousness and commitment in learning for students and parents in terms of following up their children. The results showed that the evaluation of the effectiveness of e-learning depends on the teacher in terms of finding the best method for delivering information to students, searching for it, and activating learning resources. It also depends on the student in terms of his seriousness in taking responsibility in the absence of face-to-face learning at school and that he must focus on the method of collecting, receiving, understanding, and retaining information, and from the point of view of the primary grade's teachers, students of the first three grades cannot acquire writing and reading

skills except with the help of parents. The effect of the gender of the teacher and the number of years of experience for the teacher (less than or more than 5 years) on the effectiveness of e-learning in the study population was studied. It plays a key role in raising and enhancing the effectiveness of e-learning, but this depends on the diligence and seriousness of the teacher in dealing with e-learning and on his technical skills.

Teachers' opinions and beliefs about e-learning varied, as the first category (which represents the majority) thought about e-learning negatively because it is not feasible and requires more effort compared to face-to-face education, as it needs devices, equipment, and a high-quality internet connection, while the second category thought about e-learning positively, they described it as better than face-to-face education, especially at the secondary school grades, and that it saves the school's financial costs. According to the study survey, there is a positive and negative relationship between the effectiveness of e-learning and the teachers' beliefs about it, where the positive relationship was that the effort expended by the teacher will be less and that it is better in terms of financial cost. The presence of credibility in evaluating students and the students' dependence on parents in answering tests and technical problems in terms of equipment and availability of internet connection, negatively impacts the effectiveness of e-learning and reduces it significantly, and they see that face-to-face education is better than e-learning because these problems appeared in conjunction with the emergence of e-learning.

The results of the study indicate that the extent of e-learning success was insignificant for several reasons that were mentioned, such as the lack of seriousness of students and parents in dealing with e-learning, in addition to the fact that a small percentage of students relied on themselves in studying and performing exams, and therefore the results of students in the tests were not reliable and does not reflect their abilities and the extent to which they benefit from the educational process. In another context, some opinions indicated the success of distance education because it was able to fill the gap caused by the sudden stop of the face-to-face educational process.

The opinions of the study sample varied about the factors that contributed to the success of e-learning, one of the most crucial factors is to select a teacher's staff which they are capable to use e-learning technology and immerse it in the educational process. Also providing the required equipments and software in addition that parents should provide a good study environment for their children and urge them to rely on themselves in performing their homework and exams in addition to the necessary tools such as computers, mobile tablets, and internet connection. Based on the results, teachers suggested more than one successful and effective way to use distance education, where the opinion of the majority of them was that capacity-building of students to use distance education technologies is necessary, in addition to finding an effective evaluation mechanism to test students' abilities and the extent to which they benefit from the educational process, some also have suggested that students should keep the camera turned on while attending remote lessons as an example of commitment, attention, and discipline during the class, this will reflect better and real results for the students' levels.

In the context of the readiness and capacity of the current systems to implement distance education, the views of the study sample varied between that the readiness is weak in terms of low quality of Internet connection and the lack of computers or mobile phones for each student in the same family, which reflects the low-level economic and social situation of the family in addition to the lack of technology and equipment for teachers that facilitates them to broadcast and record lectures and create educational content with high quality and efficiency on one hand. On the other hand, there were opinions showing that the readiness of systems to implement distance education had improved in the academic year 2021–2022 compared to the previous academic year 2020–2021, due to the experiences gained by dealing with e-learning technologies which enhanced the capabilities of both students and teachers in implementing and using E-learning technologies. The study sample formed a variety of expectations and goals related to the curriculum used in e-learning, the most prominent of which was that in each school there should be experts in preparing a stimulating learning environment and building technical capabilities for students and teachers, in addition to trying to overcome the obstacles faced by face-to-face curricula when it's shifted into electronic curricula. Promoting the "Educational-Loss Support" initiative launched by the Ministry of Education aimed at bridging the scientific gap among school students that was caused by the sudden shift to distance teaching.

The study collected many results regarding teachers' suggestions for new and innovative methods for applying e-learning even after the end of the Corona pandemic. It was also suggested that e-learning could act as a supportive system to face-to-face education, which raises the efficiency of the teaching process in general, and some suggestions indicate that e-learning should be applied to literary subjects such as geography, Languages, and history, in addition to suggestions for providing the necessary equipment for the teacher to prepare educational content properly and communicate more effectively. Finally, some teachers suggested that e-learning can be applied in extreme weather conditions such as heavy rain and snow.

4 Conclusion

According to the results, e-learning had many pros and cons, the most prominent of its cons were the lack of credibility in the tests, technical obstacles, poor infrastructure, and the lack of equipment needed to implement e-learning, in addition to the lack of seriousness and commitment in dealing with education by students. The most prominent advantages of e-learning were that it was a suitable alternative for students to continue their education during the Corona pandemic, saving time and effort for teachers, saving costs for schools, and providing better options for delivering information and scientific content to students, eventually. The study concluded that e-learning is more suitable for students in the intermediate and secondary school stages.

5 Recommendations

- E-learning should be integrated with face-to-face education, especially in literary courses such as geography, history, and languages.
- The e-learning implementation requires the availability of tools such as computers, smartphones, and an internet connection, which constitutes an additional financial burden on parents. Therefore, the study recommends that the state or the Ministry of Education should provide computers or tablets with acceptable prices to reduce the financial burdens on parents.
- Developing and improving the infrastructure and enhancing internet quality to ensure its accessibility and efficiency to all populated areas in Jordan.
- E-learning can be used in specific periods, such as "Ramadan", to reduce the efforts made by student and teacher and to facilitate the teaching process during those periods.
- Conducting workshops aimed at building the capacities of teachers, students, and parents regarding e-learning tools and platforms.
- Conducting more research and studies to measure the impact of the Corona pandemic on other sectors and communicating these results and proposals to officials and decision makers.

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Research-Based Learning (RBL), Curriculum, and Courses in Undergraduate Science Education in the Post-COVID-19

Hussein M. Elmehdi, Raed A. L. Qawasmeh, Abdel Aziz Gamouz, Mahreen Arooj, Kamrul Hasan, and Ihsan A. Shehadi

Abstract This paper discusses the formal implementation of scientific research at all levels of university education; programs and courses as an approach being adopted in the post-COVID-19 era. Research-based learning (RBL) shall be used in delivering the research components in the undergraduate programs and courses. National, institutional, and individual research interests shall be addressed through defined modules and directed research projects impeded in the curriculum and course deliveries and assessments.

Keywords Research based learning (RBL) · Research based curriculum · Research based courses · Transferable skills

1 Introduction

The spread of "COVID-19" around the world has negatively affected all aspects of life, especially the education process. Education during the Corona pandemic period was a great challenge for both teachers and students. To meet this challenge, attention must be paid to developing students' scientific skills in the various fields of science and technology. This requires focusing on technology education because of its crucial role in developing and building the educational process during the pandemic [1].

The main mission of education is to train young minds to solve real-life problems and enhance self-learning which is the most crucial outcome in all educational programs especially in the post-COVID-19 era. As it is known in conventional knowledge-based education, knowledge is mostly delivered in modules/courses without clear and direct association between them [1]. Mostly, academic courses

H. M. Elmehdi (✉)
Department of Applied Physics and Astronomy, College of Sciences, University of Sharjah, P.O. Box: 27272, Sharjah, UAE
e-mail: hmelmehdi@sharjah.ac.ae

R. A. L. Qawasmeh · A. A. Gamouz · M. Arooj · K. Hasan · I. A. Shehadi
Department of Chemistry, College of Sciences, University of Sharjah, P.O. Box: 27272, Sharjah, UAE

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are offered on problem-based learning (PBL) or team-based learning (TBL) where known solutions to problems (or cases) are investigated constructively by students [2–6]. Research-Based learning (RBL) relies solely on actual complex problems with compound solutions and investigation and peer led team learning (PLTL) can be easily adopted [7] over the years of studies. Hence, life-long experience in research shall be established. Such an approach is deemed essential during and after the Corona pandemic. It cannot be denied that courses and modules in knowledge-based learning are sequential and complementary; however, solving compound scientific problems through sequential/parallel educational process has not been widely implemented in the higher education at the undergraduate level. In the past few years, students in the applied science field at higher educational institutions became less interested in pursuing science education as it is evident by sharp decrease in retention rates. The latter is evident by lack of interest and motivation, especially in areas of basic sciences, chemistry, physics, mathematics, and to a lesser extent biology. While there are several factors contributing to such phenomena, one of the prominent factors is the inability of students to link content and topics taken in such courses to real-life problems and applications. In addition, students fail to see the connection of these topics to job markets and employability readiness or opportunities. These factors are considered as the main reasons for such loss of interest in basic sciences, which focuses on the inability to present the overall role of collective science fields in solving and understanding real-life problems through the applications of scientific research methods. In addition, and more importantly, students fail to connect what they cover to employment credentials and job readiness. Therefore, program and curriculum designers must consider these issues and provide creative teaching and learning approaches that highlight the importance of such fields in interesting and attractive styles. Instructional delivery and course outcome need to address these concerns. One approach which has proven to be amazingly effective is to allow students to get actively involved and take part in the learning process. The latter has been identified in Blooms taxonomy, which allows them to apply, analyze, and evaluate. After the COVID-19 experience with remote and hybrid learning, students became very dynamic, and so should our educational systems and approaches. Student experience and expectations have changed due to exposure to technologically driven and globalized education. The boundaries between the educational stages (or levels) are changing rapidly and what is expected from high school graduates does not reflect their actual competencies and abilities. Nowadays, students are learning basic principles of chemistry, physics, mathematics, and biology at exceedingly initial stages and students can reason hypothetically and deductively [1]. By the time students reach high school, they already possess a certain level of scientific maturity due to accessibility to all kinds of scientific information. This allows educators at postsecondary institutions to introduce creative teaching and learning approaches and models that cater to students taking more prominent at all levels of the education process. At the University of Sharjah, involving students in research at preliminary stages has been identified as one of the key strategies in post-COVD-19. The aim is to involve students in scientific research at the initial stages of their university education deems logical through the incorporation of scientific research as a clearly defined component in

the course and curriculum design, educational outcomes, and deliveries. Scientific research projects are also clearly defined and tailored on a customized basis that fits the ability and the interest of students.

2 Methodology

The concept of designing a research-oriented curriculum, course, and RBL starts by introducing a single mandatory course of "Transferable Skills for Scientific Research". Then the application of such an approach can be implemented via three distinct levels such as intra-departmental research-oriented curriculum, Departmental/program research-oriented curriculum, and Course oriented research. Figure 1 represents the general design of RBL into the curriculum starting by identifying research priority at the National level to course design and implementation.

2.1 Transferable Skills

The Transferable skills for scientific research will be designed to introduce newly admitted students to scientific research methodologies, skills required for conducting

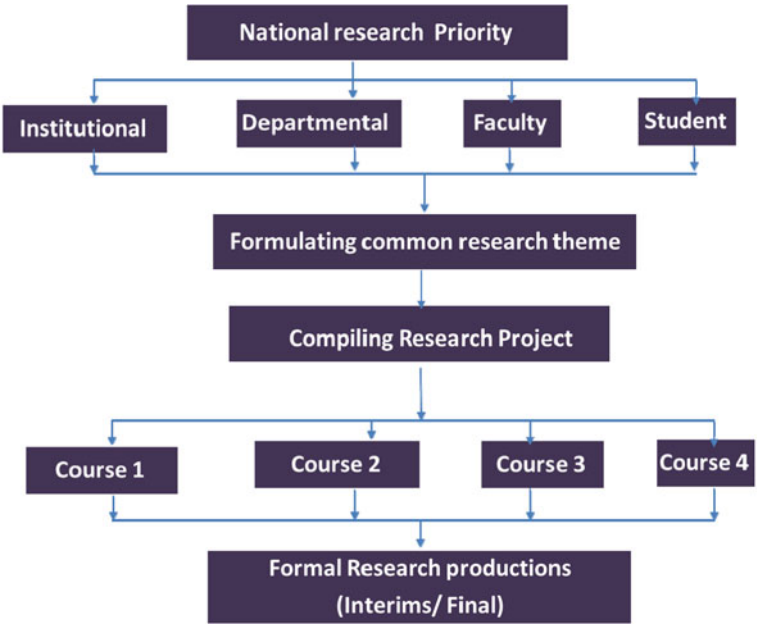

Fig. 1 The research problem design that starts with national research priority

scientific research, and well-defined problems that shall be addressed over the years of acquiring knowledge. The transferable skills course shall act as the road map for students to use the appropriately guided education in scientific research. The difference between the "Transferable Skills for Scientific Research" and the "Transferable Skills" courses is that the former shall clearly define the research projects of interests (National, institutional, Departmental, or individual) [8]. The national research interest is defined by the national authorities as important problems to tackle and resolve and is stated in the government's strategic plan. The institutional and departmental research interests are subsets of the national research interest where the projects are bound with the infrastructure and the skills of faculty members and researchers who belong to such institutions /Departments. The individual research projects reflect the interest of the individual (students or Faculty member) whose research interest and expertise falls beyond the national interest like resolving an abstract problem in mathematics.

The structure for the proposed syllabus for "Transferable Skills for Scientific Research" shall follow the following timetable:

- Week 1: Introduction to scientific research methodologies. This includes various steps involved in research and experimental design, data analysis, presentation, and reporting.
- Week 2–3: Introduction to editing tools used in scientific research; Chemdraw, mathcad, AutoCad, EndNote, MS office, Databases, Simulations protocols, overview of instrumentations, and related techniques.
- Week 4–6: Writing research proposal and grants [9].
- Week 7–10: Documenting and processing scientific results through mini-projects.
- Week 11–16: Presentations and round table discussions about specific research projects.
- Assessment tools:
  - Comprehensive proposal about selected research project (50%)
  - Exams, Quizzes, assignments (50%)

Detailed syllabi are program specific and what is presented here is a generic structure for mere illustration purposes [10].

2.2 Aspects of Research-Oriented Curriculum

During the delivery of the "Transferable research skills course", the three aspects of Research oriented academic structure and curriculum shall be presented in the following approach.

2.2.1 Intra-Departmental Research-Oriented Curriculum

As the scientific academic programs are clearly overlapping, it will be beneficial to define interdisciplinary research projects that can be executed and supervised through many Departments and academic units [2, 11, 12]. As an example of such an approach is to address the issue of sustainability through common complementary projects between Applied Science and Engineering Departments [13]. For example, in a typical joint project, scientists shall explore new material for harvesting energy and engineering looks for design, applications, and feasibilities as shown in Fig. 2. A similar example, cases or problems can be easily created in applied sciences courses taught in the medical and health sciences colleges with the aim of addressing issues in both disciplines in the form of creative research-driven projects. These approaches are of great national interest and align with the latest United Arab Emirates reforms in postsecondary education in general and in applied sciences. The objective of such reforms is to allow students to get involved in creative innovative projects as early as the second and third year of their academic programs. All intra-disciplinary projects are well defined, and the research components shall be clearly defined and implemented either in the courses or in the program design and delivery. The knowledge and skills components of the educational outcome are clearly defined by the program QA and additional research outcomes are incorporated and assessed. The initiative is designed to introduce micro-credentials that include various skills such as presentation and communication, scientific write-up and reporting as well experimental design. The research-related activities shall be on a continuum trend to achieve the fruit of research strain by the time the student graduates. Instead of conducting research only in the capstone modules, research outcome will the product of continuous training and investigation over the years of study. Challenges are expected, especially when the research objectives are not clearly identified and properly structured (or outlined). Students will be allowed to work on projects that serve the outcome of interlinked courses throughout the entire program (study plan). Even though this may be considered a challenge, it is important to allow students to work in projects that can be extended beyond one course, which will enable institutions to move into the era of personalized or custom-made curriculum where the specific interest of the student, the nation and the institute is to be addressed. Each student shall have a specific problem to understand and resolve during his/her course of studies. In such a model, all academic and research activities of the students shall be advised and monitored through the assigned academic/research advisors.

2.2.2 Inter-Departmental Research-Oriented Curriculum

The Departmental/program research-oriented curriculum is implemented the same way as the intra-departmental concept; that research project is solely supervised, assessed, and monitored within the department. The initiation of such programs starts with the students taking the “Transferable Research Skills” course. After that, the student shall be advised by his/her advisor to define the research component

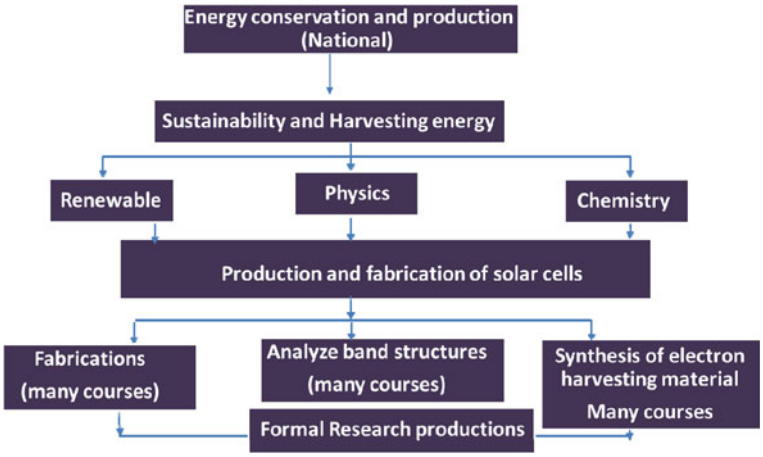

Fig. 2 Example of integration energy-oriented project between different departments

in every major course in the field. For example, Fig. 2, a student who wishes to address the UAE national interest in diabetes must define related contribution to the problem's solution from most courses he/she will take during the study.

In the transferable course, the problem shall be clearly defined along with the related issues. In the introductory courses, understanding of chemical equilibrium principles and the acid/base behavior on insulin functionality. In the level 2 courses, the thermodynamically/kinetically controlled process to be discussed along with the insight of functionality and identity of the active centers. In the third level courses, study the activity and selectivity of selected related enzymes. In the 4th level courses, students shall design and synthesize chemical inhibitors/initiator of some enzymes related to diabetes. At this stage, the scientific problem is well defined, and findings must be reported. The end results must lead to publication in scientific journals as pioneer research work along with a comprehensive thesis. Consequently, the senior research project courses shall be integrated within the curriculum over the years.

While the supervisor prepares a set of projects that serve the model, students with high intellectual capacities and mature research ideas shall be given the opportunity to select their own projects. The research advisors shall guide such students to formulate their individual research plan. A proposal compiled by the student can be submitted to the research council within the Department to be assessed and appropriate recommendations shall be provided.

The research-oriented course can be applied in two ways:

- Through a specific problem assigned to students individually and must understand and solve such problems during the course. The instructor shall break down a complex problem into small modules which will be assigned to students. At the end of the semester, the students shall integrate all their findings into a single report/presentation. For example, Fig. 3, a case study was advised in the Physical Chemistry 2 course where students compiled a single report about Alzheimer's

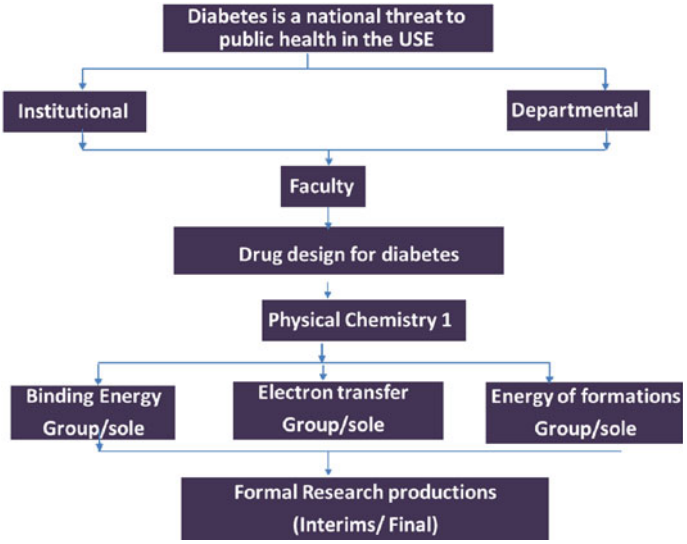

Fig. 3 Model for fostering research related to diabetes in line with UAE national interest

disease, potential cause at the molecular level, identification of related substrates, proteins and enzymes and potential inhibitors using principles of thermodynamic and kinetics (Fig. 4).

- Through a specific problem to be addressed in all academic courses during the same academic year. The research council of the department shall define a complex problem to be addressed by students enrolled in level 2, 3, and 4 courses. At the end of the year, all findings shall be presented in a research forum along with proper recommendations and further action plans. Multiple departments and academic units can identify common problems. Students are treated as if they are graduates with a clear focus on research and research methods. The outcome of such an approach is preparing students to pursue their future career in research and development sector.
- Through assigning each student a different problem based on their academic achievement and level of intellectually. At level 1 course, such problems may act as a stimulus for students who have not defined a problem to address yet.

3 Conclusion

Incorporating scientific research in our educational systems is highly needed to prepare future generations to excel in the areas which have not been explored yet. The world has many current problems along with emerging new ones, and to contribute to moderating such problems, scientific research should be a culture rooted in our

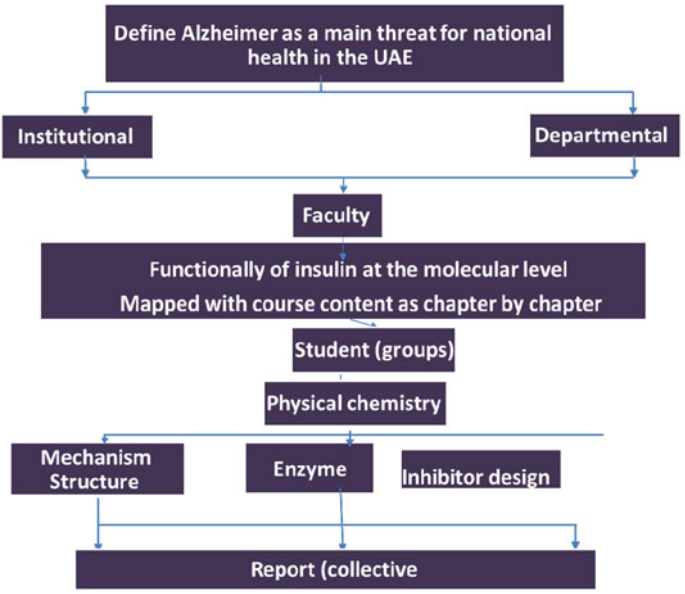

Fig. 4 Model for fostering research related to Alzheimer's disease in line with institutional interest

youth at the undergraduate level. Adopting the RBL is extremely challenging and can be implemented as a formal part of curriculum of all undergraduate programs. As the main principle of the RBL is fostering long-life problem solving based on enhancing the soft skills of students, it is a well-fitted model for teaching/learning in the post-COVID-19 era.

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Effectiveness of HyFlex Simulation-Based Clinical Learning in Comparison to Traditional Learning in Undergraduate Clinical Education

Mohamed M. Abuzaid, Wiam Elshami, Bashar Issa, and Mohamed H. Taha

Abstract The use of blended educational approaches, including HyFlex simulation in recent years and during the COVID-19 pandemic, has impacted medical education and has drawn attention to a new teaching method. However, integrating new teaching methods has its advantages and disadvantages. The effectiveness of HyFlex simulation is not well studied in the literature. The study aims to assess the effectiveness of HyFlex simulation-based clinical learning in comparison to traditional learning in undergraduate clinical education. The study collected demographic data, satisfaction, effectiveness, and acceptance. The data were analyzed using descriptive statistics. The mean scores of satisfactions and previous experience among graduates and students were compared using an independent sample t-test. A p-value of less than 0.05 was used as the significant level. One hundred twenty-four participants in this cross-sectional study completed an online survey. These were graduates (n = 62) and students (n = 62) from the University of Sharjah in the United Arab Emirates. The results showed that students had positive feedback about the HyFlex simulation learning method, especially the content, design, rationale, effect of simulation in acquiring knowledge and improving objective achievement. In addition, HyFlex boosted students' knowledge enhanced student-centered learning and clinical practice assessment. However, they reported that face-to-face learning was significantly more effective for acquiring practical skills than HyFlex simulation learning.

Keywords HyFlex learning · HyFlex simulation learning · Simulation-based education · Face-to-face learning · Clinical training · Medical Imaging

M. M. Abuzaid (✉) · W. Elshami · B. Issa
Medical Diagnostic Imaging Department, College of Health Sciences, University of Sharjah, Sharjah, UAE
e-mail: mabdelfatah@sharjah.ac.ae

M. H. Taha
College of Medicine and Medical Education Centre, University of Sharjah, Sharjah, UAE

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1 Introduction

COVID-19 pandemic is driving medical and health sciences colleges to substitute significant parts of the traditional teaching such as classic lecturing with online teaching to maintain social distancing [1, 2]. However, traditional teaching methods have proven effective tools for teaching core knowledge, explaining complex concepts, generating increased learning, enhancing student engagement, and activating self-directed learning [3].

With the development of technology and the enrichments of online educational resources, particularly during the COVID-19 era, medical and health sciences colleges witnessed transformation towards integrating technology within their education and teaching approaches [4]. Recently these colleges have moved towards—HyFlex learning. HyFlex learning combines the terms "hybrid" and "flexible". Furthermore, HyFlex learning refers to learning that integrates complementary face-to-face and online learning experiences [5, 6].

Experts believe that there will come a time when 80–90% of comprehensive universities will use blended learning, increasing 30% annually [7]. It is essential for medical and health sciences students to ensure that each student develops and continues to refine the basic clinical skills required to provide competent care throughout a lifetime of professional work. Therefore, these colleges strive to continue teaching these skills despite the challenges created by social distancing due to the COVID-19 pandemic through HyFlex learning [8]. A growing body in the literature demonstrated the limitations of online learning. Multiple studies confirmed that internet-based and blended learning in health professions education could be more effective than traditional learning [9, 10]. On the other hand, other studies showed that most students held positive views of combining online learning with face-to-face learning, i.e., using HyFlex learning. A systematic review reported that blended learning could develop clinical competencies among health students [11].

Therefore, HyFlex learning could be favorable and valuable for advanced application in health professions. HyFlex learning methodologies have many advantages over traditional learning methods [6], such as the ability to learn anytime from anywhere, without traveling or spending time away from work, and save on costs [12]. In addition, it allows learners to skip over the information they already know and move on to fewer familiar topics [13]. With the introduction of the new blended learning format—HyFlex learning—several studies have proven its effectiveness in teaching theoretical knowledge [14, 15]; however, fewer studies have reported its effectiveness in clinical practice [15].

Therefore, this study aims to assess the effectiveness of HyFlex learning in clinical practice courses in undergraduate radiography education.

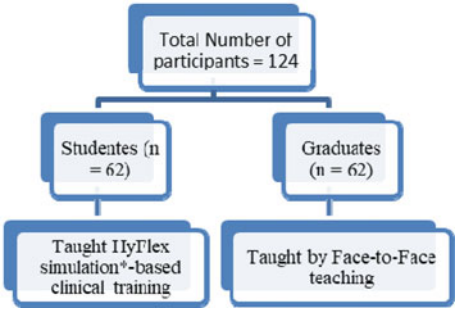

Fig. 1 Participants enrollment

2 Materials and Methods

2.1 Design

Electronic questionnaires were sent to students and graduates of the Department of Medical Diagnostic Imaging in this exploratory cross-sectional study—Fig. 1. The research team pretested this questionnaire by three medical educators and eight students before the start of the study. The feedback was used to improve the survey design and the question's understandability. Data collected from the pilot study was excluded from the results.

The participants were divided into two groups (Fig. 1); group one consisted of the graduates who completed their clinical practice study using face-to-face study mode. Group two members used HyFlex learning simulation-based clinical training learning during COVID-19 pandemic lockdown.

Group one was taught using traditional face-to-face clinical practice (CP), where the students were placed at clinical sites. Before training, the students were prepared with theoretical knowledge and lab skills at the university labs. During CP, the clinical tutors, faculty, and clinical preceptors supervised students. Students practice different imaging modalities, ranging from general radiography, computed tomography, magnetic resonance imaging, ultrasound, and nuclear medicine. In addition, they must acquire skills in radiation protection, patient preparation, positioning, protocol selection, image production, and image analysis.

In the HyFlex simulation-based clinical training, various simulation software was introduced to facilitate acquiring clinical skills such as patient positioning, protocol selection, image analysis, and radiographic anatomy.

2.2 The Questionnaire

The survey was designed in two parts. (i) The first section collected the participants' demographic information, including gender, age, year of graduation or expected to

graduate, and clinical practice study mode. (ii) The second section captured the participants' perceptions, satisfaction, opinions regarding CP study mode and blended learning effectiveness in course objectives achievement.

The following eight areas were compared between the HyFex (students) and face-to-face (the graduates); active participation, need for help, instructional methods, effectiveness, user friendly, appropriateness of the environments, achievement of the learning objective, and course content were easy to understand. In addition, the following four areas were added to HyFlex such as activities used to substitute face-to-face practice, the effectiveness of HyFlex simulation, online resources, and achievement of clinical practice objectives by online learning.

The following contents were face-to-face for graduates and HyFlex for students such as patient positioning, protocol selection, image analysis, and radiographic anatomy [16, 17].

The CP courses are ordinarily offered to the undergraduate radiography students at the Department of Medical Diagnostic Imaging (MDI) in their fourth semester. The study plan consists of five CP courses to complete the graduation requirements. The minimum duration for completing the program is four years spanning eight regular semesters.

2.3 Sampling

The convenience sampling method was utilized to collect the data as it is an effortless way to reach out to the graduates. Participants were invited to participate in the study through emails. A research assistant sent the link to the participants' emails in the medical imaging program. The invitation included detailed information about the study, study objectives, and a request to confirm their participation before starting the survey. In addition, participants were informed that completion of the survey gave implied consent to participate in the study, and they could withdraw without any consequences.

2.4 Data Analysis

Data were analyzed using a three-point Likert scale. Scores from 1–3 were assigned for these responses, where 1 = 'Disagree', 2 = 'Neutral', and 3 = 'Agree'. Satisfaction was measured using twelve questions with a maximum score of 36 indicating satisfaction and a minimum of 12 indicating dissatisfaction. Satisfaction was measured using six questions with a maximum score of 18 indicating satisfaction and a minimum of 6 indicating dissatisfaction. Acceptance was measured using two questions to gauge the participants' opinions regarding HyFlex simulation and face-to-face learning. The data were analyzed using descriptive statistics. In addition, the mean scores of satisfactions and previous experience among students and graduates

were compared using an independent sample t-test. A p-value of less than 0.05 was used as the significant level.

2.5 Ethical Consideration

The Research Ethics Committee approved the study at the institution (REC-20-04-26-01).

3 Results

All participants responded to the questionnaires. Most of the respondents were female in HyFlex (n = 59, 95%) and face-to-face learning (n = 50, 81%) environments. In HyFlex learning, 27 (44%) respondents are expected to graduate in 2023, while in face-to-face learning, 19 (31%) graduated in 2017. The demographic details of the respondents are given in Table 1.

Table 1 Participants' demographic details

	HyFlex simulation learning			Face-to-face Learning	
		N (%)			N (%)
Gender	Female	59 (95)	Gender	Female	50 (81)
	Male	3 (5)		Male	12 (19)
Year of graduation or expected to graduate in	2020	2 (3)	Year of Graduation	2012	6 (10)
	2022	10 (16)		2013	6 (10)
	2023	27 (44)		2015	6 (10)
	2024	10 (16)		2016	5 (8)
	2025	13 (21)		2017	19 (31)
				2018	11 (18)
				2019	9 (15)
Age	17–20	34 (55)	Age	21–25	6 (10)
	21–25	28 (45)		26–30	42 (68)
				31–35	14 (23)

3.1 HyFlex Simulation Learning Effectiveness

A total of n = 27 (44%) agreed that they have actively participated in HyFlex simulation learning ($\mu = 2.27$, SD = 0.728) and that n = 28 (45%) have received support whenever they needed it ($\mu = 2.35$, SD = 0.655). Many of the participants had a neutral opinion about the effectiveness of HyFlex simulation learning compared to face-to-face learning (n = 43, 70%) with a mean value of 1.53 and SD = 0.844. The online tools used to replace hands-on practice were unsatisfactory to 58% of the participants (n = 36) with mean = 1.69 and SD = 0.879). According to 32 (52%) participants, HyFlex simulation learning made the course content easy to understand ($\mu = 1.71$, SD = 0.818). Equal numbers (one-third) of the participants have expressed their opinions about the coverage of blended methods substituting for face-to-face methods. At the same time, the majority were neutral about their effectiveness (questions 9 and 10). Almost double the participants disagreed that the online blended learning resources could not achieve CP and patient care skills learning objectives (questions 11 and 12—Table 2) compared with those who agreed.

3.2 Face-To-Face Learning Effectiveness

The findings showed that most of the participants were satisfied with the environment of face-to-face learning. In addition, the participants agreed on active engagement, support, platform user-friendliness, environment, objective accomplishments, and material comprehension, Table 3.

3.3 Satisfaction with HyFlex Simulation Learning

In terms of design, content, faculty role, and the intention to improve clinical practice, most participants were either neutral or agreed with blended learning in clinical practice courses (questions 1–4). On the other hand, it was clear that the students were disappointed with blended learning regarding the difficulty to gain knowledge and skills (questions 5 and 6 in Table 4). This may be a significant result and merits further investigation to understand the reasons for this negative impression (Table 5).

3.4 Acceptance Towards HyFlex Simulation Learning

Figure 2 shows that none of the participants in both groups agreed that HyFlex simulation learning could replace face-to-face learning, with 76% saying “no” and

Table 2 Effectiveness of blended learning

	Disagree	Neutral	Agree	Mean	SD
	n (%)				
1. I actively participate in HyFlex simulation learning classes	10 (16)	25 (40)	27 (44)	2.27	0.728
2. Whenever I need help in HyFlex simulation learning, I can get it	6 (10)	28 (45)	28 (45)	2.35	0.655
3. The instructions in the HyFlex simulation platform are quiet enough for me	12 (19)	20 (32)	30 (49)	2.13	0.713
4. HyFlex simulation practice is effective	5 (8)	43 (70)	14 (23)	1.53	0.844
5. The HyFlex simulation clinical platform was user friendly	10 (16)	23 (37)	29 (47)	2.21	0.704
6. The HyFlex simulation and online learning environment are appropriate to achieve clinical practice objectives	19 (31)	15 (24)	28 (45)	1.94	0.744
7. The clinical practice objectives can be achieved by online learning	**27 (44)**	22 (36)	13 (21)	1.85	0.743
8. Course contents are easy to understand with HyFlex	14 (23)	16 (26)	32 (52)	1.71	0.818
9. The materials used to substitute the face-to-face practice are quite comprehensive	15 (24)	20 (32)	27 (44)	2.08	0.753
10. The activities used to substitute the face-to-face practice are quite comprehensive	20 (32)	21 (34)	21 (34)	2.02	0.820
11. The online sessions used to substitute the face-to-face practice are quite comprehensive	15 (24)	21 (34)	26 (42)	2.10	0.762
12. The online resources used to substitute the hands-on practice are enough to achieve the course objectives	**36 (58)**	9 (15)	17 (27)	1.69	0.879

24% saying “to some extent”. When students were asked if they felt competent when relying on HyFlex simulation learning in clinical practice, 28% said yes, compared to 80% for face-to-face learning, Fig. 3.

3.5 Comparison Between HyFlex Simulation and Face-To-Face Learning

A two-sample t-test was used to identify statistical significance in the effectiveness and satisfaction of students who experienced HyFlex simulation learning and face-to-face learning. In addition, the scores of 8 questions that analyzed effectiveness in blended learning and face-to-face learning and 6 assessed satisfactions were included. With a mean value of 1.53 and SD = 0.844, most participants (n = 43, 70%) had

Table 3 Effectiveness of face-to-face learning

	Disagree	Neutral	Agree	Mean	SD
	n (%)				
I actively participate in Face-to-Face learning classes	10 (16)	10 (16)	42 (68)	2.27	0.728
Whenever I need help in Face-to-Face learning, I can get it	6 (10)	10 (16)	46 (74)	2.35	0.655
The instructions in the Face-to-Face platform are quiet enough for me	12 (19)	10 (16)	40 (65)	2.13	0.713
Face-to-Face clinical is effective	6 (10)	11 (18)	45 (72)	1.69	0.822
Face-to-Face clinical platform was user friendly	11 (18)	16 (26)	35 (57)	2.08	0.660
The Face-to-Face environment is appropriate to achieve clinical practice objectives	6 (10)	10 (16)	46 (74)	2.35	0.655
The clinical practice objectives can be achieved by Face-to-Face learning	6 (10)	10 (16)	46 (74)	2.35	0.655
Course contents are easy to understand with Face-to-Face learning	6 (10)	10 (16)	46 (74)	2.35	0.655

Table 4 Satisfaction of blended learning

	Dissatisfied	Neutral	Satisfied	Mean	SD
	n (%)				
I was satisfied with the HyFlex simulation learning model in the clinical practice course	6 (10)	16 (26)	40 (65)	2.16	0.578
The design and content of the HyFlex simulation learning model were rational	6 (10)	16 (26)	40 (65)	2.16	0.578
Faculty had better teaching effects during HyFlex simulation learning	16 (26)	28 (45)	18 (29)	2.03	0.746
The results met expectations to improve clinical practice	10 (16)	25 (40)	27 (44)	2.27	0.728
It was easier to acquire knowledge	40 (65)	16 (26)	6 (10)	1.85	0.768
It was easier to acquire clinical skills	40 (65)	16 (26)	6 (10)	1.85	0.786

a neutral opinion regarding how well HyFlex simulation learning is compared to face-to-face learning.

Although respondents who had face-to-face learning scored somewhat higher than those who received HyFlex simulation learning, the t-test revealed a significant effect on the effectiveness and satisfaction of learning in clinical practice ($t = –0.2071$, $p = 0.03$).

Table 5 Satisfaction of face-to-face learning

	Dissatisfied	Neutral	Satisfied	Mean	SD
	n (%)				
I was satisfied with the face-to-face learning model in the clinical practice course	6 (10)	16 (26)	40 (65)	2.16	0.578
The design and content of the face-to-face learning model were rational	6 (10)	16 (26)	40 (65)	2.16	0.578
Faculty had better teach effects during face-to-face learning	16 (26)	18 (29)	28 (45)	2.03	0.746
The results met expectations to improve clinical practice	10 (16)	15 (24)	37 (60)	2.08	0.635
It was easier to acquire knowledge	6 (10)	16 (26)	40 (65)	2.16	0.578
It was easier to acquire clinical skills	6 (10)	16 (26)	40 (65)	2.16	0.578

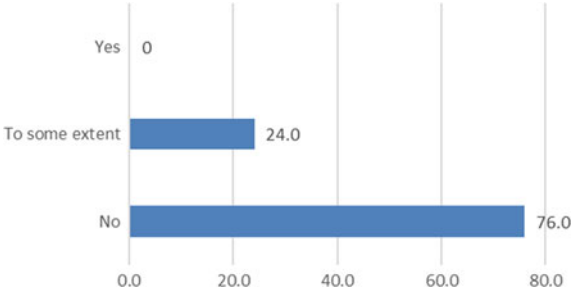

Fig.2 Acceptance of HyFlex simulation learning as a substitute for face-to-face instruction

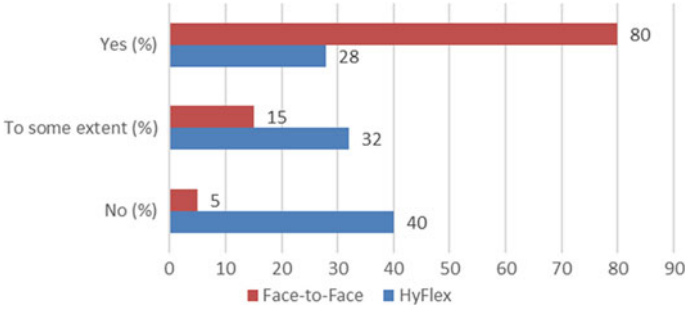

Fig. 3 Participants' views on competence in various educational techniques

3.6 Discussion

We compared the satisfaction, acceptance, and effectiveness of HyFlex simulation learning with face-to-face teaching methods on clinical practice education in this study. The HyFlex simulation teaching method was well-received by students.

In general, students had a positive opinion about the HyFlex simulation learning method, especially the content, design, rationale, effect of simulation in acquiring knowledge and improving objective achievement. This study's findings are comparable to those of a previous study conducted at Hong Kong University, which found that students had a good acceptance regarding lecture content, design, interaction, and activities [18]. However, the respondent disagrees with the effectiveness of HyFlex simulation compared to face-to-face learning. Several challenges that impede the incorporation of HyFlex simulation learning in clinical practice, such as the quality of learning material, cultural resistance, and overloaded work for teachers and students, could explain this disagreement [11].

The face-to-face replacement by online material was unsatisfactory to the participants (n = 36, 58%) (=1.69, SD = 0.879). These results aligned and supported by a previous study conducted one year ago which revealed that online tools are not enough to engage students in online learning; techno-pedagogical skills can help but certainly will not replace face to face [8].

Students' engagement can affect the student's satisfaction with integrating new teaching methods. Instructors' roles and communication technology can help to improve satisfaction, engagement, and HyFlex's simulation impact on clinical practice education [19, 20].

Another study investigated the experiences and perspectives of nine post-graduate students who took a six-week HyFlex course. While there were some communication issues between students who attended in different ways, the flexibility it provided was appreciated by participants. The use of various elements of video conferencing software and other digital tools was deemed critical to HyFlex's effectiveness [21]. Our students agreed with the prior findings, with 49% saying they were satisfied with the online platform, 47% saying it was user friendly, and 45% saying they could get help anytime they needed it. To meet the student's expectations and increase satisfaction, the author proposes increasing preparation, improving the instruction manual, and providing online support.

With 76% saying "no" and 24% saying "it's clear that neither group believes HyFlex simulation learning can completely replace face-to-face learning". Education institutes should implement initiatives to boost student participation and satisfaction with these new teaching approaches. For example, HyFlex is a promising teaching method, and the university has invested in the classroom, technology, communication, and training infrastructure to educate students better and meet learning objectives.

3.7 Limitation

Our study had certain shortcomings that need to be investigated further and addressed in future research. Firstly, find out how faculty and clinical instructors feel about employing HyFlex teaching approaches in clinical practice and how satisfied they are using the qualitative approach. Secondly, teachers' and students' challenges in acquiring knowledge and clinical skills should be investigated. Additionally, the number of time students spend using simulation software can indicate their involvement and efficacy. Finally, a long-term investigation of the effects of HyFlex simulation training methods on clinical abilities will be conducted in the future.

4 Conclusion

Due to the significant differences between HyFlex and traditional face-to-face learning, more research is needed to assure student and instructor engagement, satisfaction, and achievement of learning objectives. In addition, HyFlex integration in clinical practice education necessitates careful planning and execution. HyFlex was an excellent approach for improving students' knowledge gain using simulation software, but it cannot replace hands-on teaching.

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Impact of Service Quality on Student Retention in UAE Higher Education Institutions

Aisha Al-Shamsi, Mohammad A. Al-Hawari, Semiyu Adejare Aderibigbe, and Maher Omar

Abstract A major goal of this study is to demonstrate how improving the quality of services can be used to enhance higher education institutions' ability to hold on to their students and assist them in graduating on time. This study investigates the relationship between service quality and student retention in the higher education sector, as well as the influences of satisfaction, trust, and commitment on this relationship. The study discusses how Institutions can retain their students while defining service quality in the present day. Hence, the literature focused on how service quality impacts student retention today. Following the literary phase of the research, the framework specifies the study's methodology while analyzing the importance of service quality in higher education institutions. It aims to identify the key success factor contributing to student retention and completion of graduation in higher education through a critical assessment of service quality literature. It suggests a theoretical framework using the SERVQUAL model. A qualitative method of four focus groups was conducted. The data were analyzed using coding, and the hypotheses were constructed and discussed qualitatively. The study concluded that service quality is crucial to retaining students in higher education. According to the research, service quality is important to establishing assurance with students. This study highlights the significance of operational aspects in the service sector, particularly for high-contact services. Furthermore, it demonstrates how higher education institutions can achieve long-term sustainability while providing expansion opportunities.

Keywords Service quality · Student retention · Customer satisfaction

A. Al-Shamsi (✉) · M. A. Al-Hawari
College of Business Administration, University of Sharjah, Sharjah, United Arab Emirates
e-mail: abukhatir@sharjah.ac.ae

S. A. Aderibigbe
College of Arts, Humanities, and Social Sciences, University of Sharjah, Sharjah, United Arab Emirates

M. Omar
College of Engineering, University of Sharjah, Sharjah, United Arab Emirates

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1 Introduction

For a nation to develop and grow, education is an essential component. Quality key performance indicators for universities include student retention and on-time graduation rates. They are seen as indications of the quality of education by accreditation authorities. The success of the program influences the ranking and reputation of the institutions.

What impact does service quality have on universities' ability to retain students? This study seeks to answer this research question. It will assess how service quality affects the ability of higher education to maintain students, ensure the Institution's survival and provide a good university image. Information gathered from this study can be used to develop a model that can help increase student retention.

With a service-oriented framework of business growth in the modern world, every institution and business sector must develop its quality framework in the provision of services as well as products. According to this study, several factors influence students' retention. The factors are connected to one another and help to create a framework for understanding their interconnection. Customer retention and service quality are key issues in any area of the service sector. It could have a direct positive or negative impact on institutions and organizations. According to Zhou et al. [1], an institution needs to improve the quality of its services if it wants to keep a client. Customer retention and service quality are related, according to several studies. Additionally, some research revealed that good customer service promotes lasting connections and higher levels of client retention [2].

The education sector is similar to other business sectors, and its customers are students. Therefore, student retention is important for several reasons. Kerby said the first and primary aspect of importance is that retaining students helps educational institutions fulfill their goal of educating students and assisting them to contribute to society and the nation as a whole [3]. Secondly, student retention also has a financial aspect, as increased retention rates yield higher financial benefits for educational institutions. As per Dursun, the third reason is that an institution's retention rates contribute to a high ranking in the world ranking of universities by indicating satisfactory educational attributes and high-quality education [4].

Therefore, a high student retention rate is ideal since it represents both students and the institution's performance. High student retention rates in higher education also contribute to the growth and development of the nation.

Considering the above, we can understand the importance of studying how service quality and customer retention are related. Critical analysis of service quality literature in the higher education sector explores the main element of success influencing student retention and on-time graduation. Utilizing the SERVQUAL model, it proposes a theoretical framework. Hence, a qualitative approach that was undertaken to add more value to the literature using semi-structured interviews has been used to collect the data and analyze the data using a summative approach [5–7]. This paper has been organized through a set of sections. The first section presents the topic. Section two gives brief literature about each study concept. Section three talks

about the study hypotheses, methodology, and data analysis. Section four briefs the study finding, discussions, and conclusion in section five.

1.1 Student Retention and On-Time Graduation Concept (S.R.)

Many HEI (Higher Education Institutions) students' dropout and do not complete their studies after enrolling and some years on campus [8–12]. Therefore, student retention is a major challenging and concerning problem for the academic community in all nations worldwide. Higher education institutions (HEI) must continue developing strategies for educating the future generation. Measures for increasing students' retention rate will lead to higher graduation rates and the success of the program impacts the ranking and reputation of institutions. Accreditation bodies consider the retention rate as an indicator of the quality of education [13].

Students' retention rate is defined as continuing their studies at the Institution until graduation [14]. Moreover, according to Wild [14, 15], it is defined as graduating on time, which can take anywhere between four and five years, depending on the program's length. The percentage of first-year students who remain on to the second year of the program they enrolled in is used to calculate the student retention rate.

1.2 Service Quality (S.Q.)

The importance of service quality to business performance has been well recognized in academic literature. The extent to which a service satisfies or exceeds a customer's expectations may be used to define service quality [16]. It is usually defined as the aspect that helps in enhancing the organizational performance in an institution based on services.

Due to the vast amount of literature that has been written regarding the relationship between service quality and customer retention, less research has been done on the relationship between service quality and organizational performance. However, much debate has been stimulated on the relationship between service qualities, retention, and loyalty being applied to organizational performance. As such, the existence of a relevant linkage between profitability and retention can be referenced from a simple equation regarding cost benefit.

Moreover, providing the desired services can prompt customers to buy more than has been planned. On top of that fact, customers will tend to buy again if they are satisfied with the quality being provided in the services. Besides, it helps save money as retaining old customers' help is cheaper than attracting a new customer base.

1.3 Surrounding Theories and Service Quality Models

Both service quality and customer satisfaction are judged during the service delivery process, so evaluating them is exceedingly difficult [17]. The most well-known and extensively used measure model is SERVQUAL, which may be used to assess how consumers see their orders [18, 19]. As per Jemaiyo [17], The model estimates the extent of service quality while considering the five underlying dimensions: responsiveness, reliability, assurance, empathy, and tangibles. The SERVQUAL model originally included the following primary aspects: competence, credibility, security, communication, access, customer identification, reliability, responsiveness, and customer identification [20]. However, the model could not be fully appreciated as it fails to capture the in-depth richness of industrial coordination. However, the ten-aspect dimension showed complexity in comprehending and utilizing the data analysis. As such, the model was later modified to the five dimensions as mentioned below.

Responsiveness. The aspect defines the willingness to help customers while providing prompt services. It concerns the delivery style for any service sector while determining the customer relationship [20]. Regarding the scope of services, responsiveness deals with the provision of surroundings or, in other words, the physical environments granted to the customer.

Reliability. It defines how accurately and reliably the claimed service can be performed [17]. Reference [21] stated that the dimension would not be relevant to certain services where the customers do not expect to formulate a long-trusting bond, and they are satisfied by delivering service to them on time.

Assurance. The aspect is typically described as an assessment of a collection of questions that were first created to gauge expertise, credibility, respect, and security. At the same time, the organizational employee's capacity to gain respect and trust via competence, hospitality, and assurances is highly related to customer relationship management [17].

Empathy. It indicates caring and individualized attention provided by the organization to its customer [17]. The dimension also defines the style of delivery in services alongside analyzing the relationship with customers.

Tangibles. It relates to physical abilities and personal and equipment appearance [17]. Therefore, the aspect contributes to the highest variation of service quality. For instance, elegant hotels are known for their physical beauty and staff members' displays of service; likewise, in hospitals, patients are made to feel comfortable and conveniently transported from the parking area to the doctor's office [17].

1.4 Students Satisfaction (S.S.)

Student satisfaction, according to Kasiri [22], is a short-term mindset that results from an evaluation of a student's educational experiences, services, and facilities. As

per Kerby [23], the aspect involves a customer's decision to continue a relationship with an organization based on the expectation, at par standard of services. Hence as per the above definition, the context is a measure of the student's decision to continue their education in the Institution.

The customer satisfaction model was propounded, which provides the theory that customer retention formulates a strong link with the satisfaction the customer acquitted by the company. Following that, retention might then be dependent upon how satisfied the students are with the quality of services along with the education delivered to them.

1.5 Trust (T)

Trust has many definitions in literature. When you trust someone, you know they will not take advantage of you. If you trust someone, you will believe they are honest and will not harm you [24]. Trust is one of the essential elements to retaining customers because if customers lose trust, this will affect very bad in the business, linked to its reputation. Developing a level of trust for sustaining a bond with the customer and, in turn, makes them loyal to a particular brand.

1.6 Commitment (C.O.)

The desire to keep a commitment is a crucial indicator of commitment [25]. Such dedication demonstrates the student's desire to maintain their connection with the university, for instance by pursuing postgraduate courses there in the future. Researchers often present data demonstrating a favorable correlation between brand success in terms of service quality and loyalty [26].

2 Methodology

2.1 Research Hypotheses and the Research Model

Customer retention and service quality are affected by several factors. In this study, I have focused on the following factors: customer satisfaction, trust, and commitment. By providing the customer with good service quality, the level of satisfaction, commitment, and trust will increase. This will build a strong relationship and gain customer loyalty.

The study conceptual research model has been developed, as seen in. And the study hypotheses are as follows:

– H1: Students' satisfaction is positively impacted by service quality.
– H2: Students' Trust is positively affected by Service Quality.
– H3: Employee Commitment is positively impacted by service quality.
– H4: Students' Retention is positively affected by customer satisfaction.
– H5: Students' Retention is influenced positively by Customer Trust.
– H6: Students' Retention is influenced positively by Employee Commitment.
– H7: Students' Retention is positively impacted by Service Quality.

2.2 Data Gathering Method

The current study employed a qualitative research design in order to address the research question, gather the required data, and achieve the study's goals. Various researches on customer retention have been carried out utilizing interviews as a qualitative data gathering technique [27–30] Accordingly, we shall respond to the research question: "*What impact does service quality have on universities' ability to retain students?*". The main goals of conducting interviews with students are to examine the significant factors influencing their continued enrollment in higher education, assess the reliability of the information gathered from them, and consider their opinions on various customer retention-related issues, such as improving the service sectors in UAE universities.

Four focus groups were held, recorded, transcribed, coded, and evaluated in accordance with the following three primary steps: [31] these main steps are explained below.

First, we begin by classifying and defining the categories as shown in Table 1 [32]. Secondly, the text is transformed into the code's declared symbols. Then, to establish the key components and their frequency, the theme or symbols are finally divided into scales of + and − words count scales. Positive coded replies represent a positive opinion or comment, whereas negative coded responses represent a negative perception of the study (Fig. 1) [32].

As shown in Table 1, the final codes are as follows: Student satisfaction (S.S.), Trust (T.), Commitment (C.O.), Service quality (S.Q.), and Student retention (S.R.).

Table 1 Study factor and associated codes

No.	Codes	Study factor
1	S.S.	Students satisfaction
2	T.	Trust
3	C.O.	Commitment
4	S.Q.	Service quality
5	S.R.	Students' retention

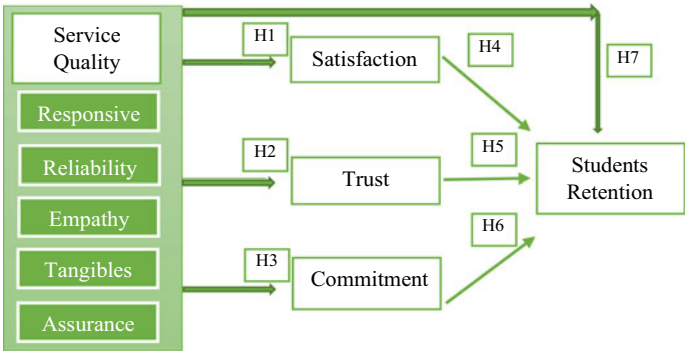

Fig. 1 Conceptual research model of this study based on [33]

2.3 Instrumentation and Ethical Factors Considered

Pre-Interview. Four interviews were conducted for four focus groups of university students in different dispelling at universities in the U.A.E (United Arab Emirates). The focus of the interview was to evaluate the service quality elements (Responsiveness, Assurance, Reliability, Empathy, and Tangibles) on satisfaction, trust, and commitment and how it affects student retention at the university. Questions covered the quality of services they got while studying at their respective universities, such as admission, registration, and advising services. A list of the students' names, I.D.s, College, Major, and contact numbers were made, and the students were called to inform them about the interview date, time, and place. The meeting room was prepared with the necessary tools such as a recorder, catering, lighting, and the atmosphere—the students were called one day before the interview date as a reminder.

Interview. The study's objectives and all the ethical concerns surrounding data collection were briefly explained to participants at the start of each interview. Additionally, several recommendations were followed to conduct the student interviews properly, which might enhance the quality of the qualitative data. The questions and answers were written in a way that was pertinent to the main service sector that the students were well-versed in. By giving each candidate adequate time and space to offer pertinent information regarding major incidents occurring in their academic journey, the interviews served the objective of gathering reliable data. The interviews were conducted in a two-way, interactive manner. The first question was designed to get the interviewee's attention and serve as an icebreaker by asking them to talk about themselves; what college have you joined? was another opening query meant to get their attention; why did they select this major? What do they want to become in the future? According to Alshurideh [32], the "introduction and small talk" phase acts as the starting phase and is intended to develop a direct interaction with the participants and tell them about the relevance and goal of the research as well as the applications of the interview data.

A lot of focus was placed during an interview on paying close attention to the participants' justifications and observations and taking notes since none of them agreed to have their voices recorded. The sequence of the questions was occasionally adjusted during interviews using a less formal approach, depending on the subjects that were emerging from the talks.

In some situations, the phrasing of the questions was also changed to clarify certain concepts and the motivation behind the question. The interview's questions were well-structured and followed a logical progression from provisionally crafted inquiries to queries that got right to the interview's goals. Most of the questions were in the style of "open answers", allowing the students to freely discuss their thoughts on each topic [32]. For each student, the interview lasted 25–30 min.

2.4 Data Analysis Procedure

The primary goal of the analysis of student interviews is to assess the university's service quality, identify the elements that influence students' satisfaction, trust, and commitment, and shape their behavior to continue attending the institution. This will assist in explaining how the interaction between students and the service provider (University) affects students' retention or switching behavior [34]. Moreover, it has been identified that verbal behavior positively and negatively supports the main study concepts in the qualitative analysis. Therefore, it was classified based on the behavioral model [35, 37].

Analysis was carried out using the analysis method based on the conversion of interview discussions into texts. To improve the accuracy and validity of translating spoken behavior into written materials, one of my colleagues examined the interview transcribing procedure. The written papers had been reviewed, and the texts were now ready for coding and analysis. Several methods were used in the interview's analysis procedure. First, a list of codes was created, which included the key elements from the prior (systematic review) that influenced customer retention [33] described in the methodology section, the coding list was divided into five categories: Student satisfaction (SS), trust (T), commitment (CO), service quality (SQ), and Student retention (SR). These were given a place in the primary behavior of drivers. Second, each sentence was examined and compared to one of the research codes as part of a text fragmentation procedure. The coding procedure has been converted into one of the research codes by theme. Thirdly, a data reduction process was carried out by identifying the main incidents to provide a clear meaning regarding the connected study topics that are highly frequent. Text division is a stage that is included in this process since it tends to gather data to support specific claims. The data were all organized and categorized, which brings us to our fourth point. This stage requires a significant deal of thought to consider how the data themes are developing into the body of the theoretical framework; thus, it was challenging to complete.

The process of evaluating the qualitative data then began. This stage involved compiling all supporting information for each category to provide conclusions and

Table 2 The study frequencies tables

Behavior	Codes	SS+	SS−	T+	T−	CO+	CO−	SQ+	SQ−	Total
Positive behavior	Count	74	0	71	0	85	0	235	0	465
	Expected count	45	0	50	0	60	0	175	0	330
Negative behavior	Count	0	25	0	15	0	18	0	24	82
	Expected count	0	5	7	9	0	14	0	10	45
Total	Count	74	25	71	3	85	18	235	24	593
	Expected count	55	5	50	0	60	14	175	10	359

perceptions based on numerical data [32]. To quantify qualitative data, repetitive activities must be counted to determine their importance, whether they should be avoided, and how frequently they occur [6]. Additionally, I've included some quotes from participants of the studied process to give it some context and important additions [36]. Following up on the coding procedure, a contingency Table 2 shows notable differences in the frequency counts of positive and negative acts toward the key factors affecting college students [5]. The independent variables are listed and coded by Table 1, then the data were categorized and grouped, and the frequency of the data was counted as words were either positively or negatively spoken during focus groups' interviews as per shown below in contingency Table 1.

To summarize, this section has concentrated on giving a clear image of the methodology employed in this study, which is developing, conducting, and evaluating qualitative interview data collected by students studying at UAE universities. This study was dependent on the clarity of the interview text and its division into brief statements through the recording, transcription, coding, summarizing, identification, classification, and numbering of study topics.

2.5 Validity and Trustworthiness

Numerous considerations have been made to improve the qualitative data collection, including the selection of students from a variety of majors and academic levels to guarantee that the correct data will be gathered, and the entire region will be covered. This approach makes use of a hard research strategy to get data from students that is valid and trustworthy, with a minimal amount of bias that may occur throughout the process of interviewing selected individuals. To assess their performance while providing these services, the students were carefully chosen, with a focus on those who applied for the most university services.

3 Findings and Discussion

To further explain the effects of the service quality elements (Responsiveness, Assurance, Reliability, Empathy, and Tangibles), the study illustrates the key behavior-setting elements influencing consumer retention behavior, which are influenced by satisfaction, commitment, and trust as dependent factors. It also identifies which elements are more significant to consumers. The behavior of students is also significantly influenced by university employees. This is because most students are unaware of the regulations and processes when applying for certain services, which means that face-to-face interactions between staff and consumers can directly alter their behaviors and attitudes.

Overall, the study in Table 1 above demonstrates that service quality (SQ) is the primary factor influencing students' retention (CR) behavior. The count of 235 positive instances was about twice as high as anticipated. According to the student, there were 235 and 24 repetitions, respectively, of both the positive and negative service quality. Additionally, statistical data indicate that service quality positively affects student retention, which supports hypothesis number (7). This is because customer retention naturally affects the level of service provided. Any type of service business must retain customers to succeed. Responsiveness, Assurance, Reliability, Empathy, and Tangibles are the primary behavior-setting factors affecting student retention. The frequencies Table 1 of these factors is shown in Appendix 1, explains the impact of the service quality elements, and identifies which factors are more significant to students; the results show that reliability had the highest positive counts (150). Next, responsiveness with (135) positive counts, then assurance (110) positive counts, tangibility (95) positive counts, and finally empathy with (75) positive counts. In addition, the values that have negative effects are shown, and further information about each is provided.

Additionally, it is becoming increasingly obvious that service quality has a considerable influence on everything related to customer retention. However, it's not apparent if service quality has a significant impact on consumer satisfaction.

The other elements that favorably affect students' retention in higher education, as shown by the frequencies in Table 1, are student satisfaction (SS), trust (T), and commitment (CO), all of which are impacted by staff conduct and university rules and services. In contrast to expectations, there were (74) favorable counts for (SS), (71) favorable counts for (T), and (85) favorable counts for (CO). Also, components contributing to negative behavior count development got (25), (15), and (18) repetitions, respectively. This demonstrates that behavior-setting components have a statistically significant favorable impact on students' retention behavior, supporting hypotheses (1), (2), and (3). This is because consumers tend to take full advantage of the direct benefits gained from service quality provided by the same university. Many academics agree with this idea, saying that the basis of consumer behavior is tied to their decision; typically, consumers make choices to maximize their value or reduce expenses [37].

Moreover, as noticed from the interviews, the students focused on two primary aspects of service quality: how quickly they responded to their requests and how consistently they provided their services. In contrast, this had a favorable impact on their degree of satisfaction, trust, and commitment. One student stated in their interview that they would be prepared to pursue their postgraduate studies at the same university if they were happy with their educational experience. And when it comes to customer loyalty, it is often defined as the quantity or quality of recurring business that consumers provide to the same service provider. In other words, the terms refer to the customer shown frequent purchases and positive provider attitudes [38] Going back to the frequency table, the overall number of favorable references is (465) counts, and the negative counts were (82), which supports the hypothesis numbers (4), (5), and (6).

Customers who show confidence in one service provider when needed are considered loyalty to a brand. The element may also be rephrased to say that it is the result of continually displaying good and emotional experiences according to [39]. The term can therefore be connected to exerting a positive emotional experience, a base of satisfaction in relation to the attributes, as well as a perceived value of experience. In general, the topic mostly consists of products and services. According to Nigel Hill [40], there is a strong link between excellent customer service and customer satisfaction.

Service quality activities point to characteristics that are believed to meet or exceed customer expectations. Depending on the circumstance, both transcend beyond the experiences had during service delivery.

4 Conclusion

This study examines the factors affecting customer retention in higher education institutions by examining the effect of service quality on customer retention behavior. It uses the elements of service quality to give a clear explanation of the circumstances, causes, and effects of retention behavior, as well as the impact of satisfaction, trust, and commitment.

Using qualitative research, seven hypotheses on retention behavior were examined; more precisely, four focus groups with university students were interviewed for this study. The primary findings demonstrated that aspects of service quality influence consumer repeat behavior favorably. In addition, repetition behavior is positively impacted by satisfaction, trust, and commitments.

The importance of this study lies in the fact that it expands the field of knowledge on multiple theoretical, institutional retention policy instruments [41] for practitioners in the higher education sector who wish to make well-informed decisions regarding the selection and implementation of student retention interventions at their institutions. Institutional policy is a different topic that must be looked at for future

Table 2 The study frequencies tables

Behavior	Codes	Incident	Negative	Total
		Positive		
Responsiveness	Count	135	5	140
	Expected Count	100	0	100
Assurance	Count	110	10	120
	Expected Count	100	0	100
Reliability	Count	150	0	150
	Expected Count	100	0	100
Empathy	Count	75	0	75
	Expected Count	100	0	100
Tangibles	Count	95	3	98
	Expected Count	100	0	100
Total	Count	113	6	119
	Expected Count	678	24	678

research. Student-centered institutions looking to include student voices in institutional choices will also find this study to be useful as they begin the shift to decision-making frameworks based on qualitative data. Further research may be done on variables like student cynicism and flexibility and how this affects student satisfaction and their retention. Additionally, employing the service profit chain model to examine staff satisfaction and its effects on customer service quality and customer satisfaction would add additional value to the study. It will help universities concentrate more on the factors that influence retention. The study's limitation was four focus group interviews, as our intention was not to generalize but to seek rich data for understanding the issue under exploration.

Appendix 1

Service quality elements: Contingency Table 3 of frequency counts where the participants reported positive and negative behavior incidents [5].The study frequencies tables

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The Reality of E-learning Assessment Practices in Higher Education Institutions

Madher Mohammad Attiat

Abstract The aim of this study was to investigate the reality of e-learning assessment practices in Jordanian universities during the Corona pandemic, as well as the challenges they faced, by investigating Jordanian university students' attitudes using an electronic questionnaire whose psychometric properties were validated. The measure included four areas: The conduct of controlling online exams, the diversity of its forms and practices, its quality, and the challenges of the online assessment. A total of 312 randomly selected male and female students participated in the study. The results revealed two types of procedures for controlling online exams, namely, controlling the exam characteristics and conditions of its applications. In addition, controlling online exams using the available technical means. It also demonstrated a great diversity in the practices of formative assessment compared to a small diversity in the practices of the final assessment. A prominent level of quality in the characteristics of the questions, their structure, the gradation of their difficulty, and their levels of knowledge was evident. As for the challenges facing online assessment only, they were related to technical, financial technical aspects. The study suggested identifying the available sources for use during the exam, diversifying the type of questions in the final exams, and non-exam assessment in classwork, and focusing on the quality characteristics of the exam to prevent cheating, more than focusing on technical tuning procedures for the virtual environment of the exams.

Keywords Higher education institutions · E-learning · E-learning assessment practices

1 Introduction

Please note that the first paragraph of a section or subsection is not indented. The first paragraphs that follow a table, figure, equation, etc., do not have an indent, either.

Subsequent paragraphs, however, are indented.

M. M. Attiat (✉)
Al Balqa Applied University, Salt, Jordan
e-mail: madhrattiat@bau.edu.jo

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The outbreak of the Corona pandemic in late 2019 has a wide-ranging impact on many aspects of economic, social, and educational life. As a result, countries acted fast to address the pandemic and limit its spread, imposing a total ban and comprehensive closures, as well as preventive and precautionary measures and social distance. All educational institutions at all levels were affected by these closures. According to a UNESCO Institute for Statistical Data report released in June 2020, school closures affect more than 60% of students worldwide. School closures affect 67.6% of students registered in the 144 nations that have implemented the closure policy [8]. This forced educational authorities to take the required crisis-response measures, such as switching to online learning to assure the continuation of the educational process during the crisis.

Similarly, all Jordanian higher education institutions have shifted to distance learning, relying on e-learning and assessment platforms and windows via e-learning management systems such as the Moodle system, which was introduced to education and assessment before the start of the pandemic in most Jordanian universities. This made it easier for universities to transfer to complete e-learning and assessment considering the comprehensive closures. In addition to using communication applications and software such as Teams and Zoom, for use in online learning. The process of integrating learning management systems into instruction and e-assessment witnessed a natural development and a tendency to benefit from technological development in improving the educational process and improving learning outcomes. This transformation is an urgent necessity for the future of education in universities [10]. However, most Jordanian universities have implemented e-learning management systems in the instruction and assessment process and provided the infrastructure to utilize these systems. E-learning management systems provide opportunities to develop learner knowledge and skills through interactive social and cultural contexts, enabling the learner to build his knowledge within the framework of interaction through learning groups, and motivating him to integrate, participate and collaborative learning via the Internet [6]. It also enables e-learning management systems within an integrated system to manage courses and implement learning activities synchronously and asynchronously. In addition to managing classwork and exams of various substantive and essay styles electronically, tracking students' performance, verifying assignments, and monitoring grades [13].

Teachers perform two types of assessment practices, assessment in traditional classroom situations or through E-media, through which they perform their roles in the classroom assessment. The formative assessment seeks to obtain information about the student's performance to improve his learning and to provide him with effective feedback on his performance on an ongoing basis to reflect positively on his learning and motivation. This is done using formative exams, projects, reports, assignments, business files, and others. The final assessment is done through conducting final exams through which it measures the objectives and levels expected to be achieved by students in the course at the end of the semester and taking the appropriate academic decision for each student based on the student's cumulative achievement during the semester [3]. Several studies have been undertaken to review institutions' experiences with the learning management system before the epidemic,

as well as students' perceptions regarding online assessment [1, 10, 13, 14, 18]. These studies found that the system was effective and of high quality in terms of instruction, assessment, training, developing digital learning skills, digital competence, satisfaction, motivation, and favorable attitudes toward using the system. Studies regarding e-learning challenges found that these challenges include technical, financial, and administrative challenges, in addition to e-learning assessment challenges, especially the challenges of managing online exams, safe digital assessment, scientific honesty, and academic integrity [16].

Despite previous experiences with the e-learning management system, its effectiveness in instruction and related practices, and positive trends in the instruction process, educators were able to use the system in managing course content, classwork of assignments and projects, and short tests in conjunction with face-to-face instruction in classrooms. However, the complete and unexpected shift from face-to-face instruction in the classroom to remote e-learning and assessment during the Corona pandemic presented public education institutions and universities with significant challenges related to instruction and assessment alike, especially in the preliminary stages of the pandemic. UNESCO's June 2020 report alluded to emergency responses in many countries throughout the world. Where fateful decisions on national examinations were made. Eleven nations decided to cancel national exams, while 22 countries them on schedule, including several Arab countries, including Jordan, and took some essential measures to keep national exams on schedule, while some countries tried to postpone exams [19]. The challenge was the continuation of online learning and the implementation of course-related activities, such as preparing and administering exams electronically from a distance, and what they require in terms of technical equipment and a sufficient frequency band, as well as the procedures and requirements for controlling online exams and maintaining academic integrity, as well as digital equality [17].

Universities responded to these emergencies by enacting a series of decisions that encompassed a variety of procedures, adjustments, and alternatives to ensure the continuity of the educational and assessment processes. The National Institute for Learning Outcomes Assessment conducted a survey of the attitudes of 813 faculty members, administrators, academic affairs, and students from 624 institutions and organizations in the United States of America, Canada, India, Italy, Saudi Arabia, Bahrain, and Algeria using an online questionnaire focused on changes made to instruction and assessment during Spring 2020 in response to the sudden shift to online learning and assessment and examining the potential impacts of these changes on assessment culture, and fears of these changes [9]. It was found that 97% of respondents made changes of some kind in response to the Corona pandemic during the spring of 2020, including changes in assignments and assessments such as switching to a successful-failed system, giving students the freedom to consider grades for courses, and flexibility in the assessment process and deadlines for assessments, reducing the number of assessment requirements, and mooting [9]. It also revealed that 75% of respondents were unconcerned about the influence of changes on the assessment system, while 25% were concerned about increasing job expectations, assessments changing, the transformation from teaching and learning, and the

accuracy of learning measures [9]. During the COVID-19 pandemic, the American Psychological Association has also provided ten guidelines for instruction, assessing, and following up on students. Some focused on setting realistic and specific goals for each lesson, explaining how learning will be assessed, asking questions, using continuous assessment throughout the semester, providing students with feedback on how learning has improved, using previous assessments to improve subsequent assessment procedures, and providing students with support and guidance [2].

Several studies on the realities of online learning and assessment have been undertaken. Daniels et al. [7] in Western Canada found that COVID-19 had a greater influence on students' motivation, involvement, and perceptions of cheating and success in online learning settings than in traditional education settings compared to distance learning environments. The results revealed a significant fall in achievement goals and empathy, as well as an increase in concerns about cheating. Students who were interested in cheating were more concerned about cheating in remote learning environments, and their perceptions of test failure were higher. Besides, learning goals predicted behavioral, cognitive, and emotional engagement. Gamage et al. [8] conducted a critical study on online delivery and assessment during COVID-19. The study focused on several issues and challenges associated with online assessment practices such as challenges in maintaining academic integrity, protecting the assessment process from hacking (secure assessment), and confirming the students' identity. The results indicated that formative assessments are minimal risk because they do not directly contribute to the final grade, compared to the high-risk summative assessments. The reasons for students' tendency toward academic lying, academic dishonesty, plagiarism, research purchase contracts, and fraud are due to the intensity of duties and competition among students, the lack of time available to complete the duties, the tuition fees, the financial and social consequences for the student, and the students' lack of awareness and knowledge of plagiarism. Reedy et al. [17] also conducted a study on students' and teachers' perceptions of cheating behavior in online exams, during the Corona pandemic, by comparing the methods and procedures followed by three universities in the Australian community. The results suggested the ease of cheating in online exams from the teachers' perspective compared to the difficulty of cheating in virtual environments from the students' point of view. The results also revealed that students' values and beliefs strongly contribute to reducing the possibility of cheating, regardless of the ease or difficulty of the exams. The study recommended reading the instructions for academic integrity before students enter the tests and design assessments that let students use open sources. It also requires cooperation and group interaction between students, designing effective questions based on thinking and mental treatments, and employing information instead of remembering questions that prompt students to search for the answer from available sources. In Palestine, Ayyoub and Jabali study [5] aimed at assessing the practices and methods of online assessment during the Corona pandemic from the perspective of Al-Najah University students. The results showed that the degree of students' estimation of online assessment practices was medium, and there were no differences in the degree of estimation of assessment practices according to the student's gender, academic level, and cumulative average.

A year and a half have passed since using distance education and assessment, and the Corona pandemic continues to cast a shadow over all countries, forcing them to devise solutions that ensure students' gradual return to face-to-face education while maintaining preventive measures to ensure students' safe return, while the educational process continues. At the higher education level, the Jordanian Ministry of Higher Education has issued a system of "integrating e-learning in higher education institutions," so that universities are committed to this system to continue e-education at a distance in 10–20% of the program's courses in full distance education, 40–60% of the program's courses in blended teaching, and 20–30% of the program's courses are in face-to-face learning [11]. Thus, we are facing a full distance learning and online assessment experience that lasted at least a year and a half before returning to face-to-face, blended, and remote education. This experience requires an assessment to find out the reality of online assessment and its challenges from the perspective of the parties to the educational process. Therefore, this study seeks to achieve this purpose by studying the reality of online assessment practices in higher education institutions from the students' point of view.

1.1 Statement of Problem

Universities have shifted from traditional instructional strategies to online instruction and assessment in response to the emergency caused by the Corona epidemic. The e-learning assessment techniques and practices changed to assure the assessment process's reliability, integrity, and fairness under objective settings, as well as its continuous efficacy in reaching learning objectives and making solid academic decisions. This approach encountered difficulties that hampered the implementation of various processes, particularly those for regulating and monitoring distant online examinations and assessments. This study seeks to identify the most significant procedures used by universities to control online exams, evaluate the diversity of online assessment forms and practices, assess the quality of online assessment practices, and identify the most significant challenges of e-learning assessment, which is what the study seeks to answer by attempting to answer the following study questions.

1. What are the procedures for controlling online exams in Jordanian higher education institutions?
2. What is the extent of diversity and adaptation of e-learning assessment tools and forms in Jordanian higher education institutions?
3. What is the quality level of e-learning assessment practices in Jordanian higher education institutions?
4. What are the challenges of assessing e-learning in Jordanian higher education institutions?

1.2 Importance of Study

Students had real-world experience with online learning and assessment, in terms of the tangible changes that occurred in the assessment process such as its diversity, quality, implementation procedures, as well as its challenges. Therefore, it was necessary to survey the opinions of that segment to which the total changes occurred. On the other hand, it has been at least a year and a half since the transition to online learning and assessment, which is a sufficient period to reveal the reality of online assessment, its effectiveness, quality, diversity, objectivity, and the creation of an appropriate virtual environment for it.

2 Material and Methods

2.1 Sample

A total of (352) male and female students from Al-Balqa Applied University and the International Islamic Sciences University in Jordan participated in the study, and they were randomly selected. Their data and responses were obtained by an electronic questionnaire through a link shared with student groups via Teams technology, and the Learning Management System, in 12 scientific and humanities departments from the two universities. Responses were also reviewed, and 40 biased and inappropriate questionnaires were excluded. The actual sample counted (312). Table 1 shows the distribution of participants by gender and university (see Table 1).

Table 1 Distribution of participants by gender and university variables

Gender		University		Total
		Public	Private	
Male	N	80	15	95
	%	25.6	4.8	30.4
Female	N	187	30	217
	%	59.9	9.6	69.6
Total	N	267	45	312
	%	85.6	14.4	100.0

2.2 Study Instrument

To reveal the reality of online learning assessment practices during the Corona pandemic, a questionnaire was developed after reviewing the related theoretical literature, and the instruments used in recent studies such as [5–7, 13, 15]. The measure included 56 items, covering four sub-dimensions: the procedures for controlling online exams (18) items, the diversity of forms, tools, and practices of online assessment (12) items, the quality of exams and online assessment practices (11) phrases, and the challenges and problems of evaluating e-learning (15) items. A five-point scale was utilized to estimate the degree of the practice of e-learning assessment from the students' perspective, including the following levels: very high (5) degrees, high (4) degrees, medium (3) degrees, (2) low degree, and (1) a very low degree. The validity of the questionnaire was verified by presenting it to a specialized committee to check the appropriateness of the items to the fields, their relevance, clarity, and linguistic formulation. The required modifications were made based on the committees' suggestions. The construct validity was also verified after applying it electronically to 142 male and female students, by calculating the correlation coefficients between the items and their fields, and between the fields. The correlations between the items and their field ranged as follows: The first field (0.28–0.78), the second field (0.29–0.74), the third field (0.27–0.66), and the fourth field (0.57–0.79). Where the correlations of the measure's fields ranged between (0.24–0.55). The correlations of the first three fields with the fourth field (challenges and problems of online assessment) were negative. Reliability was verified by Cronbach's alpha method. The internal consistency coefficients for the four fields ranged between (0.72–0.89), and these indicators are acceptable for the study.

2.3 Statistical Analysis

Descriptive statistical analysis was conducted to verify the psychometric properties of the measure using correlation coefficients including frequencies, percentages, and means. The t-test for independent samples was applied to answer the study questions.

3 Results and Discussion

Results of the first question

"What are the procedures for controlling remote online exams in Jordanian higher education institutions?" The study questionnaire includes 18 statements centered on the procedures and practices of controlling online examinations and assessments, which represented the students' assessments of the procedures and practices of the

academic administration and faculty members in controlling and monitoring online exams and assessments, as shown in Table 2.

The student's evaluation of the experimental virtual environment control procedures came to a medium degree. The most practiced procedures for controlling online exams were "The start and end of the exam is activated for all students at the same time." 80% of the students agreed to a "high and very high" degree. 57% choose "very high and high" degree to "The examinee is given a secret number after verifying his identity.", and "Increase the capacity of the question bank to ensure that the most distinct question forms are randomly generated." Whereas 50–55% of them choose "high and very high" degree to "Opening features of any other programs during the exam application such as Word, pdf, Excel is prevented.", "prevent copying and pasting operations during the test", and "prevent the use of headphones during the exam". "Very significantly and significantly" about 48% of the students agreed to "Asking fresh unsolved questions" and "The exam instructions emphasize academic integrity which must be considered during the exam." As for the procedures for controlling less-practiced online exams, the results were as follows: 83% of the students agreed with a degree of "low and very low" on "Throughout the exam, students must keep the camera open", where 54–57% of the students selected "low and very low". On "Students must submit copies of their manual answer drafts electronically," and "the online exam has the feature to return to the questions that have been answered by reviewing the recorded answers to modify them."

Results of the second question

What is the extent of diversity and adaptation of e-learning assessment tools and forms in Jordanian higher education institutions? The extent of the diversity of forms and practices of online assessment was measured from the students' perspective, through 12 statements, as shown in Table 3.

The results in Table 3 demonstrate that the degree of diversity of online assessment forms and practices is medium. 73% of the students' responses were "very high" and "high" to the statement which reads "The online exam questions were only of the multiple-choice variety." 68% of the students chose "high and very high" in response to the statement "Quizzes, assignments, and projects were used in class." While 55–57% of the students chose "high and very high" over the statement "Observing indicators of students' simultaneous attendance at lectures", and "Asking assessment questions linked to the class goals at regular intervals during the lecture." Regarding the less diverse practices, 54% of the students chose "low and very low" on the statement "The online exams included both objective and essay problems", and 43% on "Written work was the center of online exams and assessments."

Results of the third question

What is the quality level of e-learning assessment practices in Jordanian higher education institutions? The quality of online exams and assessments was measured from the viewpoint of the student through 11 phrases, as shown in Table 4.

The results in Table 4 reveal that the "quality of online assessment practices" was rated to a medium degree. Furthermore, 62–63% of students agreed to a "very high

Table 2 Descriptive analysis of the field distance exam control

Items	Degree			Mean
	Very high/high	Medium	Low/very low	
Online exams have the feature of returning to the answered questions	26.9	19.2	53.9	2.46
Throughout the exam, students must keep the camera open	7.3	9.3	83.4	1.60
The answering period for each question is set at a specific time	38.5	22.4	39.1	2.97
The start and end of the exam is activated for all students at the same time	79.8	9.9	10.3	4.23
Enough time is allocated for the exam so that there is no excess time	44.9	31.7	23.4	3.29
The exam includes inferential questions whose answers do not depend on direct content in the course	39.7	39.4	20.9	3.30
The exam instructions emphasize academic integrity which must be considered during the test	47.1	34	18.9	3.43
The examinee is given a secret number after verifying his identity	57	18	25	3.51
Movements, faces, and eyes are tracked during the test	28.6	24.7	46.8	2.65
Prevent internet browsers from working during the exam	43	17.3	37.7	3.04
Prevent screenshots while answering the exam	37.5	19.9	42.6	2.90
Headphones are prevented during the test	50.6	11.9	37.5	3.25
Copying and pasting features are prohibited during the exam	52.2	16	31.7	3.39
Opening features of any other programs during the exam application such as Word, pdf, Excel is prevented	54.8	14.1	31.1	3.39
Increase the question bank's capacity to ensure the most distinct question forms are randomly generated	56.5	26.3	17.3	3.63
Asking fresh unsolved questions	47.8	31.4	20.8	3.40
Students must submit copies of their manual answer drafts electronically	22.4	20.5	57.1	2.43
Electronically, the proportion of similarity and plagiarism in written and research work is verified	35.3	33	31.8	3.05
Online exams have the feature of returning to the answered questions				3.10
Total				3.10

Table 3 Descriptive analysis of the diversity of online assessment forms and practices

Items	Degree			Mean
	Very high/high	Medium	Very low/low	
The online exam questions were only of the multiple-choice variety	73.4	18.9	7.7	4.13
The online exams included both objective and essay problems	24	22.1	53.9	2.49
Quizzes, assignments, and projects were used in class	67.6	24	8.3	3.96
Simultaneous assessment questions were incorporated into the online classwork throughout the lectures	45.9	32.7	21.5	3.37
Written work was the center of online exams and assessments	22.8	34.3	42.9	2.73
Observing indicators of students' simultaneous attendance at lectures	56.7	27.6	15.7	3.67
The ongoing discussion of students' tasks and assignments	46.8	29.8	23.4	3.36
Asking assessment questions linked to the class goals at regular intervals during the lecture	54.8	25.6	19.6	3.50
Practical application is evaluated by the contemporaneous presentation of abilities or using video-recorded approaches	35	35.3	29.8	3.06
Use an interactive and collaborative approach to deliver presentations, assignments, or projects in small groups	41.7	30.4	27.9	3.18
The availability of an e-library for students to utilize from home to finish research assignments	42	26.6	31.4	3.13
Increasing the weight of the separation work in comparison to the overall weight of the marks	40.1	36.2	23.7	3.27
Total				3.32

and high" degree that "online exams offer questions of gradual complexity" and that "exam questions cover the course contents". 56.4% of students agreed with a "high and very high" degree on "the sufficiency of the number of questions for the course topics," and between 44 and 47% agreed with a "high and very high" degree on "The computerized assessments contained questions requiring higher mental functions, such as analysis and conclusion, criticism, and originality." "The exam questions ranged from knowledge to competencies.", "The quantity of online exams questions is small in comparison to the weight of marks," and, "to some extent, the difficulty of getting a mark compared to the work put in the study." While 51.2% of the students

Table 4 Descriptive analysis of the quality of online assessment practice

Items	Degree			Mean
	High/very high	Medium	Low/very low	
The online exams covered the course subjects	62.3	25	12.8	3.74
Online exams offer questions of gradual complexity	62.5	24	13.4	3.79
Exam questions cover the course contents	56.4	27.9	15.7	3.64
It is sufficient to listen to the recorded lectures to obtain a satisfactory grade and pass the course without attending the lectures concurrently	44.2	26.6	29.2	3.23
The exam questions ranged from knowledge to competencies	45.5	35.9	18.6	3.40
The computerized assessments contained questions requiring higher mental functions, such as analysis and conclusion, criticism, and originality	46.8	32.4	20.8	3.43
The quantity of online exams questions is small in comparison to the weight of marks	32	35.9	32.1	3.04
The time allotted for the computerized test was little in comparison to the number of questions and their difficulty level	44.9	31.4	23.8	3.39
The number of questions in the online exam was limited in comparison to the time given for the test	33.4	33	33.7	2.98
Online exam questions have become consumable and accessible to pupils	35.6	27.9	36.6	2.99
Obtaining high marks in online tests in return for little study effort	20.8	27.9	51.2	2.50
Total				3.30

agreed with a "low or very low" degree on "obtaining high marks in online tests in return for little study effort".

Results of the fourth question

What are the challenges of assessing e-learning in Jordanian higher education institutions? Students' opinions were surveyed about the challenges and problems of online assessment, through 15 items, as shown in Table 5.

The results in Table 5 demonstrate that the most challenging of online assessments from the students' perspective was "The high level of anxiety among students for fear of technical malfunction during the test" by 65.8%, "Lack of financial support for students to purchase computers" by 63.1%, "The university does not provide free internet packages for students during exams" by nearly 60%, "Poor internet coverage in remote areas" by 58%, "The difficulty of achieving justice in online exams" by

Table 5 Descriptive analysis of "online assessment challenges and problems"

Items	Degree			Mean
	Very high/high	Medium	Very low/low	
Internet interruption or weakness during the test	52.9	18.6	28.5	3.38
Poor internet coverage in remote areas	58	20.8	21.2	3.67
Power failure during the test	34.6	22.8	42.6	2.88
Unavailability of a computer (desktop or laptop)	40.1	23.4	36.5	3.04
Lack of financial support for students to purchase computers	63.1	18.3	18.6	3.80
The university does not provide free internet packages for students during exams	59.6	19.9	20.5	3.73
Weak students' skills in using smart devices (digital illiteracy)	31.1	32.1	36.8	2.95
The difficulty of achieving justice in online exams	54.4	22.4	23.1	3.59
The elevated level of anxiety among students for fear of technical malfunction during the test	65.8	18.3	16.1	3.89
Part of the test time was lost because of the online overload on the test system	52	28.2	19.9	3.57
Difficulty providing students with feedback/answering students' inquiries during the exam	51	23.4	25.6	3.45
Inadequate style of questions—commonly used—with students as multiple-choice tests	34	37.5	28.6	3.12
The negative impact of online teaching and assessment on student motivation	47.4	29.5	23.1	3.41
Low prestige of the online test compared to the traditional test	45.5	25.6	28.8	3.32
Students exploit the conditions of online exams to obtain high marks, regardless of the real level	49.4	23.4	27.2	3.41
Total				2.88

54.4%, "interruption or weakness of the network" Internet interruption or weakness during the test" by nearly 53%, "Part of the test time was lost because of the online overload on the test system," by 52%, and "the difficulty of providing students with feedback and answering students' inquiries during the test," by 51%.

The findings revealed that the students' attitudes about online assessment practices were medium degree, in terms of procedures for controlling the virtual environment of online exams by the available technical means to achieve the safe digital assessment, and the extent of the diversity of forms and practices of online assessment to ensure the

diversity of tools and forms of online assessment between traditional assessment such as objective and essay tests or alternative evaluation such as assignments, projects, peer assessment and self-assessment, quality of online tests and assessments in terms of comprehensiveness and adequacy of exam questions for all course topics, variety of mental processes involved in questions based on Bloom's Classification of Cognitive Objectives, order of questions in order of difficulty, and logical sequence. Based on the students' views, the procedures for controlling the most commonly used virtual environment can be classified into two types: The first is a set of procedures for controlling the characteristics of the exam and the conditions of its application, which was represented by activating the start and end of the test for all students at the same time, and allocating sufficient time for the test so that there is no excess time, and expanding the scope of the bank questions to generate the greatest amount of alternative question models possible. We note that these measures were implemented to prevent or reduce the chances of cheating to achieve a safe digital assessment in which all students enter the test at a specific time and allocate enough time for the test to cause them to be busy answering questions rather than searching for answers from other students. One of the changes the university made to the mid-term and final online exams was to reduce the testing time from 30 to 50 min to 2 h, which indicates the flexibility that is in response to evaluation requirements in exceptional emergency circumstances, and it is one of the characteristics of the tests across. This interpretation is consistent with the result of the National Institute for the Evaluation of Learning Outcomes study [9].

The second type is a set of technical procedures used by universities with available technical means to set the virtual environment for online exams, which included verifying the student's identity through an entry code for the exam, preventing earphones, preventing copying, and pasting during the exam, preventing any other program from being opened during the exam, and preventing screenshots. In terms of the variety of online assessment practices and forms, the formative assessment practices (classwork), whether they be short tests, self-assessments, homework, or projects, have emerged as the most diverse. Those practices are simple for the instructor to apply throughout the semester, as well as flexibility in availability and delivery times. In contrast to summative evaluation processes, which were uniform. Most students supported a little diversity in their practices, and those practices were limited to objective tests, in contrast to the diversity of their practices prior to the pandemic, where the study of [4] found that the degree of practicing the style of essay tests in the final assessment is higher than the objective tests. This is due to the official nature of the final exams, time constraints and availability at a specific time for all students, and the ease and speed of correcting objective exams electronically through the learning management system, as well as saving time and effort, and the student's ability to answer many objective questions electronically in a brief period, compared to questions on paper. The article demands a long time to answer a few questions, as well as the simplicity of predicting the proper number of questions for the pre-set test time from the university administration. In addition to the instructions of academic departments in universities about final exams, which focused on preparing question banks and categorizing them according to the gradation in difficulty, and topics

The course, setting a brief time—less than an hour—for the final online exam, and increasing the risks of final exams compared to low-risk formative exams. This result is consistent with the result of the study [8], as the final assessment tests constitute a great weight in the final mark in the course, which is achieved in one assessment session, which increases the risk of hacking and attempts to cheat by students. All these factors prompted teachers in one way or another to use objective type tests, specifically the multiple-choice questions.

In this context, we may claim that there has been a fundamental transformation in the culture of assessment, with the objective questions becoming the dominant culture in the final assessment and with the approval of academic departments in universities. The concern here is whether the assessment with a pattern of objective questions is sufficient to determine the amount to which the student has gained information and skills and the attainment of learning goals considering the ongoing Corona epidemic. Will this shift in assessment culture be sustained by the continued use of blended education, which combines e-learning and face-to-face instruction? Will online assessment retain this flexibility in the future as a natural reaction to technological advancement through a learning management system in instruction and assessment when the epidemic is over? Particularly, some institutions focused on computerizing the final examinations for the requirements of combined university courses and conducting the final exams for the remainder of the online courses through the screens of computer laboratories on campus. In terms of the quality of online assessment practices, students' evaluations focused on aspects related to the detailed analysis of achievement test results, such as analyzing the difficulty of the questions and their discriminatory ability, as well as the effectiveness of alternatives, even though these practices are typically used in standardized achievement tests [12]. And they contradict the findings of the current study, which found that students appreciated the gradation of test questions in terms of difficulty, the degree of mental processes needed by the questions, and the coverage and adequacy of the number of questions for the course themes. This finding can be viewed in two ways. In the first instance, it is the teacher's response to the university's academic administration's directions and instructions by creating a bank of questions for each course, dividing it according to the level of difficulty and course topics, based on the elements of the specification table, and then randomly selecting a sample that represents the final exam via the learning management system Moodle.

Concerning the challenges of online assessment, they were technical, technical-administrative, and financial, and their resolution necessitates increasing bandwidth, providing the technical infrastructure, and overcoming the problems that universities encountered during the online assessment. These issues posed a significant difficulty for colleges, particularly during the start of the epidemic and the move to online learning. The time factor was critical for the continued use of online learning and assessment, the achievement of test justice, the right of students to equal opportunities to learn and test in safe virtual environments, and the reduction of feelings of anxiety and fear caused by technical problems, particularly technical support and Internet speed, especially for students in remote areas far from the Internet coverage.

4 Conclusions and Recommendations

Based on the theoretical background of the study and its results, we conclude the following:

1. A shift in evaluation culture, with assessment being more flexible than before.
2. Technology and learning management systems have helped to boost the digital efficiency of both the student and the instructor, allowing the teacher to manage, prepare, and administer the online exam, as well as read the outputs of the test results analysis.
3. Universities use two types of processes to govern the virtual environment of the tests: control of the test characteristics and application settings, and technical procedures.
4. Improving the abilities and culture of question bank construction, as well as the quality and features of objective exam items.
5. Diversification of online formative assessment procedures (classwork) and dependence on the multiple-choice approach in final assessment (final examinations).

The study recommends educating students about academic integrity, research ethics, citing and documenting during lectures, and discovering available sources for use during testing. In addition to using essay-style questions in final exams with objectivity, asking practical questions that require higher mental treatments, and using assessment practices without exams during the semester that require interaction and cooperation between students in the completion of student projects. The study recommends focusing on test quality features to avoid cheating and transfer efforts rather than technological control measures for the virtual environment of the exams, attaining technical fairness, and protecting students' rights to safe access.

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Post-COVID Education: Virtualization as the Way Forward

Emenyeonu C. Ogadimma, Syed Hassan Raza, T. Serra Gorpe, and Farah Irshad

Abstract Online education has been in practice before COVID-19. However, COVID-19 pandemic has popularized online education. This study aims to explore the application of Process Virtualization Theory (PVT) in an e-learning process to gain new insights into the education context. Data was collected through an online survey from 362 university students in Pakistan. Results of the structural equational modeling indicate that eradication of digital divide can improve students' engagement in virtual learning environments and thus entrench e-learning as a viable mode of education. Thus, this study has unfolded the understudied factor of digital divide in a developing country setting. To this end, the study underscored the threatening potential of digital divide to e-learning. Furthermore, the study has validated the notion of PVT theory that when a virtual process or a system reduces the need for sensory requirements, there are more chances of adoption. For educational institutions, the findings recommend incorporating offline learner-material and interaction capability (e.g., feedback) in their e-learning management system to promote students' adoption of e-learning.

Keywords Online education · Post-COVID education · Virtualization theory · Vitualizability

1 Introduction

The education sector, especially teaching and learning, has continued to experience rapid changes due to evolving technologies. There is a clear paradigm shift from the traditional teaching method to a more technological one. In the traditional

E. C. Ogadimma (✉) · T. S. Gorpe
University of Sharjah, Sharjah, United Arab Emirates
e-mail: eogadimma@sharjah.ac.ae

S. H. Raza · F. Irshad
Department of Communication Studies, Bahauddin Zakariya University, Multan, Pakistan

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system, learners were more passive, and the educator was considered the transmitter of knowledge. In the new order, through the availability and use of technologies, students/learners become more active participants and consumers of knowledge. The internet has made education more possible and democratized through effective online education [1]. Nonetheless, issues like non-availability and reach of technology may inhibit e-learning [2, 3]. The opportunities in online education necessitated by COVID-19 pandemic need to be explored as they are expected to be standard practices in the future [4]. One such opportunity is virtualization. Virtualization is taking place in many contexts, including education (e-learning), shopping (e-commerce), and friendship development (social networking sites and virtual worlds) [4–6]. However, some processes are more amenable to virtualization than others. This is the case in e-learning. Hence study aimed to identify the factors that affected virtualization in e-learning among university students in Pakistan through an online survey. Process Virtualization Theory (hereafter PVT) describes how amenable a process is to being conducted without physical interaction between people or between people and objects [1]. For this study, e-learning process virtualization referred to the vulnerability of a student–teacher virtual interaction since literature has suggested that the virtual learning outcome can be evaluated based on the attributes related to the learning ability of students [2]. Furthermore, Scholars [1] indicated that formal education might be virtualized under certain situations and for subjects. Students' e-learning engagement in the virtualized learning environment can affect the student's performance [4]. Virtual outcomes are therefore determined by the e-learning process virtualization in the virtual learning environment. Consistent with this idea, the current study investigated the e-learning process virtualization as virtual outcomes. Therefore, the study employed process virtualization theory as an analytical lens to explore the factors that restrict or facilitate the e-learning process virtualization. The four primary constructs of the process virtualization theory are sensory requirements, relationship requirements, synchronism requirements, and identification and control requirements that affect whether a process is amenable or resistant to being conducted virtually [1, 3]. In the current study, the two primary constructs, the sensory and relationship requirements, are considered since the other two constructs do not have much relevance in e-learning and can be considered in future studies. Moreover, the study considered how representation and digital divide as two moderating factors affected the virtualization of e-learning. The paper overviews the PVT theory focusing on the e-learning process virtualization delineated in the following section.

2 Literature Review

2.1 Process Virtualization Theory

One influential and comprehensive theory is the Process virtualization theory (PVT) to describe virtual processes. The PVT, proposed by Overby [1], has gained attention in several domains such as e-commerce [5], health [6], governance [7], e-learning [2, 4, 8], and information technology [9]. The strength of PVT lies in postulating interaction and the tradeoff between more pragmatic factors in developing one's inclination towards the virtual process [5]. Secondly, the nature of constructs such as sensory requirements is very much applied in nature in several contexts [6]. Thirdly, based upon the above factors, PVT has parsimony and is suitable for explaining several attributes and expected relationships in different circumstances [7]. For example, PVT assumed that one's sensory requirement is a function of one's perception of the representation of the virtual process. There is an inclination to adopt a virtual process when that virtual process fits the practical requirement. Lastly, the PVT is a comparatively new theory; therefore, Overby [1] considered it timely in defining the phenomenon of virtualization. Although this theory has not been widely tested yet empirically [10], there have been many suggestions for its application in different settings. For instance, Graupner and Maedche [11] utilized PVT in the banking sector. Similarly, numerous scholars have enhanced it by turning it into a multiclausal mode for qualitative and quantitative research [7, 12]. Researchers found that virtualized processes have some limitations due to high sensory and identification requirements. Therefore, applying PVT in an e-learning process is a step in the right direction to gain new insights in an education context.

2.2 E-Learning Process Virtualizability

Virtualization theory advances the understanding of the willingness and participation of individuals in the virtual process [8]. In this regard, PVT proposed process virtualizability as the ability to perform a process without the involvement of any face-to-face interface among individuals or individuals and objects (e.g., computers). To this end, PVT outlines the critical factors in determining any virtual process's outcomes [9]. Overdi (2008) operationalized virtualizability based on either (a) the quality of the computer-mediated interaction between stakeholders or (b) the adoption of the underscored virtual process. Process virtualizability is proposed to tap attributes, including the extent of the likelihood of the adoption or quality of the process in question. Previous research indicated that virtual processes related to shopping processes, such as electric commerce [5], e-government [7], and IT adoption in the industry [9, 13], are amenable to virtualization. Given that students' e-learning engagement in the virtualized learning environment can affect the student's performance, virtual outcomes are therefore determined by the e-learning process virtualization in the

virtual learning environment [8]. Consistent with this idea, this study has employed process virtualization theory as an analytical lens to explore the factors that restrict or facilitate the e-learning process virtualization.

2.3 Sensory Requirements and E-Learning Process Virtualization

Sensory requirements are coined as one's requirements and expectations from the virtual process regarding broad sensory experiences related to the process, other stakeholders, and objects [6]. The PVT suggests that when participants engage in a virtual process, they presume to sense several sensory involvements, including (1) seeing, (2) hearing, (3) smelling, (4) touching, and (5) identification of other stakeholders (e.g., instructor). These sensory requirements diminish the usage of virtual processes [14]. The overall physical experiences of an individual would shape the extent of their involvement in the virtual process in question. For instance, higher expectations of these sensory requirements can result in affective dissonance. Ample research has affirmed that individuals with higher sensory requirements could engage less in the virtual process [11, 15]. These studies clarified that sensory characteristic function as the troublesome antecedent of the virtual process outcome [14]. In the context of e-learning process virtualization, several research studies have evidence that learner-material interaction is essential for effective learning [8]. The rationale is that the lower sensory requirement (SR) of a process, the more suitable it is to be done virtually and vice versa. Similarly, learning materials' audio and visual requirements could improve learning outcomes' quality [4]. As a result, it would be challenging to execute the more demanding sensory needs and manipulate physical objects in the virtual environment. COVID-19 has forced all educational institutions to adopt a virtual learning mode. A greater need for sensory requirements reduces virtual outcomes at different educational institutions [10, 12]. Based on this, the following hypothesis was stated on the sensory requirements for e-learning process virtualization:

H1: Sensory Requirements have a negative influence on e-learning process virtualization.

2.4 Relationship Requirements and E-Learning Process Virtualization

Relationship requirements (RR) are necessary for process participants to interact with one another in a social or professional environment [15]. Overby [1] asserted that social interactions allow people to gain information, build trust, and form friendships. When everything else is equal, a process with a greater connection will be more

resistant to virtualization [3]. As a result, the less virtualization-friendly the process is, the more participants favor RR. Prior research has indicated that RR negatively influences consumers' inclination to adopt digital procedures [2, 10, 12]. Relationship requirement evidence proves that the strong bonding between students and teachers may affect learning outcomes. Previous research has shown that student–teacher bonding improved learning outcomes and academic performance at all levels of school [16]. The research identified that the connection between trust and intimacy is essential in a virtual context [1]. A virtual environment, on the other hand, makes it difficult to build trusting relationships. Since all brick-and-mortar learning is being replaced by virtual learning in COVID-19, students and teachers have had a bond before commencing virtual learning. However, in informal education during COVID-19, the connection between teachers and students had already been created. Therefore, we proposed the following hypothesis:

H2: Relationship Requirements have a negative influence on e-learning process virtualization.

2.5 Moderating Effects: Perceived Representation of ICT Orientation

Overby [1, 15] refers to the moderating constructs as the characteristics of the virtualization process. There are three moderating constructs: reach, representation, and monitoring capability [7]. Each moderating concept positively impacts the relationship between major concepts and process virtualizability. Even though IT plays a crucial part in virtualized processes, not all processes are virtualized using IT [3]. Furthermore, according to Overby [15], process virtualizability may be positively affected by the moderation of IT factors. The role of the moderating IT-based constructs, such as the ICT orientation of a system, has been overlooked in past studies [10, 11]. Therefore, currently, moderating components of the PVT are re-conceptualized in this study. ICT orientation of e-learning management system is relevant to the research setting. Virtual processes have expanded in recent years due to advancements in IT, notably the internet. Process virtualization is therefore influenced by IT [2]. A process virtualization's initial IT component is representation, described as IT's ability to show process-relevant information, including simulations of people and things in the real world, their attributes, and how we interact with them visually. ICT capability was used as a representation for the current study [10]. Examples include the sensory components involved with an interaction between students and learning material that may be simulated using IT. Sensory requirements can be integrated into a virtual process using IT. Computer simulations may be more effective learning tools in certain situations than physical objects [6]. Literature is evident that a higher degree of representation by incorporating ICT-based features to address sensory requirements into virtual processes can enhance the chances of individuals engaging in the process [11]. Hence, building on the previous literature [11, 14],

the processes with better representation capabilities through ICT would positively moderate the primary influence of sensory requirement on process virtualizability. Thus, we hypothesize that.

H3: The perceived representation (ICT orientation) of the learning management system moderates positive nexus between sensory requirements and e-learning process virtualization; thus, higher ICT orientation leads to higher e-learning outcomes.

Similarly, a steam of research advocated that the representation capabilities of e-learning management systems can address the requirement of students to develop a relationship by providing them opportunities to interact with instructors [8]. Some studies also stated that interaction between students and teachers is indispensable for students and a critical factor in determining their participation in e-learning undertakings [8] [18]. The nonexistence of opportunities for such interactions causes students discontent and affects their active participation during e-learning [4]. Considering the e-learning setting, students who lack interaction capability in the e-learning management system start perceiving complications in developing and upholding relationships with teachers. Conversely, modern systems with these representation capabilities, such as question and answer, live lecture streaming, feedback facility, etc., lessen the feelings mentioned above. Therefore, we assumed the following hypothesis:

H4: The learning management system's perceived representation (ICT orientation) moderates the positive nexus between relationship requirements and e-learning process virtualization; thus, higher ICT orientation leads to higher e-learning outcomes.

2.6 Perceived Digital Divide

The PVT proposed a factor of reach and coined it as the capability of any virtual process that permits process participation [5]. For example, the internet connection availability and strength enable people to participate in a process. Thus, reach is a critical aspect while someone is undertaking the virtual process. Better reach can provide the flexibility to participate in a process (e.g., e-learning) anywhere in the world at any time [3]. To this point, reach is a key factor in determining process involvement across time and space. IT allows many educational processes to be conducted at any time and from various locations. IT facilitates a live, interactive session during virtual learning through Zoom, Google Meets, Google classroom, Second Life, and many other apps that allow people to interact, negotiate and give feedback in real-time. During synchronous virtual learning, IT-based virtual learning allows the connectivity between the dispersed students in real-time settings. Originally in PVT, reach moderates the relationship requirements and process virtualization linkage to determine the adoption and outcome of the process virtualizability [15]. For this study, the context of a developing country has been considered as reach is a critical issue, and digital divide prevails given poor connectivity and strength. The students residing

in developing countries have greater concerns about digital divide. Even when they have to participate in online classes willingly yet, they perceive digital divide (e.g., internet issues) as a major difficulty in attaining online education and thus become less inclined toward e-learning Process Virtualization; we, therefore, hypothesize that:

H5: Digital divide negatively moderates the positive nexus between relationship requirements and e-learning process virtualization; thus, a higher Perceived Digital Divide (PDD) leads to lower e-learning outcomes.

3 Method

The study used a quantitative online survey for the data collection. The use of online data collection is suitable as the context of this study is the virtual process. An online questionnaire was distributed among the university students currently or previously enrolled and using a learning management system. The sample was approached using university volunteers, lecturers, and online platforms. A filter questionnaire asked, "have you ever attended e-learning/online classes" with a request to terminate the participation in the survey if they never used—the learning system. In total, 362 responses were obtained. Most of the participants were 51.7% female and 48.3%, male. Most participants were aged between 18 and 23 (64.9%); most students were enrolled in undergraduate programs 58.8%). The majority reported monthly incomes between 25,000 and 50,000 PKR (32.2%) for the family income.

3.1 Instruments

The current research adopted the items to represent the variables underpinned in this study from previous literature [1, 12, 15] with slight modifications. All items were measured on the five-point Likert scale anchoring "1 = Strongly disagree to 5 = Strongly agree". Three items were used to measure each construct of Perceived Sensory Requirements (SR), Perceived Digital Divide (PDD), and Perceived Representation (PRICT). At the same time, four items were used to measure each construct of Perceived Relationship Requirements (RR) Process Virtualizability (PV).

4 Results and Analytical Strategy

The demographic analysis revealed that Descriptive analysis was carried out to prepare data for the SEM that involves; deletion of the outliers, normalization of data, and variance inflation (henceforth VIF) test. Consequently, 23 cases were removed

Table 1 Validity statistics

Variables	CR	AVE	α	PRICT	SR	RR	PDD	PV
Perceived representation (ICT)	0.81	0.59	0.84	(0.76)				
Sensory requirements	0.82	0.61	0.78	0.28	(0.78)			
Relationship requirements	0.83	0.55	0.89	0.29	0.56	(0.74)		
Perceived digital divide	0.82	0.61	0.76	0.17	0.59	0.31	(0.78)	
Process virtualizability	0.80	0.58	0.70	0.39	0.14	0.18	0.42	(0.76)

from the total of 362 cases to normalize the data due to outlier characteristics of these cases. Pearson's correlation matrix suggested a significant relationship between SR, RR, PDD, PRICT, and PV.

4.1 Confirmatory Factor Analysis

As mentioned earlier, SEM has been used to test the validity of the measurements involved in this study. Thus, the measurement model was initially tested for the goodness of fit test using the suggested six indices on AMOS. The results of CFA revealed suitable goodness of fit such as $\times 2/df =$, CFI = 0.92, NFI, TLI = , RMSEA = and SRMR = 0.061, NFI = 0.97, and RMSEA = 0.036. One item from the construct of the PV was deleted to attain the model fitness. Later, validities assessments were carried out, the constructs revealed decent loadings and resulted in satisfactory composite reliability, and average variance extracted was achieved. Following the item loadings, Fornell-Larcker criterion-based (henceforth FLC) values were observed to assess the discriminant validity. The values of the FLC presented in Table 1 revealed the adequate and recommended parameters (CR = $\geq$0.7 and AVE = $\geq$0.5). Besides, the square root values of AVE were found to be less than the correlation between five constructs, PRICT, SR, RR, PDD, and PV, and thus, the assumption of the discriminant validity.

4.2 Hypotheses Testing

We employed the CB-SEM method using AMOS software for the hypotheses analysis. Two hypotheses focused on the direct influence of sensory (H1) and relationship (H2) requirements on the e-learning PV, respectively. The results showed a direct and negative influence of the sensory requirement on the e-learning PV ($\beta = -0.23$), and H1 was supported. Likewise, results also verified that relationship requirement negatively influences—learning PV ($\beta = -0.31$), and H2 was supported. Overall, this model revealed a variance of 42%. Following the Preacher et al. [17] stage-wise moderation analysis approach, another model was run by adding three interaction

terms using the bootstrapping method. The conceptual model hypothesized the three moderations, and all were added in this model by computing the interaction terms such as (SR-X-PRICT), (RR-X-PRICT), and (RR-X-PDD) to test H3, H4, and H5. The results indicated that PRICT positively moderates (SR-X-PRICT $\beta = 0.36$) the sensory requirements (H3) relationship with e-learning PV. The results suggested that PRICT positively moderates (RR-X-PRICT $\beta = 0.19$) the relationship requirements (H4) with the e-learning PV. Finally, the results indicated that PRICT inversely moderates (PDD-X-PRICT $\beta = -0.26$) the relationship requirements (H5) relationship with the e-learning PV. Model 2 extracted a variance of 57%, and a 15% moderate change in the variance remained moderate. Hence H3, H4, and H5 were supported.

5 Discussion

In the e-learning process virtualization context, there is evidence that learner-material interaction is essential for effective learning [8, 16]. The rationale is that the lower sensory requirement (SR) of a process, the more suitable it is to be done virtually and vice versa. This was the case in this study where there was poor student engagement in e-learning due to a lack of material interaction. Therefore, better ICT representations can improve students' engagement in the virtual process of e-learning. More representation implies higher integration of multimedia facilities in ICT that can reduce or make up for the sensory requirements of the students (see Fig. 1). On relationship requirements, the findings of this study validate past research that indicated that RR has a detrimental influence on consumers' inclination to adopt digital procedures [2, 12]. This particular result is a pointer that relationship requirement—evidenced in substantial bonding between students and teachers—improves learning outcomes and academic performance at all levels of school [18].

Therefore, there is a need to increase the effort required to virtualize e-learning systems by providing apps that facilitate student–student, and student–teacher interactions, to diminish the participants' belief that relationships can be attained through

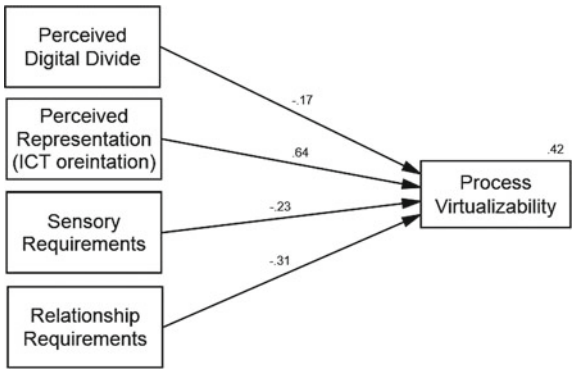

Fig. 1 Structural model

face-to-face only. It was evident from the result that digital divide serves as a negative factor as it decreases the probability of students' engagement in a virtual learning environment, especially in the case of developing countries. This supports the earlier assertion that Internet reach allows virtual process participation [5], i.e., internet connection availability and strength enable the students to participate in virtual education anywhere in the world at any time [3]. Thus, efforts should not be spared in providing accessible, adequate, and affordable internet to all, especially in developing countries. This will make e-learning affordable and worthwhile in developing (e.g., Pakistan) compared to the nations with higher income levels (e.g., UAE). Thus, the students and other stakeholders would evaluate the perceived utility of an e-learning system (e.g., a learning management system) in terms of its capability to provide an alternative but relevant and practical learning facility. Consequently, we conclude that better representativeness of ICT (learning management system) through incorporating multimedia components, recorded lectures, interaction with instructors, availability of online materials and options to ask questions and get customized responses from instructors, submitting assignments, and getting customized comments), and eradication of digital divide can lead to the thriving e-learning environment.

6 Conclusion

COVID-19 pandemic has unexpectedly forced educational institutions to adopt virtual management systems to endure academic activities. Several countries face severe challenges due to the lack of internet access, digital infrastructure, and unproductive learning management systems. This research fills this gap by underpinning PVT theory to understand how the virtual process requirements of the e-learning process outline students' involvement in effectively using the e-learning systems in place. This research provided a unique understanding of e-learning management systems to facilitate the educational institutions "going virtual." Two significant findings of the study are that better representativeness of learning management systems and eradicating the digital divide can lead to a thriving e-learning environment. Therefore, countries like Pakistan and UAE must focus on delivering learner material and the e-learning systems' attributes to ensure that the student's sensory and relationship requirements are contented. Thereby, improving interactive capabilities that can address such necessities are significant components of attaining an efficacious e-learning process among middle east students.

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Investigating the Impact of Extracurricular Activities on the Academic and Social Skills of University Students in Post-Covid-19: A Case Study

Amel Fawzi Zaki

Abstract In the aftermath of COVID-19, education has been disrupted worldwide. Universities had to instantly adapt to online education taking into consideration all the factors that foster success of education in such unprecedented circumstances. However, online education negatively affected students' academic and social skills. This study explores the impact of relaunching Extra-Curricular Activities (ECA) in the post-COVID-19 period on enhancing university students' academic and social skills. The ECA used is magazine writing; it was launched in March 2021 at the Arab academy for Science, Technology and Maritime Transport/Sharjah; the outcome was the first issue of the students' magazine *Ibn Majid*. The ECA aimed at enhancing students' academic and social skills and increasing their engagement in classes, which was drastically affected due to the isolation and social distancing of online education. The study is conducted on the students who took part in the magazine aiming at identifying their perception of their skills enhancement. It adopts a quantitative and qualitative analysis of students' answers to two questionnaires where they express the way they perceive their academic and social skills before, during and after online learning and upon joining the ECA. Findings show that students who joined this ECA experienced a productive learning environment that positively impacted their academic and social skills. Moreover, this project's outcome played a significant role in motivating them to take part in future ECAs. The study recommends more implementation of product-based ECAs as one of the significant solutions to the online education problems.

Keywords Academic and social skills · Extra-curricular activities · Post COVID 19 period · University students · Magazine writing · English language · IbnMajid

A. F. Zaki (✉)
Applied Linguistics and Head of Language Unit, College of Language and Communication, Arab Academy for Science, Technology and Maritime Transport, Sharjah, United Arab Emirates
e-mail: amelfawzi@aast.edu

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1 Introduction

Upon the declaration of COVID 19 as a world pandemic, the entire world undertook extreme safety measures to fight it and to minimize the risk of its spread [5]. Physical distancing, quarantine, school, and universities closure were among the safety precautions adopted by many countries. Though having a significant positive impact on preventing the virus from spreading fatally among people, this closure had a negative impact on several life aspects, on top of which is education. To sustain the educational process in schools and universities, most countries quickly adopted alternative means of instruction for their students, so they migrated to online education to secure an ongoing learning process for them.

1.1 Online Education Before the Pandemic

Online education has often been an optional method of learning; in other words, the demand for online education has always been rooted in the aim "to provide quality education to all students, regardless of location and time" [3]. Online learning has been targeted by learners who seek flexible learning environments, such as those who are hospitalized, seek high-quality education that is not available where they are located, have work commitments that prevent them from traveling for education, all of which have led to the growth in the amount of distance learning courses and programs that are offered [3].

1.2 A Subsection Sample

Having said this, it is of great relevance to throw light on online education during the pandemic and how its role has significantly changed from an optional learning method to a mandatory one. Owing to the COVID-19 pandemic, online education became the only means of education to students and learners of all age groups who suddenly became forced to migrate to this new system of education. However, it became normal to find resistance to this kind of education from students/learners of all backgrounds and all age groups. This resistance was manifested in their lack of motivation, disengagement, detachment, and reluctance.

1.3 Online Education During the Pandemic

Despite facilitating the educational and learning process, online learning left students and learners with significant problems that affected their academic as well as their

social skills to the extent that governments and universities started to worry about the resilience of education during the pandemic. Students started to face problems related to their social skills, such as rare outings outside of the home environment, lack of socializing through physical contact with their peers and classmates. They also developed some forms of loss in interest for attending online classes, indifference toward tasks, homework, and other related responsibilities.

2 Focus of the Study

The idea of this study stems from the above-mentioned discussion; the study seeks to explore the opportunities of eliminating the negative impact of the online education on students' academic and social skills, hence contributing to the resilience of education in emergency situations such as the pandemic. The current study argues that one way of enhancing those skills is relaunching extra-curricular activities and encouraging students to take part in them to increase their engagement and motivation, hence, overcome any drop that happens to their academic and social skills.

2.1 Academic and Social Skills

On the one hand, the Academic skills targeted in this ECA and in the current study is English language skills, such as reading and understanding, paraphrasing, summarizing, and using vocabulary related to general and specific topics. English is seen as a universal language when communicating and interacting [1]. English competency is a basic requirement in the students' academic development. It is with no doubt that English language skills equally as others have been threatened by the online education since they usually require special attention to be developed and maintained. The social skills on the other hand include Teamwork behavior, Self-development behavior, and interpersonal skills.

2.2 Research Gap

Research in online education has always focused on specific areas, such as material development, teaching methods, affordability of courses, and others. Online learners chose this mode of communication on their own, hence, problems with academic and social skills were not part of the potential problems that could be encountered. However, owing to the COVID-19 pandemic, online education became the only means of education to students and learners of all age groups. Little research has been done to explore how empowering students can impact their performance and enhance their learning abilities. This study argues that when students/learners develop

a sense of autonomy in learning, they feel more empowered and motivated, which in turn, guarantees a successful learning experience. The research investigates the means through which this learner autonomy can be promoted and takes the case of ECA as one of those means.

2.3 Description of the ECA

The ECA used in the current study is part of those offered by the Language Unit at the Arab Academy for Science, Technology and Maritime Transport, Sharjah Branch. The unit offers four main clubs that work on enhancing students' language and social skills, namely, Speaking club, Writing Club, Book Club, and Movie Club where students voluntarily join any of those clubs. The speaking club offers students insights on presentation skills, speech delivery, conversation skills, and debating skills. The movie club encourages students' critical thinking skills as they watch movies related to their fields of study and engage in a variety of discussions criticizing key themes in the movies, such as leadership skills, communication skills, decision-making skills, and above all language skills. The book club also encourages those who love reading to take part in reviewing books related to their fields or to their interests. Finally, the writing club works on magazine writing as a comprehensive task that integrates reading skills, research skills, summarizing and paraphrasing, interviewing. It also targets leadership skills, behavioral and teamwork skills.

The topics addressed in the magazine were chosen with the help of the students, and they varied from general topics to more specialized ones. Students were divided into groups; each group chose certain topics and worked on them as a team. They were given clear guidelines about the sources to consult and the techniques to use to add credibility and authenticity to their work. Some groups were responsible for interviewing key figures at their university, while others were responsible for interviewing one another to shed light on the talents they had. Among the topics addressed in the magazine are the biography of H. H. Sheikh Dr. Sultan Al Kasimi Ruler of Sharjah, Women empowerment, Sustainability in the maritime industry, interviews with key figures and talented students, description of their college life, sports and activities, and others. The outcome was the first issue of Ibn Majid magazine, distributed in print and electronically.

2.4 Aim of the Study

This study aims at exploring the students' perception of the impact of participating in the above-mentioned Extra-Curricular Activity (ECA) in the post-COVID-19 period on enhancing their academic and social skills, which were drastically affected due to the isolation and social distancing of the online learning environment.

2.5 Research Questions

The study poses the following research questions:

1. How do students perceive their social and academic skills in the online educational system?
2. How do students perceive the development of their social and academic skills upon participating in the ECA?
3. How much has the ECA contributed to improving their skills?

3 Materials and Methods

The data used in the current study is collected from the questionnaires' responses of a group of university students who took part in the afore-mentioned ECA. All students are enrolled at the College of Maritime Transport and Technology in Khorfakkan, Sharjah. Their ages range from 18 to 21 years old; they are males and females, and they all belong to Arabic speaking countries where Arabic is their first language and English is their second Language.

The current research uses a case study design. It is considered a predominant method of qualitative research [7], the use of a case study approach enables researchers to capture all the intricacies of a particular case, the effects of a phenomenon, or event in the lives of an individual or group in a specific context, and it enables the exploration of similarities and differences between cases [2]. However, owing to the argument put by some scholars that case studies can still integrate both types of analysis, the interpretations of the findings relied on quantitative analysis as well. [8], for example, does not recognize the boundaries between quantitative and qualitative case study methods; he maintains that "regardless of whether one favors qualitative or quantitative research, there is a strong and essential common ground between the two" [8]. He highlights the similarities between the two research traditions and specifies the common tools which can be functional and instrumental in the design and methods of case study.

The current study adopts an eclectic approach combining different research techniques and strategies from [4–6, 8], that best serve and support the aim of the current study. For the Case Study Design and Data Collection, [8] Case Study Research is followed. He specifies five main components to a Case Study Design; a study's questions; its propositions, if any; its unit(s) of analysis; the logic linking the data to the propositions; and the criteria for interpreting the findings [8]. Out of the six data gathering tools, namely, documentation, archival records, interviews, direct observations, participant observation, and physical artifacts, the current study uses participant observation which is consistent with investigating the students' perceptions of their own skills. As for the data analysis, [4] approach is more convenient as it offers flexibility to the process. She argues that data analysis is simply "a matter of giving

meaning to first impressions as well as to final compilations" (p. 71). She lists Two methods of data analysis, namely, Categorical Aggregation and Direct Interpretation, the latter is the one used in the current study. For Data Validation, [6] approach is adopted, where the researcher relied on long-term observation yearning for optimum improvements in students' academic and social skills.

A case study on a group of twenty-four students has been carried out. Students attended several meetings to receive instructions about magazine writing and other related skills before they started their actual work. They received ongoing supervision from the language Unit team to make sure they take the optimum benefit from all the phases of the magazine writing process. Students were divided into groups with one team leader in each group who was responsible for compiling his/her group's work.

Afterward, students were required to fill out two questionnaires about their perception of their academic and social skills before, during, and after online education and upon taking part in the ECA. This was followed by a quantitative and qualitative analysis of the students' responses to have a clear view of the impact of the ECA on their skills.

Instruments. Two questionnaires are used in the current study; one aims at investigating the students' perception of the impact of the ECA on enhancing their social skills, while the other aims at investigating their perception of the impact of the ECA on their academic skills. These questionnaires aim at helping the researcher trace the development and improvement—if any—of those skills after taking part in the ECA. They do not aim to compare online education to physical education which, the study argues, has been negatively affected by COVID-19 online classes. The number of students who responded to the social skills questionnaire is 22 while the number of those who responded to the academic skills questionnaire is 14.

Social Skills Questionnaire. The first questionnaire examines the students' perception and evaluation of their social skills before, during, and after taking part in the ECA. It investigates the following social aspects:

1. **Teamwork behavior**
    - Communicating with their peers to work on a specific task
    - Managing conflicts between group/class members
    - Maintaining a healthy teamwork atmosphere
    - Getting to know new colleagues and making new friends
2. **Self-evaluation behavior**
    - Having a sense of accomplishment
    - Feeling successful
    - Feeling appreciated by college students, instructors, relatives, and parents
    - Feeling encouraged to take part in the next issue of the magazine
    - Feeling motivated to take part in other ECAs launched by college

3. Description of the relationship's quality before, during, and after taking part in the ECA.

Academic Skills Questionnaire. The second questionnaire examines the students' perception and evaluation of their academic skills before, during, and after taking part in the ECA. It investigates the following aspects:

1. Reading and understanding
2. Summarizing
3. Writing
4. Expressing own points of view clearly and accurately
5. Gaining knowledge about new topics

Identifying new vocabulary and expressions about general as well as specialized topics.

4 Results and Discussion

Results of the two questionnaires show that students who joined this ECA experienced a productive learning environment that positively impacted their academic and social skills. Moreover, the outcome of this project, Ibn Majid Magazine, played a significant role in motivating them to take part in future ECAs. Examining students' responses carefully, it becomes clear that there is an increase in their tendency to take part in ECAs after experiencing online education. This indicates their awareness of the negative impact of online education on their performance and reflects their need for activities that would bring them back to their normal life. It is worth mentioning that responses less than or equal to 5% are not shown in digits on the pie charts as per Google Forms settings.

As far as teamwork behavior in social skills is concerned, and on a scale of Positively Affected, negatively affected/Had no effect, 80% to 95% of students' responses to the following areas came as "Positively Affected". The highest percentage of responses was "Positively Affected," followed by "had no effect." Negatively affected usually constituted less than 5% of the total percentage of responses. This is evident in the following extracts taken only as a sample for this finding from the social skills questionnaire responses, as shown in Figs. 1, 2 and 3.

As far as Self-evaluation behavior in social skills is concerned, and on a scale of "*Positively Affected, negatively affected/Had no effect*," 80% to 95% of students' responses to the following areas came as "*positively affected*". The highest percentage of responses was "positively affected," followed by "*had no effect*." Negatively affected usually constituted less than 5% of the total percentage of responses. These findings are further illustrated in Fig. 4.

When asked to describe how the ECA affected their social and academic skills, responses revealed that most students showed high self-accomplishment feelings and said they have benefited on distinct levels. They attributed this success to the

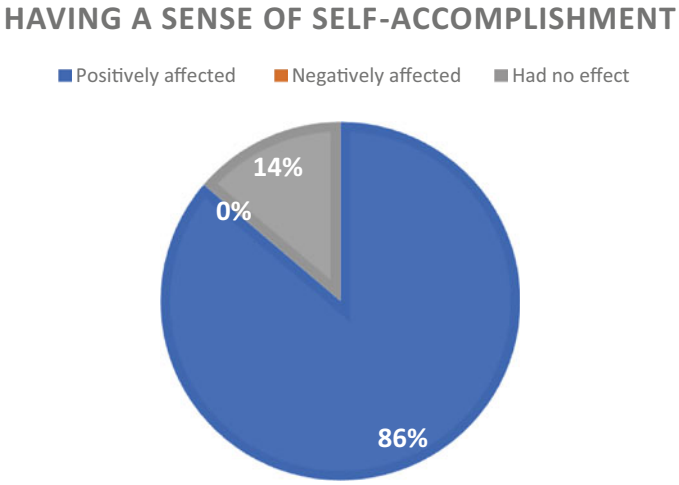

Fig. 1 Communicating with their peers to work on a specific task

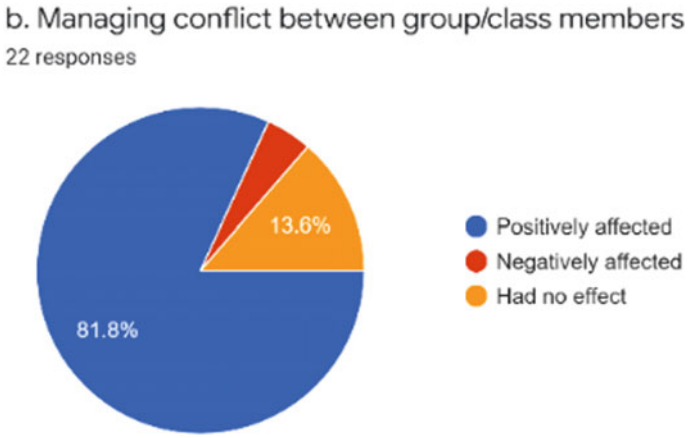

Fig. 2 Managing conflicts between group/class members

techniques and strategies used during the process of magazine writing, besides the encouragement and positive feedback they got from their peers and supervisors. Having a closer look at the lexical choices they made in this respect, we find that they mostly have positive connotations and implications. This is evident in the Figs. 5 and 6, which were collected from the social and the academic skills questionnaires.

"Develop language—increase knowledge—make friends", "Positively evolved", "Improved my academic skills", "Gained new information and new friends", "loved the teamwork and organization by the students and teachers", "I have grown in the spirit of social and scientific participation as well", "Actually for me, I have benefited

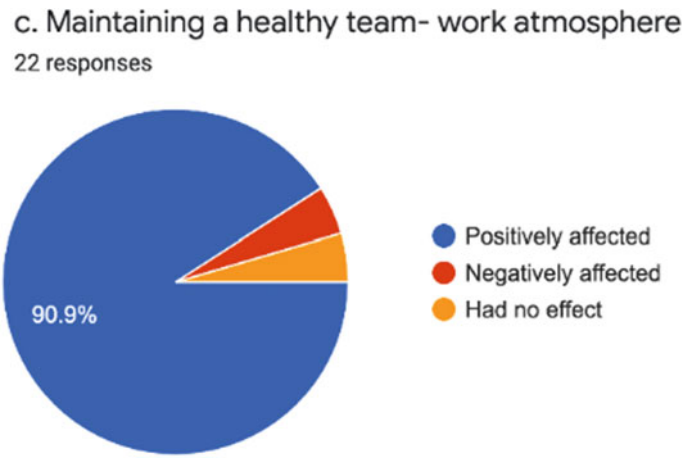

Fig. 3 Maintaining a healthy teamwork atmosphere

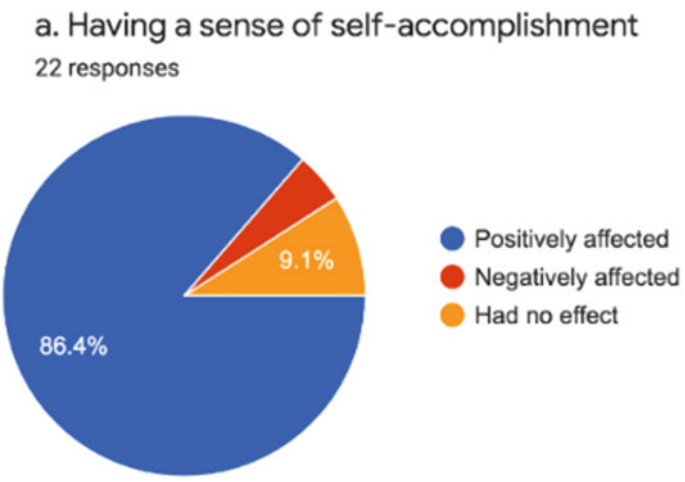

Fig. 4 Having a sense of self-accomplishment

many things, this experience change and improve my skills my writing how to manage ideas and group workings really I love this experience", "extra-curricular activities have greater academic success, greater character development, especially in the areas of time-management and leadership skills, more positive social development and greater interest in community involvement."

Upon having this quick walkthrough on the students' responses in both questionnaires, it is logic to argue that students' skills were clearly negatively affected by spending 3 successive academic semesters communicating only behind the screens and missing any chance to interact normally as they did before COVID-19. However,

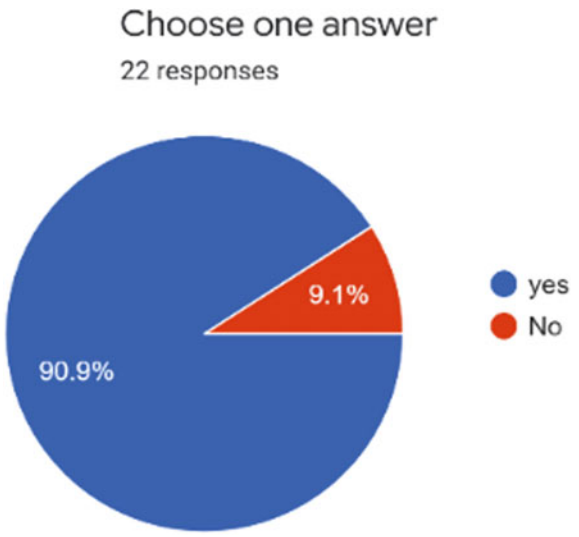

Fig. 5 Would you take part in the second issue of the magazine?

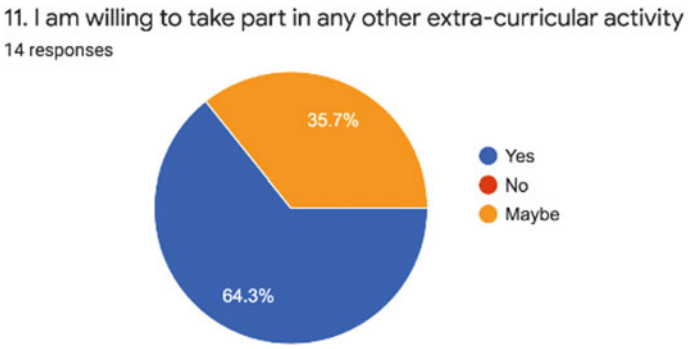

Fig. 6 Willing to take part in other extra-curricular activities

their responses later show that they can perceive a significant improvement in their social behavior, self-evaluation, and academic behavior. Moreover, 64.3% of the students confirmed their willingness to take part in future ECAs in general, while 90.9% of the students showed interest in participating in the second issue of Ibn Majid Magazine in particular. It is worth mentioning that results show strong achievement of the General Education Program PLOs which work on increasing students' knowledge about a variety of topics, enhance their communication skills with one another, develop self-autonomy, and show significant self-development in a wide array of skills. This makes ECAs an essential tool for securing competent, skillful graduates who are ready to conquer their career lives on a strong basis of all required skills.

5 Conclusions and Recommendations

The study recommends more implementation of product-based ECAs as one of the significant solutions to the educational problems caused by COVID-19 online learning system. The study also suggests doing more research on the effect of those extracurricular activities on the student's general learning behavior and attitude. Investigating the correlation between those activities and students' progress would provide insight into this area of study. More attention should also be given to student-centered programs that promote active participation with challenging and intellectually stimulating content that meets the needs of individual learners.

The study concludes that the students experienced an improvement in their academic performance on various levels. Language skills—research skills-paraphrasing, reading, and understanding, summarizing, and expanding their knowledge. Participation in extracurricular activities provides students with greater opportunities to interact with people outside their current social circle, thus contributing to increased friendship and social confidence development. This study also concluded that those students who were active participants have developed a greater feeling of responsibility and commitment.

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Rethinking Career Development Post COVID-19: The Career Profile of the Future Framework (CPFF), an E.I.-Based Human Skills Approach

Faouzi Bouslama, Lana Hiasat, and Christine Coombe

Abstract Presently, many organizations are going through a lot of changes brought about using emerging technologies, such as Artificial Intelligence (AI), Machine Learning, and Smart Automation, to streamline their businesses and improve productivity. Moreover, environmental factors, the COVID-19 pandemic, brought attention to the importance of mental health and Emotional Intelligence (E.I.). Therefore, several existing job roles are being redefined and many young professionals in non-supervisory roles are at risk of losing their jobs. These organizations are now more than ever very keen on identifying the required knowledge, attributes, and skill set, and links between personality traits and professional success. As such, there is an urgent need to address the gap in the knowledge and skills required by this transformation, identify the jobs to be retained in the current and future workforce and create plans to close any skills gap. This paper presents an innovative Emotional Intelligence (E.I.) based human skills framework to assess and map university graduates and young professionals into typical career tracks, and hence create a sustainable professional profile, especially in post COVID-19 era. The proposed framework, entitled the "Career Profile of the Future Framework-CPFF", has four dimensions: Knowledge, Attitude and Mindset, Skills, and Human attributes. This framework is expected to be an asset in assessing the knowledge and skills of university graduates and young professionals, and helping in finding answers to questions such as "How can I stay relevant, given that automation and AI can do the tasks related to my job?"; "What reskilling and upskilling in existing and new employment sectors do I need?", and "How can I identify the requirements to synergize my E.I profile while catering to my mental health balance?".

Keywords Career profile · CPFF · Framework · Knowledge · Skills · Attitude · Mindset · Human attributes

F. Bouslama (✉)
Computer Information Science Department, HCT, Dubai Men's Campus, Dubai, UAE
e-mail: fbouslama@hct.ac.ae

L. Hiasat · C. Coombe
General Studies Department, HCT, Dubai Men's Campus, Dubai, UAE

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1 Introduction

Presently, many organizations are going through a lot of changes brought using Artificial Intelligence (A.I.) and automation [32] to streamline businesses and improve productivity. With automation and AI implementations, today's workforce is experiencing significant disruptive shifts, with new roles being created, and other jobs and tasks being eliminated. The changes are impacting more employees at the non-supervisory and junior levels of the workforce.

In fact, organizations are now embarking on upskilling/reskilling initiatives for their employees and focusing more on those unique human cognitive capabilities that machines simply cannot master. Emotional intelligence (E.I.) skills are the one area that neither A.I. nor automation can easily reproduce. In fact, A.I. and automation will lead to a considerable increase in E.I., especially in sectors of the economy in the UAE such as service, banking, retail, and manufacturing. These organizations are now more than ever very keen on identifying links between personality traits and professional success.

Moreover, environmental factors, the COVID-19 pandemic, brought attention to the importance of mental health and Emotional Intelligence in maintaining a productive workforce. Organizations have been identifying solutions to challenges posed by COVID-19 and transforming themselves to reduce the gap in the required skills. In higher education, for example, universities adopted innovative approaches in instructional delivery, and teaching and learning to answer the needs for online course delivery while providing opportunities to improve mental health resilience and adaptability.

The capacity to receive emotions, simulate emotion-related feelings, understand the information of those emotions, and manage them is one definition of what has been termed Emotional Intelligence [22]. This form of intelligence has been the subject of many studies related to the workplace and particularly leadership qualities. It seems reasonable then to investigate the influence E.I. has on the performance effectiveness of especially fresh graduates and young professionals, and whether this contributes to their professional success. There is certainly enough evidence to investigate further the link between human skills, adaptation, and professional success.

In an ongoing HCT-funded research project [10], the researchers have developed a series of localized bilingual surveys used to assess the E.I. skills of students and faculty at the HCT Dubai Colleges. The skills in E.I. are important to know how to interpret our emotions to communicate with all stakeholders. In fact, having E.I. skills is especially important not only in education, but equally important in pursuing careers and seeking success and achievements. In fact, these skills can help them deal with challenges faced in changing working environments and needs in knowledge and skills. In Bouslama et al. [4], the researchers are presently involved in an interdisciplinary HCT-funded research project where they are investigating the influence of E.I. on the well-being and the preparedness of young professionals in organizations. The research project which is an extension of a previous work [6] aims at finding out whether this contributes to the retention and professional success of

these young professionals during the changes in the work environment and the fourth industrial revolution.

At the Higher Colleges of Technology in the UAE, one of the main pillars of HCT 4.0 is "No Emirati left behind" where HCT has the commitment to help secure jobs for the graduates and to make a positive contribution to the UAE society. However, as the UAE workforce transformation is accelerating, many roles in the job market are being redefined also with A.I. and automation, and this is expected to impact future job opportunities for these graduates as well as the workplace environments. As such, there is an urgent need to identify skills in the Fourth Industrial Revolution era, jobs to be retained in the current and future workforce, and to create plans to close any skills gap.

This paper presents an innovative Emotional Intelligence-based human skills framework to inform, raise awareness, as well as assess the knowledge and skills of job seekers, and help them create a sustainable professional profile, especially in post COVID-19 era. The proposed framework, entitled the "Career Profile of the Future Framework-CPFF," has four dimensions: Knowledge, Skills, Attitude and mindset, and Human attributes. This framework is expected to be an asset in assessing the knowledge and skills of university graduates and young professionals, and help in finding answers to questions such as "Do I have the appropriate knowledge, skills, mindset, and human attributes to get a job?," "How can I stay relevant, given that automation and A.I. can do the tasks related to my job?;" and "What reskilling and upskilling in existing and new employment sectors do I need?."

2 Work Readiness of Fresh Graduates and Young Professionals

2.1 Perceived Work Readiness of Fresh Graduates

Work readiness is defined as the abilities and functional skills needed to be successful. In a report on work readiness standards and benchmarks, work readiness was defined in terms of foundational cognitive skills and non-cognitive skills [1]. The non-cognitive skills include personal characteristics and behavioral skills crucial to one's success including work ethics, collaboration skills, professionalism, and adaptability. The traditional focus of tertiary educational programs is on cognitive skills. However, to graduate students who are work-ready, these programs need to equally focus on non-cognitive skills.

2.2 Soft Skills and Attributes Lacking Among Fresh Graduates

The Society for Human Resource Management found in a 2019 report that 51% of responses indicated that education has done little to help address the skills shortage that the industry needs. The top soft skills according to members are problem-solving, collaboration, and teamwork [31]. Employers seem to indicate graduates lack listening, critical thinking, communication, and interpersonal skills. The focus of tertiary education should be the development of skills that machines cannot perform.

3 Skills Shortages and Skills Mismatch Among Fresh Graduates

In McGuinness et al. [23], the authors provided a clear overview of the concepts in skills mismatch, a term which is very broad and can relate to many forms of labor market friction, and discussed the measurement and the relationships of the various forms of mismatch. This includes the vertical mismatch related to education level (over-education vs. under-education), skill gaps, skills shortages, horizontal mismatch relating to the area of study, and finally skill uselessness.

In fact, it is important to differentiate between the assessments of individual concepts of mismatch vs. those relating to an organization. As for an individual, the assessments are usually related to how close the education level or skill set maps to the ones required in the current job [7]. However, when the concepts of mismatch are looked at from an organization's perspective in terms of vacancies, it means how close the education and skill set of the job seeker meets its requirements which includes an assessment of over-education, over-skilling, a horizontal mismatch, or skill obsolescence due to changes in the work environment.

As per McGuinness et al. [23], the last mismatch related to human capital has not received enough attention in the research community and needs more focus. This is due to the negative impact on productivity and the need for a large investment in training and professional development. In addition to education and skills, it is especially important to focus on two more additional dimensions which are the attitude and mindset as well as the human attributes of an individual which are elements of the proposed framework.

4 Upskilling and Reskilling of Young Professionals

4.1 Skills Gap

The need to reskill your professionals comes as we realize our graduates are well prepared to succeed as students but not in the changing workplace. The skills and competencies in the workplace are constantly changing, and it would be futile to keep updating the curriculum to meet the industry's changing needs. In a recent forum at Expo Dubai 2020 hosted by the Higher Colleges of Technology entitled '2nd Annual InnCuVation forum', academics and industry partners met to discuss this very issue of the skills gap and meet industry needs. Industry experts agreed that a focus on soft skills is needed, and they also emphasized the importance of developing graduates that can quickly adapt to the changing learning environment. The two critical skills that industry experts emphasized were flexibility and adaptability to change rather than a focus on pure knowledge acquisition.

4.2 Training and Professional Development

Current training and professional development for educators focus on technology implementation to teaching and curriculum development. A recent search of the offered professional development in our tertiary institutions (Feb. 2022) showed that the 128 offered training educators are in the areas of educational technology tools such as Kahoot, Nearpod, Book widgets, Microsoft Teams, Camtasia, etc., or how to design the online class. The focus was on learning instruction for the online class and the implementation of tools for the Blackboard learning management system. Training for the development of skills or competencies was lacking. There is a strong need for such training for educators to understand the changing nature of the work environment and refocus the training on how to develop critical skills in skills to graduate with a mindset of flexibility and adaptability.

4.3 Ability to Unlearn and Relearn

Education programs were preparing students with the ability to learn. However, they fail in teaching them to unlearn and relearn which critical competencies to succeed in an uncertain future. Warrell [30] explained what this unlearning and relearning mindset means by stating that in today's accelerated changing work environment learners and educators alike need to embrace the discomfort that comes with letting go of the old and going through the pain of constantly learning the new relevant competencies. Warrell [30] provides several approaches to developing the skills of unlearning and relearning. The first approach is to challenge one's assumptions and

mental models that may be holding one back. The second approach is to be curious. As adults, we tend to stop or put brakes on our curiosity, and we stop asking questions. Warrell [30] emphasized that our learning is capped to the extent of the questions we ask. The third approach is to always be humble, learn with humility, and be open to learning which is the growth mindset that educators need to focus on in their programs. The fourth approach is to practice 'De Vuja' and consult your 'future self' by looking at an issue from a future perspective. The last approach is to be able to truly embrace the discomfort of change. Warrell [30] prompts us to ask the question as educators and lifelong learners: What do you need to unlearn and relearn?

4.4 Challenges in Career Path and Holistic Development

There are many challenges that a graduate would face in their career development. Some of these challenges include the skills that need to be relearned or unlearned, other challenges could come from embracing uncertainty and continuously fast-changing work environments. Career mapping, therefore, becomes a complex and ever-changing activity. In an international conference hosted by the Federal Authority of Human Resources in the UAE (FAHR), Billeh [3] listed three steps for career mapping: self-assessment, individualized career map, and exploring other opportunities. The exploration of opportunities is a critical skill to prepare graduates because the traditional challenges that Zidle [33] listed of career paths including promotion challenges, diplomacy, and onboarding are not today's challenges that one would face. The more difficult challenges stem from the need to have a growth mindset and several paths for one's career.

4.5 Need for a Framework

Today's competencies have changed, and educational institutions need to modify their programs to prepare for the holistic development of graduates rather than a pure focus on knowledge acquisition. However, frameworks that address multiple career paths in one's work life cycle do not exist. Traditional career mapping would map skills with the work needs. However, these skills would become irrelevant once the work environment changes. The proposed framework is to address the gap for tertiary institutions to prepare graduates that are future-ready rather than ready to meet certain industry needs.

5 Creating the Career Profile of the Future Framework-CPFF

By the time of graduation, students from higher education institutions usually should have acquired knowledge, abilities, and skills which constitute the main ingredients for success in a person's career. Employers are keen on hiring the best candidates who can perform the job responsibilities, be ready to assume roles from day one, and add value to the organization.

The objective of the proposed Career Profile for Future Framework (CPFF) is to inform job seekers, such as fresh university graduates, about the type of knowledge, skill set, attitude and mindset, and human attributes that they should be aware of to be better prepared for job search and interviews. Self-awareness and assessment of one's knowledge, abilities, and skills should allow the person to pursue a successful career journey to maturity and excellence. The following sections detail the four dimensions of the proposed CPFF.

5.1 The Knowledge Dimension

Many distinct types of knowledge figure prominently in careers skills development and form part of our CPFF.

- *General Knowledge*: A dictionary definition of general knowledge [16] is information on a wide variety of topics that a person collects gradually over a period of time. The sources of this information come from activities like reading and watching television and consist of general information rather than detailed information on subjects that a person has previously studied. The amount of general knowledge that a person has is important for career skills development as it is said to open different paths to learning and it is helpful in identity creation from a young age. As far back as 1904, Spearman found that "general intellectual ability was the most established predictor of occupational and educational measurement" (Spearman, 1904 as cited in Chammorro-Premuzic et al. [8, p. 1]). Research has also shown a link between general knowledge and many other skills and abilities, among them IQ, abstract reasoning, and personality [8].
- *Field-Specific knowledge and Subject-Matter Knowledge*: Field-specific knowledge and subject matter expertise are other types of knowledge that individuals develop throughout their lives and as they progress in their chosen career path. Sometimes people with advanced knowledge in a specific field are called subject matter experts. When individuals can combine their field-specific knowledge and subject-matter expertise with their background or general knowledge and use this combined information to understand better, this is called schema theory in the literature [27]. This background knowledge acts as a type of scaffolding, which allows an individual to build on existing information they already possess which of course results in a better understanding and a better memory of the contents,

concepts, and materials. In more simple terms, Piaget and Cook [27, p. 7] called schema "the basic building block of intelligent behavior—a way of organizing knowledge".

- *Linguistic Knowledge*: Knowledge of multiple languages can be an advantage to prospective job seekers thanks to our increasingly global economy. They are seen by many as being an asset when applying for jobs, looking impressive on a CV, and in many global contexts are a necessity in certain fields. In a very engaging article in Forbes magazine, Hulett [19], President of Language at Rosetta Stone Inc., states that "being able to speak a language that's in demand may even result in a promotion or a higher salary, especially in a competitive industry like the technology sector" (p. 1). According to Global Scotters (n.d.) [17], other advantages that result from increased linguistic knowledge and having proficiency in more than one language include: knowing a second language helps you know more about your native language; knowledge of a second language makes you a better decision maker, problem solver and increases your creativity levels; and increased linguistic knowledge and second language skills, helps you build better relationships as language learning also facilitates a better understanding of someone's culture and their perspectives.
- *Knowledge about the teaching and Learning Process*: Another type of knowledge that is critical for those going into education and most particularly the teaching profession is knowledge about how teachers teach and how learners navigate the learning process. Although the combination of general and field-specific knowledge and subject matter expertise is important when imparting knowledge, it is not likely to be effective if the educator lacks appropriate mechanisms to facilitate the teaching and learning process for their students.
- *Knowledge about the Society in which we Live and Teach*: According to Snoek's (2013) [28], contributing elements of professionalism, for an individual to have high professionalism levels, it is important for them to have knowledge about the society in which they work and function as professionals as well as knowledge about how to navigate the policies of the country and/or employment context.

5.2 The Skills Dimension

Many diverse types of skills are critical in career skills development and form part of our CPFF.

- *Time Management Skills*: *With time management skills, a person can manage time effectively so that they allocate the right time to a project activity, knowing that time is always limited*. This involves the balancing of various demands such as those encountered at work, in personal life, and in other commitments. Effective time management includes skills in effective planning, setting goals, objectives, and deadlines, prioritizing tasks, and other activities [15]. It is especially important for graduates and young professionals to know how to distinguish between Urgent and Important tasks, from those which are not urgent but Important, or Urgent but

Not Important, or finally those which are Neither Urgent nor Important. Stephen R. Covey in his book on 'The 7 Habits of Highly Effective People' presented a matrix of importance vs. urgency used in deciding where to invest time and effort. He emphasized in his approach to effectiveness in planning and achieving goals the balance between obtaining desirable results and care for how to produce those results [12].

- *Teamwork*: This is the second important attribute in the Skills dimension. It refers to a person being able to collaborate in a team to achieve a common goal or complete a task in an effective and efficient way. The concept of a team is different from a group of people working together as the former relates to interdependent members working in harmony to achieve a common goal [13]. Of course, for a team to work in harmony there are certain characteristics that a team must have. This includes skills such as communication (addressed in Dimension 4 of the CPFF), challenging work and commitment, and finally accountability (Work Ethic-Dimensions 2 and 3 of the CPFF).
- *Career-specific Skills*: A person acquires and develops over the years panoply soft and hard skills including soft skills such as time management, teamwork, adaptability, creativity (Dimension 4 of the CPFF), and hard skills such as computing and digital literacy (Dimension 2 of the CPFF), data analysis, math, and statistics, etc. Career-specific skills are those abilities that allow the fresh graduate applying for a job to perform the job responsibilities in the best way and to complete the job requirements. Many career-specific skills are acquired in life and while attending education; however, many other skills are obtained through job experience, professional development, and training. Many of the soft skills are transferable in any type of job. On the contrary, hard, or technical skills are related to a specific job or task.
- *Digital Literacy*: As per the United Nations Educational, Scientific and Cultural Organization (en.unesco.org), digital skills are critical for jobs and social inclusion [29]. The report defines digital skills as a range of abilities to use digital devices, communication applications, and networks to access and manage information [29]. These skills enable a person not only to create and share digital content but also to communicate (Attribute in Dimension 4) and collaborate (Dimension 2 related to Teamwork) and solve problems (Attribute in Dimension 4 related to critical thinking). Digital skills are enablers in developing someone's career, helping solve problems, and creating self-fulfillment in the workplace and personal life. A fresh graduate is usually able to demonstrate entry-level digital skills, however, these skills grow to become advanced as the individual engages in more learning, unlearning, and relearning (Attribute in Dimension 3 on Attitude and Mindset) as disruptive changes in work environments, such as the use of Artificial Intelligence and Automation, are modifying the required skills set needed for the twenty-first century digital economy.
- *Work Ethic (Actual Physical Follow Through of Doing the Work)*: For fresh graduates and young professionals to self-develop and thrive in interrelated businesses and societies, they need to use their skills and abilities while believing in work as a moral good. It is important to understand the set of values centered on the

importance of doing work and how a person handles his or her responsibilities while seriously doing the work. It is especially important to believe in how an excellent work ethic motivates people and makes them ready to be professional in the workplace.

- *Philanthropic/Volunteer Outreach*: Another skill that is especially important to allow someone to thrive in his/her career is philanthropic and volunteering work. A successful professional should want to help others while promoting everyone's welfare. He or she is expected to contribute to the charity of worthy causes. Not only money but equally important is the donation of a person's time, efforts, and talents to help others such as people in need of help. In Nikzad-Terhune and Taylor [25], the authors conducted a research study on community engagement and philanthropic learning. They discussed how the philanthropic learning have gained traction in university settings as a method to help prepare students for both workplace competency and citizenship. They examined the impact of experiential student philanthropy as part of a graduate course as a learning method that offers students an opportunity to examine community and social issues in organizations.

5.3 The Attitude and Mindset Dimension

The attitude and mindset dimension includes several important skills that a future-ready student needs to develop. The first important skill relates to the ability to learn new things, unlearn what is no longer of use, and relearn from a unique perspective. The second important skill development in this area is passion. In the World Economic Forum (2019), Menon [24] described the 4th industrial revolution jobs as mostly automated but experts advised to focus on one's passion to continue to be relevant.

In an interview on the Saudi vision of 2030, Saudi Crown Prince Mohammed bin Salman [2] emphasized the importance of passion at work stating that merit and efficiency are basic competencies at work but being passionate is motivation to act. The third area in this dimension is work ethic and professionalism. This is defined in terms of mental attitudes and values stemming from well-founded standards of what is right and wrong and a set of acceptable standards in societies. These standards could differ from one society to another, however, there are some standard values that need to be developed and accepted universally. The top eight work ethic values that need to be developed according to the Indeed career guide include the following: reliability, dedication, discipline, productivity, cooperation, integrity, responsibility, and professionalism [20].

5.4 The Human Attributes Dimension

Many distinct types of human attributes are necessary for a successful career path and form part of our CPFF.

- *Emotional Intelligence (E.I.)*: For a person to have a successful career path, he/she needs to have human attributes such as emotional intelligence. He/she needs to acquire and develop over the years panoply emotional intelligence skills including self-awareness, self-management, relationship awareness, relationship management, mood, and adaptability. These abilities allow the young professional to succeed in a job search and perform the job responsibilities in the best way. In Dimension 3 on Attitude and Mindset, a person is expected to be able to learn, unlearn and relearn. However, when considering the learning process, it is well known that it rarely occurs in isolation, and so our ability to accurately perceive how others feel or react may also be an indicator, or at least a contributor, to success. The capacity to receive emotions, simulate emotion-related feelings, understand the information of those emotions, and manage them have been the subject of a wide range of studies in what has been termed Emotional Intelligence (E.I.) [22]. This form of intelligence has been found to be the subject of a wide range of studies related to the workplace, especially in leadership roles, teaching, and learning [9–11], where a lot of success in performance was attributable to E.I. Emotional Intelligence (EI) is defined by Goleman [18] as the ability to realize your own emotions and those of others, the ability to get self-motivated, and the ability to manage one's own emotions and relationships with others. Bouslama et al. [5] developed a localized six-quadrant model of Emotional Intelligence which features Self-awareness, Self-management, social awareness, Relationship awareness, Adaptability, and General Mood (see Fig. 1).
- *Leadership*: Northouse [26] defines leadership as "a process whereby an individual influences a group of individuals to achieve a common goal". In fact, having

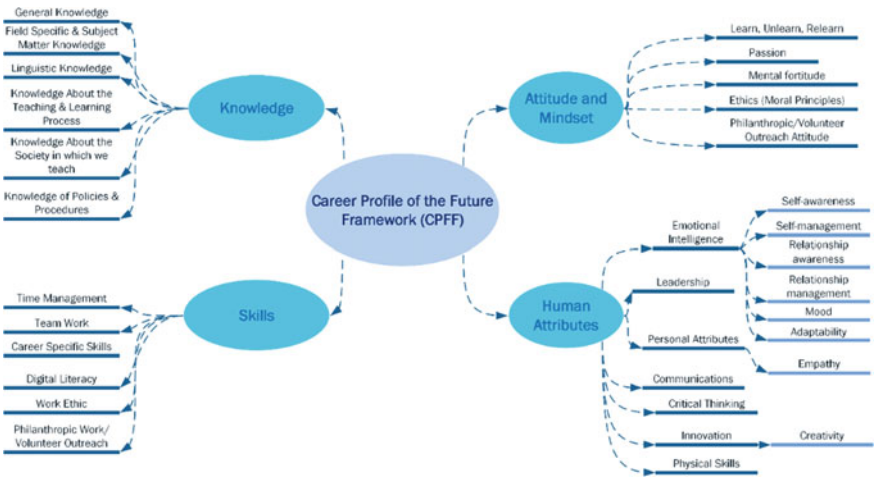


Fig. 1 The career profile of the future framework-CPFF (Bouslama-Hiasat-Coombe).

such a human attribute as a leader can inspire his team members to work in harmony toward achieving a common goal. The leader needs to have skills such as problem-solving, active listening, conflict negotiation, excellent communication, and other abilities and skills. University graduates start developing leadership skills while getting involved in course projects and extracurricular activities such as volunteering outreach (Dimension 2).

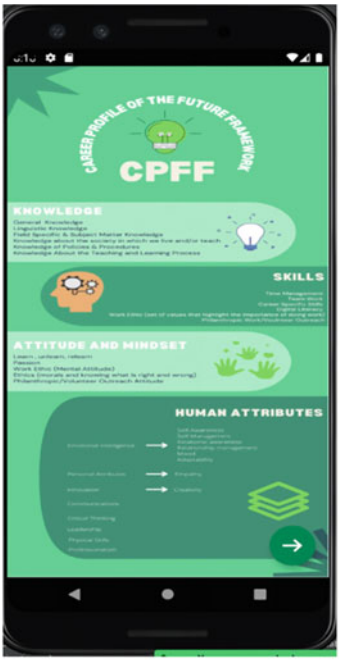
- *Personal Attributes*: As per Indeed.com, the American worldwide employment website for job listings and the Job search engine, personal attributes are particularly important human traits that define the personality and the approach to work or a situation of a person [21]. The job market nowadays is highly competitive and there are many challgences facing the fresh graduates and young professionals. Having the right personal attributes can help a lot in securing jobs. In fact, employers are keen to hire job candidates who can exhibit personal attributes such as being optimistic, motivated, and adaptable. Also, it is especially important to demonstrate human attributes such as taking initiative and being willing to learn, unlearn and relearn (Dimension 3). Moreover, a desirable personal attribute that your professionals need to develop is resilience. As the work environments keep being disrupted with AI and automation as well as downsizing, the ability to overcome such challenging changes at work while remaining in control of his/her emotions is certainly a desirable personal attribute.
- *Empathy*: Another human attribute that plays a key role in having a successful career is empathy. Though humans all have an inherent feeling of empathy, the capacity to really understand and or feel what the other person is going through differs from one person to the other. There are several types of empathy including cognitive, emotional, and somatic empathy. It is well known that practicing and demonstrating empathy in the workplace has many benefits. It creates a productive working environment while establishing good human relationships and interactions and can lead to more engagement and effective communication. Moreover, in design thinking when solving problems and creating proper solutions, the design process begins with Empathizing to move to defining and creating ideas and prototyping. Here, the ability to observe, interact, and immerse in understanding and determining needs is an especially important human attribute [14] as presented in the 'The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators' by Dyer J., et. al.
- *Communications*: To succeed in work environments and in teams, the ability to communicate properly and effectively is especially important. Effective communication can lead to better team collaboration and ensures everyone is well-informed and updated while increasing the level of confidence of the team members. University graduates and young professionals have usually developmental communications skills. They are required to work hard on this human attribute to progress in their careers. It is important to have good communication skills when they are in certain situations such as in meetings, brainstorming, providing feedback, negotiating, giving directives, crediting excellent work and achievement, or managing performances.

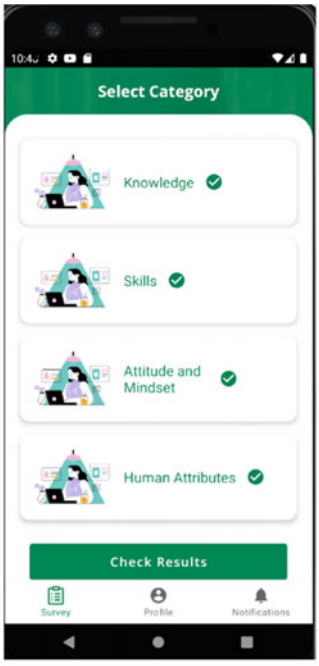
- *Critical Thinking*: Another human attribute that plays a significant role in career success is the ability to think and carefully question a subject, analyze it, and draw conclusions from the analysis. The thinking process should not be biased and prone to feelings. This is the ability of someone to think critically. Today's businesses are hiring graduates who have critical thinking as a human attribute. The expectation at work necessitates agility in looking at situations and problems as they arise, being able to analyze them, find solutions, and take appropriate decisions.
- *Innovation: Innovation is the key to continuity and prosperity in businesses.* Having the ability to innovate is a highly desirable human attribute sought by employers. The power to generate innovative ideas and create values and wealth can make a significant difference when seeking jobs and pursuing careers.
- *Creativity*: Creativity is the ability to produce innovative ideas that are useful to create new end products and services. Having a creative mind can transform and innovate the way businesses are done.
- *Physical Skills*: Another human attribute that can make a difference when seeking jobs is physical skills. It is about how accurately and consistently a person uses his/her in performing and completing tasks. These skills include body endurance to repetitive and demanding work, strength, stamina, power, coordination, agility, and other physical skills.
- *Professionalism*: Finally, Dimension 4 on human attributes includes professionalism. This is about a person being reliable, having ambitious goals, and caring about all aspects of work. Professionalism requires that a person be responsible, well-organized, and accountable.

The CPFF framework with all its four dimensions and sub-dimensions is shown in Fig. 1.

6 Implementation of the CPFF

To prepare for its use and implementation by the various service departments at Dubai Men's Campus and HCT system-wide, the research team sponsored two capstone projects of graduating students in the Computer Information Science (CIS) department where two teams of students gathered the functional and non-functional requirements, performed the analysis of the requirements and designed a solution, and then implemented the solution in the form of a mobile app for Android devices (see Fig. 2). The main objective of the mobile app was to raise awareness about the CPFF framework. Users of this app can self-assess their knowledge and skills on the four dimensions of the CPFF and receive assessment results and recommendations to work on their areas that need further development. The user of the app receives a certification of completion upon taking the interventions and completing a post assessment. Figure 2 depicts screenshots of the some of the developed GUIs for the app, and a sample of questions on how to assess the knowledge dimension.





Sample questions used for assessing the Knowledge dimension

Q1. Mohamed has just started a new job which requires him to write in English. Which type of knowledge would be most helpful to this task?

A. → General knowledge
B. → Specific knowledge
C. → Linguistic knowledge
D. → Knowledge about the teaching and learning process

Q2. Ahmed is applying for a job in the tourism industry in Dubai as he wants to serve as an ambassador to his country, the UAE. What type of knowledge would be important to him to serve in this role?

A. → Knowledge about the society in which we live
B. → Knowledge of policies and procedures
C. → Linguistic knowledge
D. → Field specific knowledge

Q3. Omar is currently an IT major at a local government university in the UAE. He wants to get a job with a famous company like Microsoft. Which type of knowledge should Omar highlight in his CV?

A. → His General knowledge of the world
B. → Knowledge of policies and procedures
C. → His Knowledge of the field IT
D. → Knowledge about the UAE

Q4. Amna, a recent graduate of business at a government university, has just accepted a job in a large UAE-based company. The HR department has advised her to become familiar with the general rules and guidelines of the company. What type of knowledge does she need to focus on?

A. → General knowledge
B. → Field specific knowledge
C. → Knowledge about the UAE society
D. → Knowledge of the company policies and procedures

Fig. 2 Developed CPFF mobile app and sample self-assessment questions

7 Conclusion

In conclusion, this paper presented an innovative framework that is based on four main dimensions. All these dimensions are important for individuals and organizations to address the urgent issues of hiring, skill gaps and mismatches, reskilling and upskilling, and career path planning and development, especially in post COVID-19 era. The CPFF is expected to play a key role in support of individuals seeking jobs and looking for a successful and sustainable professional career and profile. Moreover, this framework is expected to help support service departments at educational institutions such as Career and Counseling in providing informed support to students and alumni in finding answers to their questions, and properly guiding them in how to be ready for the job market and work environment disruptions.

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The Practices of Digital Citizenship Among Undergraduates at Sultan Qaboos University in Oman During COVID-19

Mouza Alsaadi, Nabhan Alharassi, Jamal Alsalmi, and Salim Alkindi

Abstract Digital citizenship (DC) has been an essential subject in educational research for the last few years. This study aimed at discovering the degree to which Omani undergraduate students practiced digital citizenship during the COVID-19 pandemic. The participants were 262 undergraduate students (116 males and 164 females) who took an online university elective course at Sultan Qaboos University (SQU) in Spring of 2021. The study adopted a quantitative approach to data collection to investigate students' digital citizenship practices. An online situational judgment test was developed and conducted to address six dimensions of digital citizenship: digital identity, digital civic engagement, digital ethics, digital literacy, digital safety, and global digital communication. The findings show that the level of practicing digital citizenship dimensions ranged from intermediate to low. Additionally, the results show that the least practiced dimensions are digital civic engagement and digital identity. Further, the results indicated some gender differences in students' practices of digital citizenship. Considering the results, more efforts are required from stakeholders to enhance the level of DC among undergraduates. The findings of the study are considered good indicators to be taken when designing and evaluating curricula at higher education institutions.

Keywords Digital citizenship · Higher education · Situational judgment tests · Undergraduates

M. Alsaadi (✉)
Information Studies Department, Sultan Qaboos University, Muscat, Sultanate of Oman
e-mail: s12788@student.squ.edu.om

N. Alharassi · S. Alkindi
Information Studies Department, Sultan Qaboos University, Muscat, Sultanate of Oman

J. Alsalmi
Library of Nizwa University, Nizwa University, Nizwa, Sultanate of Oman

S. Alkindi
Information Studies Department, Sultan Qaboos University, Muscat, Sultanate of Oman

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1 Introduction

Considering the tremendous transformation that COVID-19 has made in all aspects of life, digital citizenship practices have become a priority in daily life for most citizens around the globe who have Internet access. Throughout the coronavirus pandemic, people of different ages have been required to develop and use digital literacy practices to learn, stay informed, and connect with family, friends, and communities [10]. People have been forced to communicate and perform most of their life commitments online. This significant lifestyle shift has alerted governments to the necessity of empowering their citizens with the required digital competencies that enable them to communicate safely and effectively in the virtual world.

According to UNESCO [27], the COVID-19 lockdown obliged students of all levels in many parts of the world to utilize the Internet and digital tools as an essential part to continue their education remotely. Using social media and educational platforms was not optional; on the contrary, it became compulsory to proceed with the formal learning process in many countries. This experience revealed many issues related to students' responsible use of the Internet. Some of these issues were concerned with the lack of digital literacy, and some were related to digital ethics like copywriting and safety. This big shift forced educational authorities and other governmental institutions to take the responsibility for ensuring that students are fully aware of the appropriate norms and responsible behavior needed while using technology and participating in digital life. Curran and Ribble [13] emphasized the critical role those educational institutions play in empowering their students with the required digital competencies to participate effectively in their societies and the entire digital community. Although the topic of digital citizenship (DC) had been discussed years before the pandemic, COVID-19 has raised awareness of this issue among educators and decision makers.

According to the Council of Europe [12], digital citizenship refers to "the ability to engage positively, critically and competently in the digital environment, drawing on the skills of effective communication and creation, to practice forms of social participation that are respectful of human rights and dignity through the responsible use of technology." Alternatively, a digital citizen is someone who, through the development of a broad range of competencies, can "actively, positively, and responsibly engage in both on and offline communities, whether local, national, or global" [25]. According to Fingal [16], the International Society for Technology in Education identifies five main competencies of digital citizenship that students need to acquire to become digital citizens. Students must be inclusive, informed, balanced, engaged, and alert when using the Internet. Given these five competencies, educators need to be aware that their students.

1. Are open to hearing and respectfully recognizing multiple viewpoints and engaging with others online with respect and empathy.
2. Can evaluate the accuracy, perspective, and validity of digital media and social posts.

3. Use technology and digital channels for civic engagement, solve problems, and be a force for good in both physical and virtual communities.
4. Make informed decisions about how to prioritize their time and activities online and offline.
5. Are aware of their online actions (digital footprint and reputation) and know how to be safe and create safe spaces for others online [16].

Digital citizenship is recognized to be among the most researched topics in contemporary studies. Over the past decade, a large volume of literature has been published regarding DC in education [12, 22, 24]. These assorted studies cover all levels of education, starting from pre-school to the tertiary level. Many of these studies focus on k-12 students, curricula, and schoolteachers; however, the attention to DC in higher education is very new and limited, as Ahlquist [3] claimed. Moreover, the number of peer-reviewed studies regarding DC in higher education is also inadequate. In the Higher Education (HE) scope, several studies identify and measure undergraduate students' perception and awareness of DC such as Abdulqawi [1], Alsamadi [7], Kara [18], Erdem and Kocyigit [15], Alrashed [6], and Naji [23].

As the concept of DC varies from one scholar to another, different tools and instruments have been used to measure DC among undergraduates. Since Mark Ribble is considered the pioneer in constructing the concept and components of DC, it is not surprising to find that most studies and scholars stand on the work of Ribble's nine elements and adopt his framework of DC to build up their studies' tools [17, 22]. However, Ribble's framework of DC was proposed to students in the k-12 levels and not to university students. Therefore, there have been many attempts to develop new tools and scales to measure DC in the higher educational scope. These attempts appear in the work of Kim and Choi [20], Choi et al. [11], and Mahdi [21].

Overall, although there is a consensus among researchers that DC is important at all education levels, there is limited research exploring digital citizenship practices among university students. Besides, it appears from the previous review of the literature on DC in the HE domain that most of the studies focus on undergraduate students' understanding and perception of DC. However, the actual practices of DC have not been given much attention in research.

2 Research Problem

In Oman, developing citizenship stands as one of the main targets of Oman's national strategic plan, known as Vision 2040. Moreover, preparing the 'good citizen' is among the primary goals of Oman's educational system [14]. Regarding DC, this concept started to emerge in the Omani context within the last five years of the previous decade. The topic of DC received attention from the Omani government due to the increased rate of incidents related to cybersecurity, security breaches, and cybercrimes. Accordingly, national campaigns were launched to promote citizens' and residents' awareness of digital safety and personal digital data protections.

In addition, educational institutions launched similar campaigns for students and training courses for teachers. Although the main concern was digital safety, students at the school level gained more focus on these efforts. In the same vein, research regarding the perception of DC among students and teachers at the school level gained more attention compared with higher education levels. The available literature reveals that there is a lack of studies investigating DC practices among students in higher education institutions in Oman.

In March 2020, because of COVID-19, the ministry of education in Oman announced the end of the school year for students from grades 1 to 12. On the other hand, higher education institutions continued their academic year and shifted to online distance learning. Sultan Qaboos University (SQU) administration decided that all courses would be delivered to students online. Students were compelled to use virtual platforms and communicate with their teachers and perform all study requirements online. This big shift has undoubtedly affected the way students communicate and interact within the virtual community. This study investigates the practices of digital citizenship among undergraduate students at Sultan Qaboos University during COVID-19. This paper seeks to address the following research questions:

1. What has been the level of practicing digital citizenship among Sultan Qaboos University undergraduates during the COVID-19 pandemic?
2. Does the level of practicing digital citizenship differ due to students' gender, the field of study (humanities/sciences), or the year of study?

3 Methodology

This study adopted a quantitative approach to data collection by using a situational judgment test (SJT) to measure students' levels of practicing digital citizenship. This type of method has the advantage of surveying many respondents. SQU students represent the research population. Established in 1986, SQU is the biggest national governmental university in Oman. It has nine colleges (four humanities and five sciences) and the Center for Preparatory Studies [26].

The study sample covered 320 undergraduate students who took an online university elective course (COMP1002: Our World in 4IR Era) at SQU in the Spring 2021 semester. The content of the elective course is related to digital transformation in the world and how it affects human life. Students from all colleges can register for this course. This was among the rationales for selecting this specific course to represent the study sample. The link of the SJT was sent to four sections of students during their online class on the Google Meet chat box. Out of 320 undergraduates who registered for the elective course, only 262 respondents were received (116 males and 146 females). Table 1 shows the distribution of the study sample by gender and field of study.

Table 1 The distribution of the study sample by gender, field of study, and study year

Variables	Types	Freq.	Percentage %
Gender	Males	116	44.3
	Females	146	55.7
Field of study	Social sciences	129	49.2
	Applied science	133	50.8
Study year	1st year	74	28.2
	2nd year	80	30.5
	3rd year	60	22.9
	4th year and above	48	18.3
Total		262	100

3.1 Research Instrument

An online developed situational judgment test (SJT) was conducted to address distinct aspects of digital citizenship: digital identity, digital civic engagement, digital ethics, digital literacy, digital safety, and global digital communication. Twenty-six situations or scenarios representing the components of digital citizenship were presented to which the student responded according to a four-point scale. These situations were developed after reviewing educational literature related to digital citizenship in the context of higher education [11, 20, 23]. The test items were modified to suit the context of Oman. For each situation, a set of four options were presented to the students, who then chose the one which best reflected their behavior. Table 2 shows examples of two scenarios given to the students:

3.2 Validity and Reliability of the Pilot Sample

Face Validity: The research instrument was validated by 13 experts from the Department of Psychology and Measurement, the Department of Information Studies, and other experts in information technology from outside the university. They were asked to provide their comments, modification, and suggestions on the given scenarios and situations in terms of their clarity, suitability, the given grades for each option, and any suggestions that they deemed appropriate in terms of addition or deletion. Out of 30 items, four items were deleted.

Structural Validity: The structural validity of the scale constructs was measured by calculating the correlation coefficient between the mean values of the items with the mean values of the dimension to which it belongs. All values were above 0.41, which indicates a good correlation. Additionally, the Pearson correlation coefficient between the mean value and the mean value of the six dimensions of the scale was calculated. All results were significant at 0.01 and ranged from 0.46 to 0.73. The research instrument was administered to 60 students to check the reliability of the

Table 2 Examples of two situations given to students in the study instrument

		Level of practice
1	*In the digital content and posts in your social media accounts*	
a	You are always very keen on choosing the quality of digital content and its relation to your specialization and hobbies	Advanced
b	You have digital content and posts, but they are not related to your interest, specialization, or skills	Intermediate
c	Most of your posts are only comments on other people's accounts and posts	Low
d	You don't add any digital content or posts to your social media accounts	Very low
2	*During the elections for the Shura Council and the Municipal Council in the previous period*	
a	I promoted the election campaigns of the candidates representing my state on social media	Advanced
b	I expressed my views on the citizen's role in choosing a candidate through social media	Intermediate
c	I was following the progress in the election stages without any participation in social media	Low
d	I had no interest, participation, or expression of opinion during that period on my social media accounts	Very low

questionnaire. Then, the internal consistency was calculated using the Cronbach Alpha reliability coefficient, and the result was 0.73. This value indicated that this questionnaire was consistent and reliable to collect the needed data for this research.

4 Results and Discussion

4.1 Data Analysis

Data were checked for equality of variance, normality of distribution, and appropriateness to perform parametric tests. Figure 1 illustrates the statistical methods used to address each study question.

4.2 Level Categories

To identify the digital citizenship practices estimation-level categories, Table 3 shows these categories.

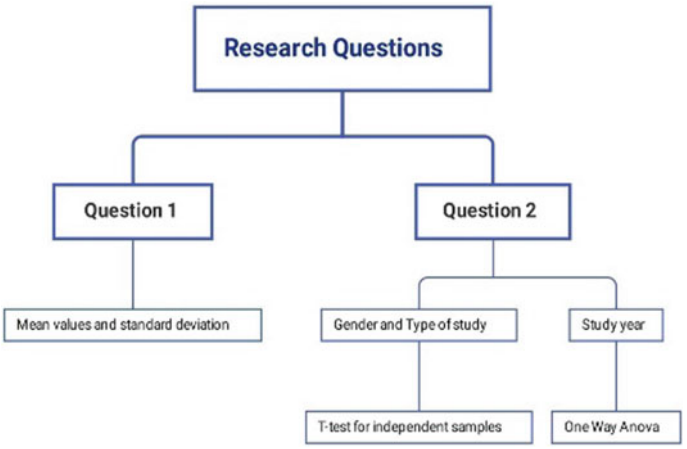

Fig. 1 The statistical methods used to answer the research questions

Table 3 Students' level categories of practicing in digital citizenship

Weighted average value categories	Practice level
1–1.74	Very low
1.75–2.49	Low
2.50–3.24	Intermediate
3.25–4	Advanced

4.3 Question 1 Results

What is the level of practicing digital citizenship among Sultan Qaboos University undergraduates? To answer this question, mean values and standard deviations have been calculated for all students' responses. Table 4 shows these results.

The results in Table 4 show that the total mean of practicing DC is 2.71, which is categorized as the intermediate level. The results also show that the mean values

Table 4 The level of practicing DC among SQU undergraduates

Dimension	Mean	Standard deviation	Rank	Practice level
Digital identity	2.54	0.61	5	Intermediate
Digital civic engagement	2.17	0.52	6	Low
Digital literacy	3.06	0.52	2	Intermediate
Digital ethics	2.82	0.53	4	Intermediate
Digital safety	2.87	0.54	3	Intermediate
Digital global communication	3.07	0.50	1	Intermediate
Total scale	2.71	0.32		Intermediate

Table 5 Independent sample t-test results due to gender variable

Dimension	Gender	N	Mean	Standard Deviation	Df	t-value	Sig
Digital identity	Males	129	2.4543	0.63484	260	−2.107	0.036*
	Females	133	2.6140	0.58859			
Digital civic engagement	Males	129	2.0948	0.54976	260	−2.016	0.045*
	Females	133	2.2257	0.49859			
Digital media literacy	Males	129	3.0261	0.57140	260	−0.826	0.410
	Females	133	3.0792	0.46857			
Digital ethics	males	129	2.7931	0.54800	260	−0.868	0.386
	Females	133	2.8499	0.50747			
Digital safety	Males	129	2.9685	0.54897	260	2.690	0.008*
	Females	133	2.7901	0.52086			
Digital global communication	Males	129	2.9720	0.50731	260	−2.780	0.006*
	Females	133	3.1421	0.47968			
Total scale	Males	129	2.6627	0.34046	260	−2.215	0.028*
	Females	133	2.7491	0.29088			

of DC's six dimensions range from intermediate to low levels (2.17 to 3.07). These results are in line with the results of Ke and Xu [19] and Al-Zahrani [9]. These results indicate that the practicing of digital citizenship among undergraduates is acceptable; however, it does not reach the advanced level. This result can be explained due to the weaknesses of the digital competencies related to practicing DC. It also indicates a gap in the perception of the digital citizenship concept. Students and universities tend to focus on technical skills only, rather than focusing on the practice of DC in classrooms. However, mastering technical skills is not necessarily sufficient to comprehend DC and enhance the level of practicing it [4]. Additionally, previous literature has revealed that university students' perception of digital citizenship was moderate [7].

It is also apparent from Table 4 that the dimensions of global digital communication and digital literacy received the highest mean values, which are 3.07 and 3.06. This result indicates that the students are aware of the global digital society and the trending issues that dominate the virtual world. Being part of the digital society forces the members to be aware of international events and react to global trends, especially those that are concerned with social issues and disasters. In contrast, the dimensions of digital civic engagement and digital identity were the lowest, with mean values of 2.17 and 2.54, respectively. Students tend to avoid participating in political and civic issues. This result is supported by the findings of Kara [18], who indicated that students do not participate in online political activities due to discomfort, fear of future consequences, and pressure from society. Another explanation for this result is that the culture of universities' policy regulations hinders students from participating in political issues [2].

4.4 Question 2 Results

Are there any statistically significant differences in the dimensions of digital citizenship practices due to student gender (male, female), the field of study (social sciences/applied science), and the year of study (1st year, 2nd year, 3rd year, 4th year, and more)?

4.4.1 Gender

The results in Table 5 demonstrate that there are statistically significant differences in practicing DC among Sultan Qaboos University undergraduates related to the gender variable. According to the total mean, females accomplished a better level of practicing DC compared to males. To be specific, the results also show that females got higher mean values than males in the following dimensions: digital identity, digital civic engagement, digital safety, and digital global communication. The same findings regarding gender differences are supported by Al-Omari [5], though they contradict the results of Alsamadi [7] and Alsulaihat and Al-Sarhan [8] which showed no significant differences between males and females. These contradictory results may be because females are more careful during online interactions regarding digital safety. This could further be related to the culture of the society where females should be more alert and careful when using social media and the Internet. Moreover, because of the COVID-19 lockdown, females usually spent more time on social media platforms. This allowed them to be aware of global and local issues that reach trends in social media and gave them the chance to communicate and engage more effectively.

4.4.2 Field of Study

As the data in Table 6 show, there are no significant differences due to the field of study variable regarding students' level of practicing digital citizenship on the total mean. As students in both fields do not receive any courses related to digital citizenship, it is expected that no significant differences in the total scale would be observed. The only exception, as can be seen from the table, is for the dimension of digital ethics, where results indicated that students in applied science colleges have a better level of practicing digital ethics compared with students in social sciences colleges. These differences can be explained by the fact that students in applied science colleges are more exposed to using digital programs and issues related to copywriters and digital data protection.

Table 6 Independent sample t-test results due to *field of study* variable

Dimension	Field of study	N	Mean	Standard Deviation	Df	t-value	Sig.
Digital identity	Social sciences	129	2.5795	0.60220	260	0.939	0.349
	Applied science	133	2.5083	0.62451			
Digital civic engagement	Social sciences	129	2.2124	0.52604	260	1.358	0.176
	Applied science	133	2.1244	0.52211			
Digital media literacy	Social sciences	129	3.0642	0.51658	260	0.262	0.794
	Applied science	133	3.0474	0.51779			
Digital ethics	Social sciences	129	2.7506	0.49646	260	−2.265	0.024*
	Applied science	133	2.8966	0.54454			
Digital safety	Social sciences	129	2.8872	0.53558	260	0.535	0.593
	Applied science	133	2.8515	0.54533			
Digital global communication	Social sciences	129	3.0853	0.49558	260	0.590	0.556
	Applied science	133	3.0489	0.50232			
Total scale	Social sciences	129	2.7158	0.30316	260	0.249	0.804
	Applied science	133	2.7060	0.32927			

4.4.3 Study Year

One-way ANOVA tests were conducted to examine the impact of the year of study on students' practices of digital citizenship. The data in Table 7 shows that there are no significant differences due to the year of study variable regarding students' level of practicing digital citizenship. This result can be explained by the fact that students in both fields do not receive any courses related to digital citizenship. Most programs and courses are directed at enhancing students' competencies and skills in using computers and technological tools. However, digital citizenship, as Buchholz et al. [10] argue, requires more than technical knowledge. A digital citizen must confront complex ideas about how identities are constructed, and how dialogue is held online as citizens work toward equity and change. Moreover, it is important that during the development of study plans, the content of the curriculum be supportive of empowering students with digital citizenship competencies that qualify them to practice their roles as citizens in the digital society.

Table 7 One-way ANOVA results due to the year of study variable

Dimension		Sum of squares	df	Mean square	F	Sig.
Digital identity	Between groups	0.275	3	0.092	0.916	0.434
	Within groups	25.806	258	0.100		
	Total	26.081	261			
Digital civic engagement	Between groups	0.316	3	0.105	0.278	0.842
	Within groups	97.915	258	0.380		
	Total	98.231	261			
Digital media literacy	Between Groups	0.804	3	0.268	0.973	0.406
	Within Groups	71.106	258	0.276		
	Total	71.910	261			
Digital ethics	Between groups	1.195	3	0.398	1.503	0.214
	Within groups	68.371	258	0.265		
	Total	69.565	261			
Digital safety	Between groups	1.975	3	0.658	2.423	0.066
	Within groups	70.109	258	0.272		
	Total	72.085	261			
Digital global communication	Between groups	2.175	3	0.725	2.531	0.058
	Within groups	73.880	258	0.286		
	Total	76.055	261			
Total scale	Between groups	0.719	3	0.240	0.964	0.410
	Within groups	64.112	258	0.248		
	Total		261			

5 Conclusion

Although the talk about DC in education has proceeded with COVID-19, this pandemic has accelerated the importance of acquiring and practicing digital citizenship dimensions among students. This paper sheds light on the practices of digital citizenship among undergraduates of Sultan Qaboos University in the Sultanate of Oman during COVID-19. In this study, a situational judgment test was developed to investigate six dimensions of digital citizenship practices: digital identity, digital civic participation, digital information literacy, digital ethics, digital safety, and digital global communication. The results revealed that the level of practicing DC is at the intermediate level. However, there are some dimensions, digital identity, and digital civic engagement that need to be developed. Students need to be more engaged in social issues and more exposed to global matters during their study years. It is important to ensure that the students practice digital citizenship, not just be aware of it or just acquire technical skills. It is also recommended that teachers and academics be trained to become aware of this concept and how to employ it through classroom activities. Moreover, the content of the curriculum and the extra-curricular activities

at the university need to be supportive of DC throughout the study years. Accordingly, the current study suggests an urgent necessity to include the dimensions of DC within the university's programs and the content of its courses. It is also important to note that we cannot generalize the current results of the study to other institutions of higher education in Oman as the learning environments and the quality of curricula may differ from one institution to another. Finally, more studies using different qualitative approaches are needed to investigate the practices of digital citizenship practices among teachers and academics in both private and public higher education institutions. Lastly, this study suggests a content analysis study to assess the availability of DC dimensions in a sample of higher education curricula.

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Learning Chemistry at the University of Sharjah: Before, During, and After the COVID-19 Pandemic

Abdel-Nasser Kawde, Abdelaziz Elgamouz, and Ihsan Shehadi

Abstract This study attempts to analyze the students' satisfaction with learning chemistry before, during, and after the COVID-19 pandemic at the University of Sharjah. Microsoft Forms were used to build the questionnaire and collect the data. The widely used online class applications are Blackboard Ultra, Microsoft Teams, Zoom, and WhatsApp Group features. Students had printed textbooks, e-books, and lecture notes posted under Blackboard contents as learning media. The Chemistry laboratories were carried out in a hybrid mode during the pandemic; 30% of the experiments were conducted face-to-face inside the University in an alternate mode, while the remaining 70% were conducted virtually using home-developed videos, McGraw Hill simulation, or Journal of Visual Experiments platforms. Most students experienced challenges implementing the online learning process, so they prefer the usual traditional learning methods. In addition, the assessment of the educational program learning outcomes (PLO) was measured over the last three academic years, 2019, 2020, and 2021. Results of such an assessment indicated that there is a decline in the skill outcomes B, C, and E during the COVID-19 era. The study recommends the adoption of Flex-Hybrid Classrooms, using interactive online class applications like face-to-face learning, as hybrid learning can contribute positively to the quality assurance process of the instructional methodologies. Chemistry Laboratories must be conducted in person to enhance the technical and hands-on experience skills of students. All classes, regardless of delivery mode, should be recorded, as they can contribute positively to the quality assurance process of the instructional methodologies and material deliveries.

Keywords Learning chemistry · COVID-19 · Hybrid · Virtual · Flex-Hybrid

A.-N. Kawde (✉) · A. Elgamouz · I. Shehadi
Pure and Applied Chemistry Research Group, Department of Chemistry, College of Sciences, University of Sharjah, P. O. Box 27272, Sharjah, United Arab Emirates
e-mail: akawde@sharjah.ac.ae

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1 Introduction

As defined by the World Health Organization (WHO), the novel coronavirus disease 2019 (COVID-19) is an infectious disease that causes infected people to experience mild to moderate respiratory illness. The virus originated in Wuhan, the capital city of China's central province, and started to spread exponentially all over the globe, leading to what the World Health Organization declared a pandemic [1–5]. Sending billions of people into lockdown, the virus leads to countless deaths, and presidents have declared their countries in a state of emergency, accordingly. The WHO further announced that no special treatment is required for people infected with the virus, as their immune system is sufficient to help them recover. However, people diagnosed with chronic or long-term illnesses such as aging, diabetes, cardiovascular disease, chronic respiratory disease, and cancer are at risk of developing severe sickness or even dying [6–8].

Higher education institutions worldwide, including the University of Sharjah, tried experimenting with distance learning using electronic means since traditional methods went against preventative measures [9–11]. Due to the severity of the effects of COVID-19 and the lack of knowledge about the disease, a major disruption in the education system resulted [12, 13]. Integrating chemistry education into the digital realm, with the help of electronic devices and special-sized software, resulted in self-build problem-based learning methods that proved to be interactive and effective [14, 15].

Another source of disruption in the education system was digital exclusion before the pandemic, where factors such as income, technology-usage skills, and the digital-utilization gap were contributors to the cause [16]. Before the pandemic, traditional chalk-and-talk methods of classroom interaction were the norm, with the laboratory and theory classroom layouts suitable for their cause. Using e-learning platforms was limited or optional. However, due to the unpremeditated situation of the COVID-19 pandemic, a mandatory transition to completely virtual learning techniques was perceived [17]. This transition led to the development of an effective distance learning approach by offering an improved learning management system (LMS). This will enable the implementation of a future blended classroom approach, using both the traditional and virtual means of learning [18]. The LMS software provides a tactical approach leading to managing and delivering online learning content more effectively.

Although several involved stakeholders, such as governmental authorities, students, parents, staff, and faculty were concerned whether the transition to virtual learning after a long time of traditional learning would produce desired results, the higher education sector was provided an opportunity for innovation during the testing times of the online learning approach. New challenges were anticipated from implementing the transition on a wider scale.

The public domain interrogated institutions about the quality of distance learning and teaching. This study aims to present further understanding of learning chemistry

before, during the lockdown, and after the COVID-19 pandemic. Moreover, associated challenges and COVID-19-induced opportunities will be discussed. In addition, the impact of the implementation of new methodologies on the PLO achievements is assessed using the capstone instruments and grade analysis over the past three years.

2 Research Methodology

We acquired a descriptive quantitative method using a questionnaire to assess the effectiveness of learning chemistry at the University of Sharjah. It includes questions on demographic variables (sex, level of education, digital means, and the Internet) and questions on the education method that students prefer to implement after the coronavirus lockdown. The students' perceptions of learning chemistry at the University of Sharjah were assessed on a five-step Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

The data was collected through an online survey using the Microsoft Office Forms tool conducted over 20 days (about 3 weeks) from February 17, 2022. It was conducted anonymously; no personal information has been identified.

The PLO assessments are conducted using Exit exams, Senior research courses, Industrial Training courses, exit surveys, and total grade analysis for students over the pre-, during, and post-COVID-19 era.

3 Results and Discussion

The demographic information included students' gender and year of study. About 71% female and 29% male students participated in this study. However, students were from all years of study: 74% of them were 1st-year students, where 14% were 2nd, 8% were 3rd, and only 4% were 4th-year Senior Students (Fig. 1).

Among the participants, 42% were from the College of Engineering, 33% from the College of Sciences, and 27% from the College of Medical Sciences. Thus, as

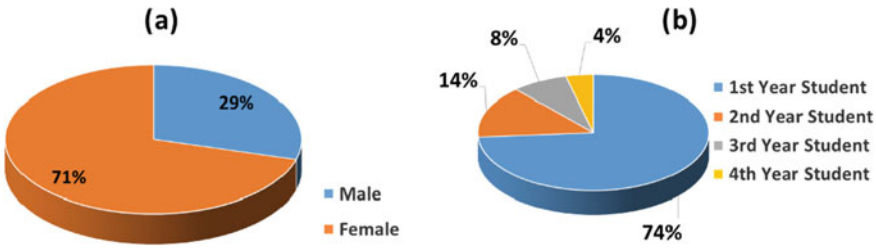


Fig. 1 Survey answers: Gender (**a**) and year of study of the participating students (**b**)

shown in Fig. 2, almost 40% of the participating students have an Engineering Major, 16% with majors in the Medical Sciences, and only 14% with a Chemistry major.

In response to the question Which chemistry courses are you taking? Fig. 3 shows that 66% of the participating students are taking General Chemistry 1, 11% are taking General Chemistry 2, 14% are taking General Chemistry for Medical Sciences, and 9% are taking other Chemistry Courses.

In response to the course mode of delivery and learning platform, 77% of the participants are taking Chemistry Courses online, 9% were hybrid, 8% in-person face-to-face, and only 6% were taking courses in blended mode. Figure 4 shows that the main LMS was BBU with 99% of the participants, and only 1% were taking courses via MS Teams.

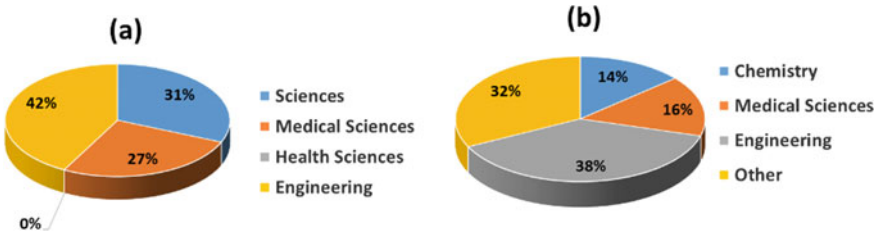


Fig. 2 Survey answers: College (**a**) and major of the participating students (**b**)

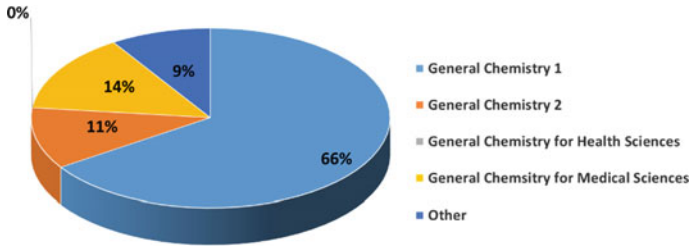


Fig. 3 Survey answers: The chemistry courses of the participating students

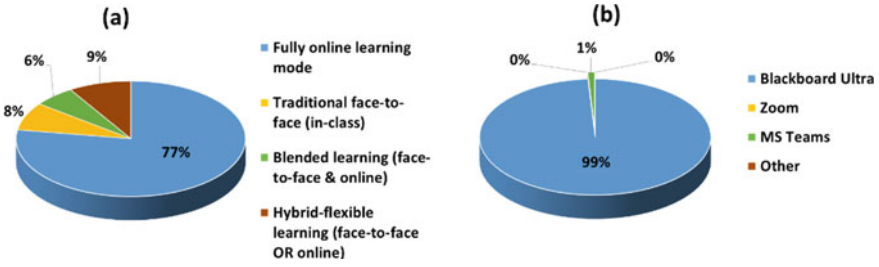


Fig. 4 Survey answers: The course mode of delivery (**a**) and learning platform of the participating students (**b**)

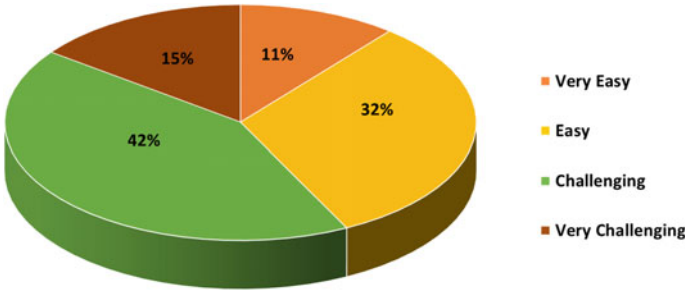


Fig. 5 Survey answers: The transition to virtual learning of the students who participated

In response to a question about how easy the transition was from the traditional face-to-face mode to a virtual learning environment, 42% found it challenging, 32% found it easy, very challenging for 15% of the participants, and very easy for 11% of them (Fig. 5).

On the other hand, in the response to how comfortable the e-learning tools used were, Fig. 6 shows that 30% of the participating students are very comfortable, 34% are somewhat comfortable, and only 6% are very uncomfortable.

Figure 7 shows that only 20% found the interaction with their instructors not easy or extremely not easy, whereas more than 50% found it extremely easy or easy. However, the interaction with classmates was extremely not easy for 14%, and 15% found it extremely easy.

Results of the response to the preferred learning mode of the participants during and post the pandemic are presented in Fig. 8. It is clear that even during the pandemic, more than 50 percent of the participating students prefer either traditional face-to-face learning or a hybrid-flexible learning mode. While, post-pandemic, 51% of the participants prefer traditional face-to-face learning, 33% prefer hybrid-flexible learning mode, which brings the total to 84% of students who prefer to come back to campus classes.

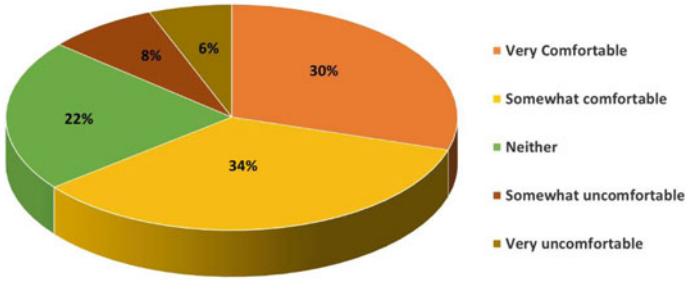


Fig. 6 Survey answers: The comfort of the participating students with e-learning tools used at the University of Sharjah

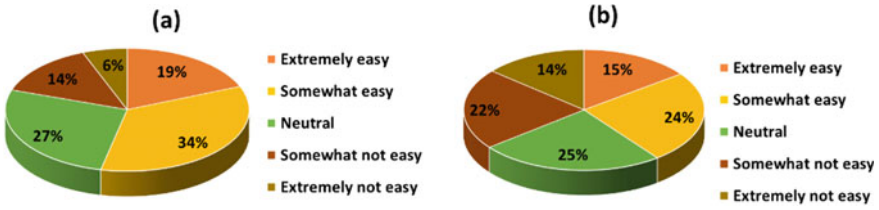


Fig. 7 Survey answers: The feasibility of interaction of the participating students with instructor (**a**) and classmates (**b**)

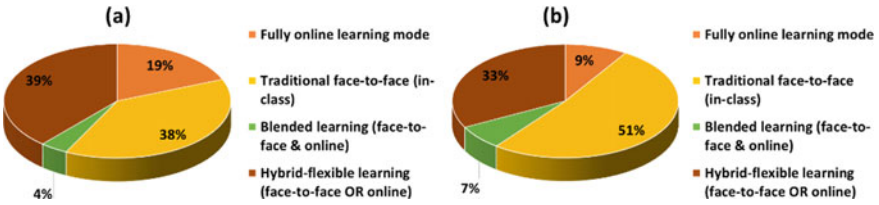


Fig. 8 Survey answers: The preferred learning mode of the participating students during (**a**) and post the pandemic (**b**)

In a response to the question "What would you say about your own experience in online/hybrid education in the courses you have taken?", 70 responses were obtained from which the following was quoted:

"Flexible time management and increased my awareness on time management."

"Extremely very bad experience, one of the worst experiences I have been through."

"It is easy and saves a lot of time."

"It was great for me since I live in Ras al Khaimah, online classes helped me mentally since I don't need to worry about going to Sharjah every day and I feel like it helped me with my grades last semester."

"I feel that the online education is better because whenever I want to study or if I didn't understand something I can watch the records easily."

"It is exceedingly difficult to adjust to. My marks get affected by it in a negative way."

"I graduated high school with amazing grades and almost had bright plans but, I do not know if it is my stupidity of not adapting and accepting the drastic new change or the fact that I genuinely enjoy studying with my classmates around me and the professor/Doctor in front of me supporting me. Either way, I am trying hard in all my courses, but it has been a real struggle... And I am just on a tight rope."

"The only advantage is that the lectures are recorded."

"Although most people will not share the same opinion as me, I found online education to be extremely convenient. Not having to commute saves me lots of time that I can reinvest into studying and maintaining a healthy sleep schedule. Since

my lectures are completely online and my labs on campus, I have no complaints regarding the mode of education."

"The first semester was hard since it was fully online, but the second semester was better because it was hybrid."

"I found it rather easy to adapt to online/hybrid learning."

"Successful and convenient."

"Not that good experience, and hard to stay focused."

"I get really distracted in most of my online classes."

"It's okay but I would have preferred to get the full university experience and be able to attend lectures in class where there would be more of a relationship between the professor and the students."

In a response to the question, the question "What are the disadvantages of online/hybrid education that affect the learning of the chemistry courses?", 68 responses were obtained from which the following was quoted:

"Feeling bored sometimes because there is no eye contact between the doctor and the student."

"Not being able to try the experiments in labs, and not understanding the concepts well."

"Less lab sessions make it more difficult to develop practical application skills."

"I don't comprehend as much information online as I do when I'm in a classroom."

"In hybrid learning, the instructor would pay more attention to the students in class rather than those online."

- "Very hard to visualize structures not being able to interact very well with the instructor."
- "Makes it difficult to speak to professors directly."
- "The only disadvantage with online education is less communication with classmates."
- "Hard to focus and interact with the instructor."
- "Bad Wi-Fi connection."
- "Getting distracted easily (not because it's chemistry but because it's an online class which getting distracted happens in all online classes)."
- "It's hard to focus during class especially when the class is 75 minutes."
- "No group work, no face-to-face teaching."
- "Chemistry Labs require hands-on experience, which is not possible with online learning."
- "The lack of face-to-face explanation makes it harder to grasp the knowledge."

After the surveys were analyzed, independent instruments are used to measure the influence of the change in the instructional methodologies on the educational learning outcomes for the chemistry program. Five assessment instruments are adopted, and the findings are shown in Figs 9, 10.

It is evident from Figs. 9 and 10 that there is a decline in the overall performance when it comes to the skills PLOs (A, C, E, I, G, and F). Such decline is expected as the hands-on skills were not nurtured during the COVID-19 era.

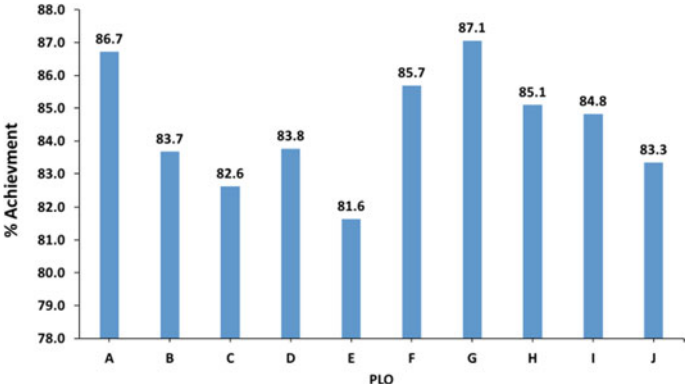


Fig. 9 The overall average over three years for the PLOs' % achievements

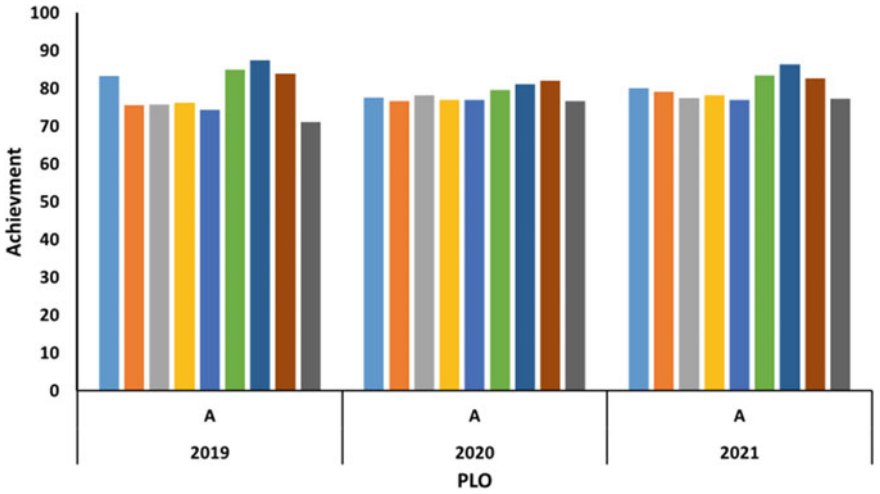
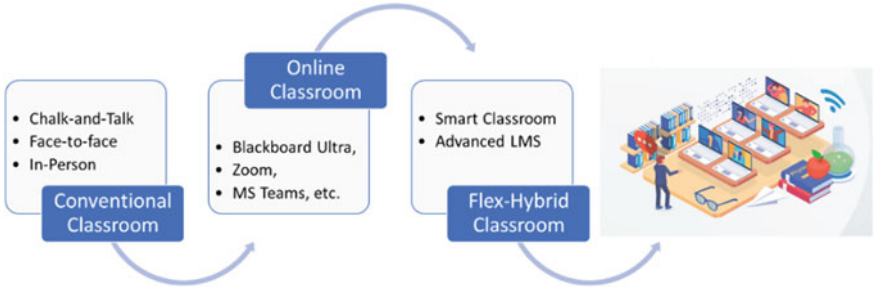


Fig. 10 Analytics of PEO from 2019 to 2021 from course grades analysis

4 Conclusion

As the perceptions and attitudes of students toward online learning are a critical factor and an essential element in the success of this kind of education and cannot be disregarded or ignored, the results of this research have clearly shown that most students at the University of Sharjah have a positive perception of online learning during the confinement period.

E-learning has surely offered an effective non-disruptive learning approach, and paved the way for the future of learning methods in a blended classroom approach. It has also improved the software of available learning management systems for the



Scheme 1 A schematic diagram for evolution of learning chemistry from conventional to online to flex-hybrid classroom format

delivery and management of learning content online. At the University of Sharjah, e-learning has enhanced the classrooms' infrastructures, as well. However, online learning during the COVID-19 era has a negative impact on the skills' learning outcomes. Hence, in all cases, the laboratories must have onsite sessions and distance learning might be avoided.

Scheme 1 is a proposed diagram for the evolution of learning chemistry from conventional to online to flex-hybrid classroom format. Online and distance chemistry education show positive features for students, giving them flexibility, independence, physical safety, and a growing virtual educational community. The results of this study show a positive result for a curricular implication of online teaching approaches for a sample of students studying chemistry in the college of sciences. For future implications, the online approach would provide students with the flexibility of referring to recorded sessions, encourage flexible communication between students and instructors, and develop broader virtual educational communities for students to build stronger relations with their fellow colleagues.

The university experience is much more than just learning various subjects, and further studies must include the instructors' perceptions of the chemistry department for online learning.

5 Recommendations

From this study, the following recommendations are to be drawn:

- Flex-Hybrid Classrooms are promising for theoretical courses as they provide flexibility in learning methodologies. Students can learn according to their past. In addition, hybrid learning can contribute positively to the quality assurance process of the instructional methodologies.
- Chemistry Laboratories must be conducted in person to enhance the technical and hands-on experience skills of the students.

- Different class modes (face-to-face, hybrid, and online) should be recorded as recordings can contribute positively to the quality assurance process of the instructional methodologies and material deliveries.

6 Program Learning Outcomes (PLOs)

- PLO A: An ability to draw defendable conclusions from data.
- PLO B: An ability to solve problems using systematic methods.
- PLO C: An ability to rationalize properties and structures using the principles of chemistry.
- PLO D: An ability to identify relationships between chemical principles and the other sciences.
- PLO E: An ability to correctly describe chemical principles and theories.
- PLO F: An ability to use correct chemical nomenclature, structural symbols, and terminology to accurately describe a process
- PLO G: An ability to write a formal publication-quality report which concisely and unambiguously summarizes the results of an experiment and states a conclusion and reviews a scientific topic.
- PLO H: An ability to assess the safety of a procedure and take the necessary precautions, based on the issues of safety regulations, ethics, and societal issues in the use of chemicals in laboratory work.
- PLO I: Knowledge of the use of the proper modern tools and other equipment in laboratories.
- PLO J: An ability to work in research and industrial institutions.

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Adapting to the New Normal: Asynchronous Learning as a Promising Solution for Post-Covid-19 Challenges in Jordanian Universities - A Case Study of the American University of Madaba (AUM)

Hanan Madanat, Majid Tarawnah, and Afag Khzouz

Abstract In the post Covid-19 time, educational trends have changed aiming at meeting the rising challenges which have a crucial impact on the learning environment. Asynchronous learning has become an alternative approach to traditional approaches. Investigating the challenges and opportunities has become a central topic of major concern. To this end, a two-fold approach, namely, an interview and a questionnaire, was utilized. In particular, the two surveys used included: an open-ended survey in which 30 faculty members answered the barriers and opportunities that they face. Whereas the second survey was built upon the responses of the first survey using the Likert scale. The participants were 72 from different faculties at the American University of Madaba (AUM) in Jordan. Statistical analyses were used to find answers to the questions of the study. The findings of the analysis of the three major themes reported the following results: first, asynchronous learning is flexible and allows the ability to both teachers and students to move in their teaching and learning process at their own pace. Second, asynchronous learning is an affordable and practical teaching modality. Third, the inability to adapt to asynchronous learning and the need for specialized training seem to top the challenges AUM's instructors encounter.

Keywords Blended/asynchronous learning · Opportunities · Challenges

1 Introduction

The outbreak of the Covid-19 pandemic has affected all levels of society and imposed unprecedented measures worldwide. The educational system has not been an exception in this regard. The pandemic has widely disrupted the educational sector and caused radical changes that caused triggering innovative approaches, methods, and

H. Madanat (✉) · M. Tarawnah · A. Khzouz
American University of Madaba, Madaba, Jordan
e-mail: h.madanat@aum.edu.jo

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modalities of teaching and learning. The drive behind such a move was to ensure the continuity of the educational process for students after the closure of schools and universities in Jordan as per the defense law as protective and preventive procedures. At the same time, applying such new modalities was an opportunity to test new teaching and learning patterns that were not applied within the educational system before, especially in Jordan.

In light of this assertion, the abrupt onset of the Covid-19 pandemic has necessitated universities to provide students with effective and supportive approaches for online teaching and learning that facilitate high-quality learning outcomes [1]. This indicates that there is an urgent requirement for the digital readiness of teachers and students all over the world [2].

The imperative to move to online learning caused by the recent Covid-19 pandemic [3, 4] has added to the stresses and workloads experienced by university faculty and staff [5]. Online modalities encompassing both blended and asynchronous models became a de facto. During this transformation, the Ministry of Higher Education and Scientific Research (MoHE) in Jordan made strenuous efforts to minimize the negative impact on students, and not allow them to be affected by this closure. To this end, online learning has been integrated into the plans of the MoHE and Ministry of Planning and Information Technology in 2002 [6].

1.1 The Impact of Covid-19 Pandemic on Education

The impact of the widespread use of Covid-19 was immense. All members of the educational process, namely, institutions, educators, and students were affected to varying degrees. Students were forced to stay at home and learn remotely instead of the interactive classroom meetings on campuses. At the institutional level, decision makers adopted blended, synchronous, and asynchronous modes as de facto teaching modes. Teachers were under surmountable pressure and played various roles to facilitate students learning and make it more enjoyable and attainable in the face of this radical change. In a nutshell, Covid-19 spreads online learning culture across the worldwide learning environment.

1.2 Online Learning Post Covid-19

The educational environment is embracing multiple innovative tools; using technology through blended learning is one of those tools. This advanced instructive approach has been encompassed rapidly yet it goes through a process. Commencing blended learning (combination of face-to-face and online teaching and learning) is considered part of the pioneering initiatives in the educational sector but its acceptance and approval, especially in the developing world face challenges to be an effective instructional tool in the learning and teaching process ibid.

The Ministry of Higher Education and Scientific Research has launched a roadmap to return to higher education institutions for the academic year (2021/2022), which includes all public and private higher education institutions for all degrees and levels of learning. In recent months, the MoHE issued regulations, criteria, and bylaws endorsed by a royal decree to empower and give legal cover to the application of these modalities, i.e. (Blended, Asynchronous) modalities.

1.3 Study Significance

The significance of the current study can be understood considering the following points: first, this study is important as it provides a clear understanding of the challenges and opportunities that can be concluded via the application of blended/asynchronous learning in the post Covid-19 period. The study serves as an attempt to bridge the gap in research concerning the description and the utilization of asynchronous learning in the higher education system that is established as a parallel educational system to the blended and face-to-face systems at the Jordanian universities in general and AUM. These modalities' descriptive nature serves as a starting point toward forming a systematic procedure that can be used as guidelines for all people of concern including decision makers, educators, and students.

Moreover, the novelty of this study stems from the fact that it is the first one, to the best of the knowledge of the researchers, that addresses this subject matter in such depth and scrutiny. As such, the study tries to delimit the use of asynchronous learning modes in attaining quality education.

1.4 Objectives of the Study

The study was conducted to achieve the following objectives:

1. To investigate AUM instructors' perspectives about the experience of asynchronous learning post Covid-19.
2. To identify the instructors' perceptions about the challenges encountered by them in the asynchronous learning environment.
3. To identify AUM instructors' opinions about opportunities, yield from the application of asynchronous learning at the university level.

1.5 Study Questions

1. What are the perspectives of AUM's instructors about asynchronous learning post Covid-19?

2. What are the perceptions of AUM's instructors regarding the post Covid-19's challenges faced in applying the asynchronous learning paradigm?
3. What are the perceptions of AUM's instructors regarding the post Covid-19's opportunities in applying the asynchronous learning paradigm?

2 Literature Review

This review presents research about the change in learning modes caused by the pandemic and the transfer from having only traditional face-to-face learning into a blended mode (combination of Face-to-Face plus online) [7–9]. Additionally, this study presents literature that examines the potential benefits and obstacles of utilizing various modes of instruction, particularly the blended learning model, in the post-Covid-19 era.

Technology has had a firm role in the education sector in the last decade. It has been noted that the success of e-and blended learning is highly dependent on experience in the internet and computer applications [10]. Rigorous discovery of such competences can finally lead to a confirmation of high possibilities of establishing blended learning. Research agrees that the success of e-learning and blended learning can depend on students as well as teachers gaining confidence and capability to participate in blended learning [11].

Research shows that 75% of students and 72% of teachers were lacking in skills to utilize ICT-based learning components due to insufficient skills and experience in computer and internet applications and this may lead to failure in e-learning and blended learning [12].

Research also shows that blended learning has been affected by factors such as family, work, and insufficient time to study, which was assured by research results that indicated learners learning without peers and teachers face-to-face interaction is not as effective as face-to-face, and it also impedes learners' process of learning.

Some researchers noted that the absence of learner interaction causes failure and cyber-truancy leading to the lack of learner connectedness. It was also noted that blended learning and the e-learning horizon negatively impacted the learners' social connections and friendship status as the lively, truthful, and emotional becomes less and event absent in such context and may lead to failure in students' social intelligence.

Some research results show that poor/excellent quality technology has a significant impact on the learners' and teachers' satisfaction regarding the blended learning context and environment. In their research, Goyal and Tambe observed that learners expressed a positive attitude towards Moodle as a blended learning platform for enhancing their learning experience.

Bourne et al. [13] examined paradigms used in online learning in general and asynchronous learning networks. The challenges and the benefits of ALN were also investigated. The study was based on a case study about the creation of an online

course. The projections for online education and the challenges that face the ALN field were also investigated through scrutiny.

Jorgensen [14] investigated the challenges and benefits of Asynchronous Learning Networks. The drive behind conducting the study was the changing educational modalities because of the impact of several factors, namely, the cost, Covid-19 pandemic, and the emerging technological advances in educational paradigms. Furthermore, the study addressed the question of whether asynchronous computer-mediated learning is an effective replacement for face-to-face collaboration and if student learning is compromised with this mode of instruction. The study concluded with highlights on the cost of instituting online courses and how these courses can be used to improve the collaborative learning environment and classroom community.

Graham et al. [15] examined the benefits and challenges of blended learning. The scarcity of related studies was the catalyst for conducting this study. The researchers utilized exploratory research from a graduate-level course to ascertain the basic cross-cultural issues which were relevant. The findings of the analysis came to confirm the benefits as touted in the literature.

Ellis and Hafner [16] explored the effectiveness of building a framework to support project-based collaborative learning experiences in an Asynchronous Learning Network. In addition, the paper aimed at providing a system-based framework for designing, implementing, and evaluating project-based collaborative learning experiences to be delivered via an Asynchronous Learning Network. Furthermore, the project's analysis highlighted the benefits of both collaborative and project-based learning and provided a thorough examination of the challenges of applying to the project.

Larbi-Siaw and Owusu-Agyeman [17] investigated the students' satisfaction in an asynchronous learning environment. The researchers utilized seven key considerations including types of interaction among students and students and teachers. Additionally, group cohesion and timely participation, knowledge of Internet usage, and satisfaction were also investigated. To this end, structured questionnaires from 500 students who took courses in an asynchronous learning environment were used to collect the data. The results of the study showed that all the variables served as robust antecedents of students' satisfaction in an asynchronous learning environment.

In a recent study, Ó Ceallaigh [18] explored the roles of teachers and educators in an Asynchronous Learning Environment. The study intended to fill the gap resulting from the paucity of research regarding how teachers and educators handled teaching in asynchronous mode. This paper reports on a mixed methods study that explores how TEs are best supported to facilitate teaching presence in an asynchronous learning environment. The data was gathered and analyzed through the administration of an online questionnaire, as well as individual semi-structured internviews and focus group interviews. The analysis results indicated significant challenges related to planning for the asynchronous learning environment. In addition, the results showed that there is an improvement in students' engagement and interaction in such learning mode.

3 Methodology

The research at hand utilized two approaches, namely, an open-ended survey in which 30 faculty members answered the barriers and opportunities that they face. Whereas the second survey was built upon the responses of the first survey using the Likert scale. The participants were 72 from different faculties at the American University of Madaba (AUM) in Jordan. Statistical analyses were used to find answers to the questions of the study. The data was analyzed qualitatively and quantitively by conducting SPSS analysis of the survey and a qualitative analysis of the interviewees.

4 Results and Discussion

In a survey for the faculty members at the American University of Madaba, 102 faculty members were asked to correspond to this Survey that comprised three parts.

4.1 Flexibility

In the analysis, 66.7% of the participants agreed that asynchronous learning is flexible and allowed the ability to both teachers and students to move in their teaching and learning process at their own pace (speed). This result agrees with the conclusion of Larbi-Siaw and Owusu-Agyeman [17], who reflected that students showed satisfaction toward applying blended/asynchronous learning. Furthermore, the analysis assured the findings reached by Ellis and Hafner [16], who explored the effectiveness of building a framework to support project-based collaborative learning experiences in an Asynchronous Learning Network in that in the e-learning era, asynchronous adds the quality of having the ability to move easily according to teachers and learners' conveniences, the fact which has been approved by more than half of the sample. Moreover, the analysis illustrated that 52.9% of the sample agreed that this self-learning modality provides the learners with a wide variety of digital tools that support this learning style even though, 32.4% shows no position in this regard, and they were neutral in their answers. Furthermore, the results elucidate that 67.1% agreed on the fact that learning gives students the opportunity to learn at their convenience and their own time, the asynchronous learning gives students the opportunity to learn at their own convenience plus their own time. Additionally, in this analysis, it is evident that a substantial proportion of the faculty members (62.00%) highly agreed that asynchronous learning gives students a greater sense of freedom and allows them to develop a sense of responsibility toward their learning assuring that this modality is of great benefit for autonomous learning allowing them to expand and magnify their knowledge based on their will. These results echo the results of Piccoli et al. and Goyal and Tambe.

Table 1 Summary of results related to the flexibility

#	Result	Percentage (%)
1	Asynchronous learning is flexible and allowed the ability to both teachers and students to move in their teaching and learning process at their own pace (speed)	66.7
2	Self-learning modality provides learners with a wide variety of digital tools that support this learning style	52.9
3	Learning gives students the opportunity to learn at their convenience and on their own time	67.1
4	Asynchronous learning gives students a greater sense of freedom and allows them to develop a sense of responsibility toward their learning	62.00
5	Asynchronous learning gives the opportunity to faculty members to invest much time in between semesters preparing for their courses; this quality was approved by 48.6%	48.6

Finally, the analysis indicated that asynchronous learning gives the opportunity to faculty members to invest much time in between semesters preparing for their courses; this quality was approved by 48.6% of the participants who also assured that asynchronous classes are properly prepared, and this exposed their students to a secure, rich, and diverse learning environment (Table 1).

4.2 Practicality and Affordability

The findings of the analysis of the data seem to agree with the findings of Hadad [11], Larbi-Siaw and Owusu-Agyeman [17], Goyal and Tambe, in that asynchronous learning is believed by 80% of the sample to allow for greater opportunities for students who may have other obligations and who might not be able to attend a traditional class and offers a wide range of the online resources. More than half of the faculty members were happy to receive training sessions on the asynchronous mode of teaching and 34% were satisfied with introducing this mode of teaching before implementing it. However, only 37% of the sample thinks that Asynchronous learning provides equal opportunities for all students [11].

Consistent with the argument posited by Meyer and Paewai, 73% of the participants recognized asynchronous learning as a feasible substitute to conventional instruction during times of crisis. While 58% believe it allows for institutional savings, 45% say it saves time. 75% say that asynchronous learning allows storing lessons that are delivered live to be used as review materials and 66% believe that this could be helpful in improving accessibility for differently-abled students ibid (Table 2).

Table 2 Summary of results related to the practicality and affordability

#	Result	Percentage (%)
1	Asynchronous learning allows for greater opportunities for students who may have other obligations and offers a wide range of online resources	80.0
2	Introducing mode of teaching before implementing it	34.0
3	Asynchronous learning was a viable alternative to traditional learning in crises times	73.0
4	Asynchronous learning allows storing lessons that are delivered live to be used as review materials	75.0

4.3 Challenges

The analysis of the survey on the challenges that faculty members encounter comprised 17 questions. The questions were centered on specific sub-themes, namely, adaptation to asynchronous learning, lack of direct communication and interaction with students which allows for more isolation for students, lack of discipline, and technical problems.

As for the adaptation to asynchronous learning, in an asynchronous learning environment, around 60% of the instructors at AUM are found unable to adapt to these new learning styles. This result was similarly reported by Shraim and Khalifa, 2020, who justified that the main drive behind the lack of adaptation was because students have been accustomed to traditional learning modalities. To add, around 50% of the AUM instructors reported that such a mode of learning requires specific technical skills which enable them to handle the teaching process ibid. Most of the instructors 80% indicated that they need to have more time for preparation which is not available because of the extra workload and more start-up time needed to fully prepare courses (videos or online materials), especially before the semester start. This time is even found to be doubled because there is an increased need for organizational skills. This includes the time and the skills needed for redesigning the whole course to effectively flow in the new mode of teaching [14].

The second sub-theme addressed the lack of direct communication and interaction with students. Around 70% of the respondents revealed that in the asynchronous learning environment, they find it difficult to communicate their thoughts, ideas, and values to their students. They believe that asynchronous learning curbs fruitful interaction between learners themselves and learners and instructors. This reality is linked to the contention that asynchronous learning allows for more isolation for students. Around 60% of the instructors indicated that asynchronous learning does not enable instant feedback to students.

The third sub-theme was centered around the lack of discipline. Most of the instructors, 85%, reported that lack of discipline is one of the symptoms of asynchronous learning. Around 45% of the instructors reflected that in asynchronous learning mode, students develop undesirable learning habits such as procrastination, dropping out, and unauthorized absence.

Table 3 Summary of results related to challenges

#	Result	Percentage (%)
1	The instructors at AUM are found unable to adapt to the new learning styles	60.0
2	AUM's instructors reported that the asynchronous mode of learning requires specific technical skills which enable them to handle the teaching process	50.0
3	AUM's instructors reported that they need to have more time for preparation which is not available because of the extra workload and more start-up time needed to fully prepare courses (videos or online materials), especially before the semester starts	80.0
4	AUM's instructors indicated that it is difficult to communicate their thoughts, ideas, and values to their students	70.0
5	Asynchronous learning does not enable instant feedback from students	60
6	Lack of discipline is one of the symptoms of asynchronous learning	85.0
7	Technical problems affect the learning process negatively	30

Finally, the technical problems were reported to be the least impactful of all challenges. A minority of instructors (30%) indicated that such issues may affect the learning process negatively. Additionally, around 35% of the instructors reflected that such technical issues can be frustrating and expensive (Table 3).

5 Conclusion

The study investigated the perspectives of AUM faculty members about the application of blended/asynchronous following the outbreak of Covid-19. Three main subthemes emerged, namely, flexibility, affordability and practicality, and challenges. The study concludes with the following implications, first, at the institutional level, laws should be enacted to empower the application of blended/asynchronous learning modalities. Second, Higher Education Institutions should provide a reliable infrastructure for such modalities. Third, educators must embrace these modalities as a tool for transition into flipped learning. Fourth, educators should look at the existing challenges as opportunities that can be catalysts for achieving positive transitional changes in the learning process. The study concludes with a recommendation for conducting a large-scale study on the impact of Covid-19 on the teaching modalities in educational institutions in Jordan.

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An Exploration of Direct Instruction: Why Teaching Matters

Nicole Shammas

Abstract Why Teaching Matters is a question at the heart of all instruction. While the answer seems obvious, actual teacher-led teaching, or direct instruction, has taken backstage in the last decade to a more constructivist approach where student-centered; project-based learning, and inquiry inform students learning. This paper argues that alongside this student-centered approach, there is a need, depending on the context, for a teacher-led, direct instruction approach. Studies show that direct instruction is indeed a robust pedagogy leading to student attainment in both short-term retention and long-term proficiency. The author invites readers to consider direct instruction as a potent teaching and learning model, replacing the dichotomy of teacher-centered versus student-centered with a collaboration between the two. This paper presents findings from a study by the researcher illustrating teachers and learners' perspectives on Direct Instruction. Findings indicate a preference from the learners for this approach and a flexibility among teachers to adopt the methodology most appropriate for their context. This paper contributes to knowledge by filling a gap in the field on the perspectives of learners and teachers on Direct Instruction and by bringing to the forefront an alternative discussion around teaching pedagogy.

Keywords Teacher-centered · Student-centered · General Studies · Higher Education Teaching Pedagogy Curriculum research

1 Introduction

1.1 Understanding Direct and Indirect Instruction

To begin this paper, it is first important to explore the history and establish key definitions around what direct and indirect Instruction are. These terms are interchangeable with teacher-centered (direct instruction) and student-centered approach

N. Shammas (✉)
Dubai Women's Campus, Higher Colleges of Technology, Dubai, United Arab Emirates
e-mail: nshammas@hct.ac.ae

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towards education (indirect instruction). Direct Instruction refers to "any academic instruction that is led by the teacher" (Rosenshine, [46], p. 1). Indirect instruction refers to a student-led and student-centered learning process [20].

Prior to the 1960s and 1970s, the traditional teacher may have used the infamous 'chalk and talk' approach where learners are typically passive and the teacher is seen as the font of all knowledge [7]. The move toward indirect instruction, or a more student-centered classroom, was born from several influences outlined below.

1.1.1 New Understandings Around Learning Theory

Primarily, John Dewey (American Philosopher, 1859–1952) challenged traditional notions of the role of the teacher and learner and brought to light ideas of students as participatory active learners, where the curriculum should reflect students' real-life needs. Dewey's philosophy is encapsulated in this quote: "the child becomes the sun about which the appliances of education revolve; he is the center about which they are organized" [9, p. 51]. Through Dewey's lens, a child-centered education involves viewing the student as a whole person, with cultural and familial considerations, whose basic needs such as the physiological need to be met for them to succeed academically [22]. Dewey's philosophies have withstood the test of time and have left an indelible imprint on the fabric of educational theory [55]. Dewey's approach falls under constructivist theory which has had much sway in shaping educational philosophy. In its simplified definition, constructivism argues that learning happens as students construct meaning and that they are the architects of their own learning [10].

A further branch of constructivism is social constructivism famously associated with Vygotsky (Soviet Psychologist, 1896–1934), who emphasizes the need for social interaction to facilitate learning [33]. Vygotsky's theories transfer to today's classrooms in several activities, namely the widespread use of group work, project-based learning, and the need to scaffold or stage learning working within the 'zone of proximal development' [30].

1.1.2 Learning Style Theory

Alongside our deepening pedagogical understanding of educational philosophy and reform, another shift took place that did much to bolster the argument for indirect instruction: that of learning styles theory. While the jury is still out on the credibility of learning style theory; in its heyday, it was embraced in academic circles and an educational game changer in propelling student-centered learning into the spotlight. The reason for this is that the main tenet of learning style theory is that we all learn differently, therefore, if we accept that as true, then the next logical conclusion is that we must teach differently to try to accommodate these different needs. Teachers around the globe soon began to ask the question: How can our teaching styles match students' learning styles? What ensued was the questionable practice of adapting

teaching styles to suit student learning preferences, citing increased motivation and attainment as a result [51]. It was widely believed, and still for some, that learning style theory: "can impact a student's ability to learn and comprehend. Therefore, knowledge of different learning styles is essential for teachers" [29, p. 1].

From the learning styles, movement classroom practice began to endorse more student-centered classroom techniques. For example, showing films to support visual learners, incorporating reflection activities for reflective thinkers, and group work for those learners who learn through interpersonal relationships [54]. Current literature suggests that the foundations of learning style theory are thin and asks us to question their adoption in the classroom [15]. The implications for this paper are that theories instrumental in advancing Indirect student-centered learning are not always on firm footing, thus inviting a re-examination of Direct Instruction.

1.1.3 Sage on the Stage Versus Guide on the Side

Another key influence that exemplifies this dichotomy between direct and indirect instruction is most fittingly illustrated by King [24] in her metaphors of 'Sage on the Stage' versus 'Guide on the Side'. In this analogy, King equates the stage on the stage to a teacher who imparts knowledge to her learners through a traditional model of transmitting the information. She reiterates that "such a view is outdated and will not be effective for the twenty-first century" [p. 30]. The guide on the side model is where learning is contracted as learners assimilate and make sense of latest information. This leans on information processing theory where students reconstruct information in meaningful ways. These terms sage on the stage and guide on the side are much used in education, with educators often aspiring to be the guide on the side [36].

1.2 Evidence to Support Indirect Instruction

This view that indirect instruction is the gold standard in teaching is further buttressed by substantial empirical evidence. School-based research presents numerous studies in defense of indirect instruction. A 2014 study by Friedlaender et al. [14] argues the success of student-centered learning across high schools in California when compared to traditional teaching. A similar study in New England argues that indirect instruction leads to higher engagement and deeper learning [43]. Researchers in Higher Education sing from the same song sheet in their unanimous praise of Indirect Instruction, for example in Europe:

> It [Indirect Instruction] has become the key principle underlying the intended reforms enhancing the quality of teaching and learning in European HE [26, p. 69].

This thread is woven throughout global research, with academics purporting the efficacy of a student-centered classroom alongside positive student feedback [53].

To compare the two approaches of direct and indirect instruction, the core attributes of each pedagogy are summarized by Sawant and Rizvi [48] as follows:

Teacher-Centered/Direct Instruction

- Students are passive recipients of knowledge
- Knowledge is acquired without contextual awareness
- Accuracy is key
- Teacher's role is to give information
- Competitive
- Assessment measures learning
- Single discipline

Student-Centered/Indirect Instruction

- Students construct knowledge by synthesizing information
- Inquiry, critical thinking, and problem-solving
- Teacher's role is to guide and facilitate
- Students are active learners
- Interdisciplinary
- Mistakes are part of learning
- Assessment to guide learning

Compare phrases from the table above such as 'students are passive recipients' to describe direct instruction to 'students construct knowledge' to describe indirect instruction, and the narrative beginning to emerge here is one where teacher-centered is often viewed as inferior in some ways. Clearly, student-centered is the preferred approach, the perceived academically sound approach, and simply 'the best way' [21]. It is now time to turn our attention to the 'sage on the stage', to ascertain whether this bad press is warranted or not.

1.3 Evidence to Support Direct Instruction

In 2015, the BBC launched an 'edutainment' series 'Chinese School: Are Our Kids Tough Enough?' The purpose was to gauge the impact of Chinese teachers on the attainment of British students. These Chinese teachers adopted a traditional teacher-led approach and results showed students scored 10% higher over a 4-week period when compared to classes without Chinese teachers [56]. While lacking academic rigor, this increase in attainment speaks volumes in support of Direct Instruction.

In a study of literature over the last 50 years examining the effectiveness of direct instruction, Stockard et al. [52] analyze 328 studies to determine conclusive findings. Their examination crosses over subject-specific and general attainment and the affective domain and perceptions of learning. Results across the board were consistently positive demonstrating the value of this approach. They close by saying:

> Certainly, our nation's children deserve both effective and efficient instruction. As one of the anonymous reviewers of our article put it, "Researchers and practitioners cannot afford to ignore the effectiveness research on DI" [p. 503].

Earlier research by Lockery and Maggs [31] reports the overwhelming success of direct instruction with over a decade of research to support their findings. The researchers examined the use of direct instruction across a range of subjects from mathematics to language and across a range of subjects from special needs to mainstream to gifted.

These results are not surprising when you consider that the pedagogical foundations of direct instruction are good classroom practice based on carefully sequencing tasks, guided instruction, proficiency checks, and modeling; peppered with student activities [32]. In this model, responsibility is transferred to the learners strategically, but only *after* the material is presented. Guided instruction is an exemplary practice that is not only key to understanding the power of direct instruction, but which also elevates it from its traditional view where students are perceived as being 'told'. The diminishing role of the teacher in student-centered instruction has led to hesitancy among educators to take center stage again as and when needed. However, guided instruction provides a bridge between the two. Students are still afforded considerable time to practice and experiment with new concepts, however, first, they are taught, they are presented with information, where the teacher personally invests in carrying these concepts to the learners in ways as varied as storytelling, lectures, or question and answer sessions [6]. Adding to our knowledge base on guided instruction is the backing of neuroscience and the development of cognitive support pedagogy which cites sequencing, chunking, mass practice, and modeling as key classroom practices for optimal learning [35]. These strategies serve to address the limitations of working memory, therefore, supporting the brain to process and retain learning [46]. It is also worth noting here that while there is much empirical evidence to support guided instruction in the classroom, there is little to support minimally guided instruction, and of that much to suggest that it only serves to widen the achievement gap between low and high achieving students [27].

Despite these glowing testimonials, direct instruction continues to invoke the ire of those in support of indirect instruction [25]. This is more of a philosophical divide with a discrepancy between evidence-based practice and the philosophical adoption of inquiry-based learning. Indeed, the diatribe against direct instruction can at times be unsatisfyingly punitive. Described as a 'harsh, inflexible, and depersonalizing approach' (Jalongo, 1999, as cited in Hempenstall [17] p. 13). Further, "teachers are driven to meet accountability standards and often sacrifice the needs of the students" [5, p. 50]. Finally, Kassem [23] claims a Direct Instruction approach may "prevent students' educational growth because …teachers do most of the work" (p. 134). There appears in the literature a naïve construct of what Direct Instruction/teacher-centered translates to in the classroom, often described as authorization and controlling, as Emaliana [11] describes it:

all questions which are raised by students, if any, are answered directly by teachers without students' involvement. In designing the class activities, teachers control every single learning experience (p. 60).

These are not isolated critiques of Direct Instruction, and despite evidence pointing to its efficacy: "its popularity and subsequent implementation have not enjoyed such support" [32, p. 143].

Like all other teaching modes, direct instruction, when done well, is engaging, memorable, effective, and provides many opportunities for practice. To dismiss it in favor of indirect instruction is a loss to educational practice; the message here is to consider how these two approaches can work alongside each other.

As the interview findings in this study demonstrate, teachers who choose, at times, to adopt a teacher-led classroom approach, do so with consideration of the learners and imagination in the planning.

1.4 Summary

The literature provides evidence in support of *both* direct and indirect instruction as valuable tools in a teacher's repertoire. Both approaches have a strong foothold in educational theory, and both have empirical evidence to support their efficacy. Despite this, direct instruction is often seen as the lesser of the two, as it is the least adopted and has received unwarranted criticism. To dig deeper into this phenomenon, the researcher conducted her own study outlined in the following section.

2 Research Study

This research study is an exploration, triggered by reading about the impact and renaissance of Direct Instruction. The author's interest was piqued by this reading and a natural curiosity arose about its place and effectiveness in the author's context. As she began to experiment with a more teacher-led classroom approach, she found informal student feedback to be positive, thus initiating the need for a more formal study. This is a small-scale, mixed methods study with participants enlisted from the author's place of work, the research aimed to answer two questions. Data was collected through interviews with faculty members and a student survey.

1. How do students perceive the efficacy of Direct and Indirect Instruction?
2. What are faculty pedagogical beliefs toward Direct and Indirect Instruction?

3 Findings

3.1 Faculty Interviews

While the literature points to evidence in support of direct instruction, the literature also indicates a reluctance on the part of teachers to adopt this approach [17] (Vitale and Kaniuka, 2009). This reluctance is born from several factors, citing a key argument that direct instruction impedes higher order thinking based on rote learning and memorizing facts [12]. While this argument has been debunked, supported by evidence from neuroscience (Willingham, 2009) this negative perception still seems to linger. One purpose of the interviews was to establish faculty perceptions of direct and indirect instruction to see if these concurred with the literature, or not.

Key Themes Three themes emerged as significant that address the question: *What are faculty pedagogical beliefs toward Direct and Indirect Instruction?*

- Impartiality
- Flexibility
- Teacher Care

These themes will be examined in the discussion section.

3.2 Student Survey's Findings

Alongside the interviews, further inquiry was undertaken by surveying students to gauge their learning preferences; be it direct or indirect instruction. Convenience sampling was employed as the students were in the researcher's class at the time of the research. With any dual role, there is always the potential for conflict of interest [39], however, the researcher's primary role here was one of the classroom teachers. To address ethical concerns, there was a clear distinction between the teaching and the research; simply put, class time was for teaching, and time out of class was allocated for research. Research participation was completed voluntarily, and students were assured there was no grade allocation, thus minimizing conflict of interest. Informed consent was applied, as those who volunteered to be part of the research were told clearly, both verbally and in writing, what was expected of them, confidentiality was assured, and the right to withdraw at any stage was given. 24 students volunteered out of a class of 40. All students were Emirati females, ranging from Year 1 to Year 4 in their degree programs in an English medium tertiary institution.

The survey comprised of fourteen questions, eight closed quantitative, and four open-ended qualitative. The survey was conducted online using Microsoft forms. Questions were validated and informed by theory, adapted from the work of Murphy et al., *Teacher-Centered versus Student-Centered Teaching* [37]. Survey questions aimed to address the question: How do students perceive the efficacy of Direct and

Indirect Instruction? Four open-ended questions were included in the survey to elicit the students' deeper perspectives on Direct and Indirect instruction.

The literature is not as clear-cut with student perceptions of direct learning as those of teaching faculty, with studies providing evidence for the efficacy of both. Context is a significant consideration here, with ability, cultural considerations, and motivation; to name a few, all playing a part in students' preferred learning styles.

3.3 Quantitative Questions

Questions Two and Three directly distinguish student preferences between learning best independently and learning best through teacher explanation (Fig. 1).

Twenty-two out of twenty-three responses selected five stars for question two indicating a strong agreement to learning best through teacher explanation. In contrast, two out of twenty-three responses selected five stars for question three, with the majority placed at two or three stars. Responses to question six, illustrated in Fig. 2, further validate the responses to questions two and three, with seventeen out of twenty-three participants 'strongly agreeing' that the teacher talking and explaining the lesson is a preferred teaching and learning style.

To confirm the answers above and to avoid any bias toward direct instruction, questions four and five gave alternate options as learning preferences (Figs. 3 and 4). Note, the question stems remain consistent throughout the instrument, as both good practice and to avoid any bias.

Questions four and five determine student perceptions toward both group work and independent work illustrated in figures three and four. Fifty-four percent of students indicate that group work is a teaching method they prefer with strong agreement or agreement. Seventy-three percent of students indicate that flipped/independent work is a teaching method they prefer with strong agreement or agreement. Figure five below visually illustrates students' *comparative*, preferred learning styles (Fig. 5).

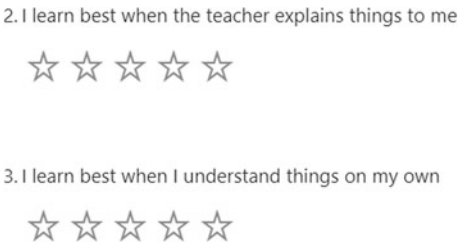

Fig. 1 Comparison direct and indirect instruction

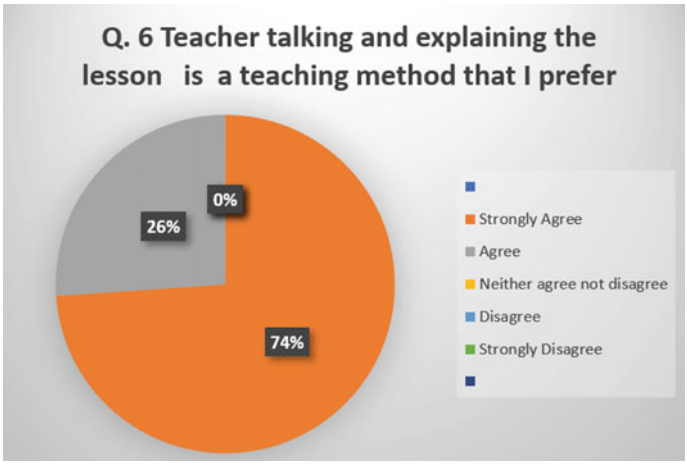

Fig. 2 Teacher talking as a preferred teaching method

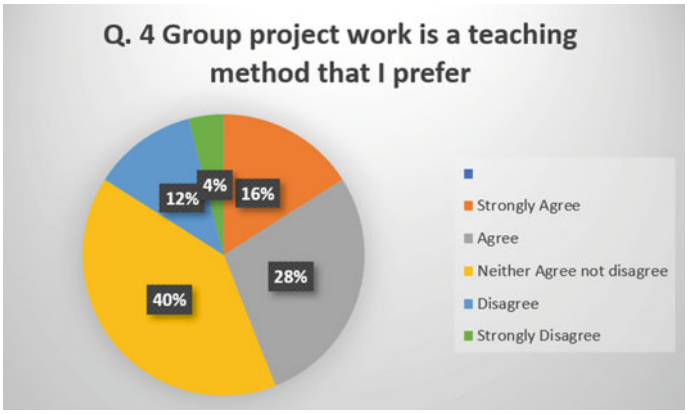

Fig. 3 Group project work as a preferred teaching method

4 Discussion

The following section highlights and explores salient points from the findings which address the research questions and contribute knowledge to the field**.**

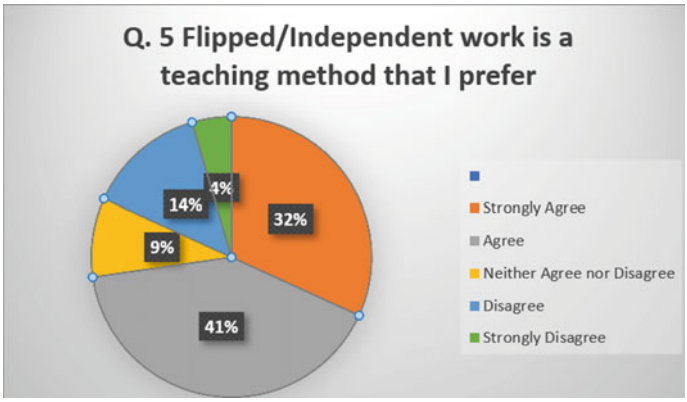

Fig. 4 Independent work as a preferred teaching method

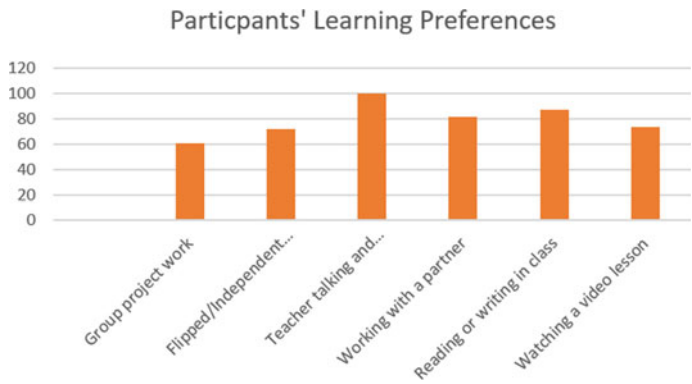

Fig. 5 Students preferred learning styles

4.1 Faculty Interviews

From the faculty interviews, the first point of discussion is that it was apparent from the linguistic and non-linguistic clues that there was no inherent bias or strong preference for either Direct or Indirect Instruction. Responses were insightful, and considered, without any negative associations affixed to Direct Instruction. A general theme of openness to its use in the classroom when contextually appropriate permeated the interviews. This is interesting and diverges from the literature which indicates a more negative perception of direct instruction among teachers [49]. One explanation to account for this is that these teachers are all highly educated, well-read, and regularly engaged in high-quality professional development. Consequently, classroom practice is impacted as this knowledge and skill development go hand in hand with

openness, and a desire to learn and explore [16]. This is the foundation of effective education as it addresses student learning:

> For teachers and school and district leaders to be as effective as possible, they continually expand their knowledge and skills to implement the best educational practices [34, p. 3].

Secondly, flexibility was a key characteristic that stood out in these teachers as they spoke of switching between direct and indirect Instruction regularly; as and when needed. One variable to be considered here that may account for this flexibility is the impact of COVID-19 on teaching which may lead to a more teacher-led/direct instruction approach [40]. Additionally, these teachers are all experienced, averaging 20-plus years in each profession, and as Berliner [4] reasons, experienced teachers often demonstrate more flexibility than those new to the profession.

Participant One: *It depends on the type of students I am working with. My approach [now] is a lot more teacher-centered because the students, um, you know, are very needy. They need a lot of help. So, there are students who have just finished high school and, um, they are new, it's the first semester at college. They do not have good study skills. They do not understand the micro steps required to keep up with a course. If I were working with more advanced-level students who were self-motivated and responsible and had good study skills, I would not need to do so much, helping, reminding, and supporting.*

Participant Two: *Uh, I do both. And, uh, or, I mean, I'd prefer to get beyond reductions and binaries and see things in terms of, uh, continuums and contextual. I would say that I am somewhere in the middle, I do believe in the need for explicit instruction. That is a part of human learning, not just something associated with the classroom, but for any kind of learning. So, I mean, somebody might characterize me as teacher-centered points in the lesson when it is necessary to give students the information; most important is whether it is comprehensible to learners? Is it meaningful to I mean, an effective story could keep people spellbound for an extended period and would, you know, be transformational in terms of learning.*

Participant Three: *Prior to COVID, a lot more student-centered, a lot more letting them do a lot more talking, but I had noticed that during the COVID time, we've, we tended to, uh, because of the limited, uh, access and the limited sort of ability for the students to do things, even though we use Nearpod and dilute and all sorts of other things. I would say I've, I have changed my sort of approach, not voluntarily, but just pure necessity too, to make sure that the students get enough content, and they understand what is going on. So, I have tended to do a little bit more, uh, teacher-led.*

Participant Four: It *depends on the individual and their level of understanding. Do they need to go back and look at the material again? Because you assume you cannot assume that we are all on the same page, even if they have done the flipped work, because their, their perception, their mindset, we know we are all different for me, it is both. For me, it must be both. And I like to have a mixture.*

A third key finding is that participants demonstrated a philosophy of teacher care, of putting the needs of the student first, this notion of feeling cared for by the teacher, is what Noddings says is key to academic success and is conveyed "by providing carefully for the steady growth of the children in their [teachers] charge" [, p. 676].

What the comments above illustrate is a dedication and commitment to the 'steady growth' of the students under the guidance of these teachers. This is particularly apparent in participant three who acknowledges that his preference is for a student-led classroom as it is the way he was taught and his general modus operandi, however, he recognizes that there is a place in the classroom for more Direct Instruction, or as he refers to it 'lecturing.'38

As a young child, I grew up in the times when I was at school, a teacher-led approach was out the window. It was all student-led. It was all, you know, um, collaborative activities where we were allowed to do to be more, have more control over our learning and that kind of stuff. So, from an exceedingly early age, I have been in that kind of mode. I think you do need to lecture every now and then, there, there is a place for lecturing.

4.2 Summary: Faculty Interviews

To summarize, the interviews provide evidence to show that teachers in the author's institution carry no reluctance toward direct instruction and all transfer it to their classroom practice to different extents. This is contrary to literature and shows both professionalism and the wisdom that comes through decades of experience. Teachers also convey an enormous sense of care toward their students, making consistent concerted efforts to provide them with classroom experiences that are meaningful to them and to ensure learning happens. Finally, a recurring theme is flexibility, which may come from experience and that these teachers are all expatriates, teaching outside their home country. The expatriate experience has often been noted as being one to facilitate more creativity and flexibility when compared to the non-expatriate working experience [13].

4.3 Student Surveys

The survey begins by asking students how they believe they learn best. The answers to questions three and six corroborate the findings from question two and provide further evidence to suggest these students respond well to teacher explanations. One reason for this may be that teacher-centered is a style these students are accustomed to, coming mostly from government high schools where free and independent thought often takes the second stage to rote learning and memorization [41].

The findings from questions four and five reveal two things. Firstly, they confirm the findings from questions two, three, and six above, that the teacher explaining, and 'teaching' is a preferred learning style. Secondly, they also validate that while 'teacher explanation' is *preferred*, there is also substantial support for group work and independent work, i.e., student-centered Indirect Instruction approach. The lean

toward direct instruction is albeit greater, however, there is evidence to suggest these students learn well from *both* approaches and this balance needs to be considered.

In terms of preferred learning styles, it is interesting to note here that 'group project work', which we can infer translates to Indirect Instruction, scores the lowest, and 'teacher explanation' scores the highest. This is interesting on several levels and can be explained through a cultural lens. Relevant to this discussion is Hofstede's cultural dimension theory [18] of which the United Arab Emirates scores highly at 90 in Power Distance. Hofstede's application of Power Distance describes the "extent to which a society accepts the fact that power in institutions and organizations is distributed unequally" (p. 45).

What this suggests is that power, from those in authority, such as teachers, is seen in the United Arab Emirates as hierarchical. A student-centered approach, however, views teacher authority as more democratic and equal and may not resonate with deep-seated cultural norms. Interestingly, a student's response as to why she preferred the teacher explanation for learning was: the *teacher knows best.*

However, contrary to this, one might expect group work to be ranked highly, as seen in Hofsteden's cultural trajectory, individualism scores low at 25 as the United Arab Emirates is designated to be a more collectivist culture (ibid). This collectivism is evidenced frequently in family and societal norms but does not transfer as strongly to the researcher's classroom dynamic. One logical explanation for this may be that this research was conducted during the pandemic when classes were online and group work was notoriously difficult [8]. It is also important to keep in mind that these findings do not indicate a general aversion to group work, they merely indicate that in order of preference, group work does not score as highly as, for example, teacher-led or working with a partner.

The survey closes with four open-ended questions to elicit participants' perspectives. Question 13 asks about group work: *Does working together in your group help you learn? Why or why not?* Results corroborate the findings illustrated above. Out of 23 responses, five participants indicated they did not like group project work, and four students were neutral. Those who did not like the group explained it was because students did not share the work equally. Fourteen out of twenty participants report group work as effective citing reasons such as being able to help each other. To explain these findings, it may be useful to refer to the role of guided instruction. These findings suggest that while group work may be perceived as satisfactory *practice*, the place of teacher lead is still seen as highly valuable in terms of introducing and presenting material, this concurs with the work of Bentham [2].

Questions ten and eleven dig deeper to elicit participants' responses around the role of the teacher and corroborate the findings from questions 2, 3, and 6 above by asking:

Q. 10: Does the teacher explaining the lesson to you help you learn? Why or why not?

Q. 11: What do teachers do to help you understand? What do teachers do that makes it difficult for you to understand? What is it about your best teacher explanations that help you learn?

All 23 participants responded consistently positively to question ten: *Does the teacher explaining the lesson to you help you learn? Why or why not?* This indicates that the teacher explaining the lesson was viewed as helpful to learning. The reasons given include:

- *better than depending on myself*
- *difficult learning on my own*
- *it helps me understand*

When asked to explain what it is that teachers do in the classroom to support learning, the keyword of 'explanation' emerges:

- *They explain slowly and repeat in a gentle voice.*
- *they explain using examples and stories and talk nice; in an interesting way*
- *They listen to me, and they explain in a straightforward way in simple words and make review the next class*

A study by Andergassen [1] supports these participants' views in arguing that clear teacher instruction and repetition are key to learning. In fact, the spiral curriculum's basis stems from repetition, to facilitate deepening learning from each cycle of repetition [50].

4.4 Summary: Surveys

The responses to the survey questions indicate that these learners overall prefer a more teacher-led, direct instruction classroom approach. These findings are robust as triangulation was used to compare results across questions. This may be due to cultural factors as noted above through the work of Hofstede [19] and through societal factors when considering previous learning experiences from more teacher-led style government schools [3]. However, it does not mean that these participants do not also respond well to student-centered, at times, there is certainly no aversion to this approach. However, this survey analyzed preferences which clearly reveal these students learn more from a more teacher-led approach. Another explanation from these results may be found in the timing of this study which was conducted during the pandemic when all classes were online, and therefore, the need for teacher support was greater [42].

4.5 Recommendations

The results of this research study reveal positive perceptions from both faculty and students around direct instruction. To validate this study's findings, a direct instruction model is recommended in the classroom with a pre- and post-intervention and

control group research design to measure the impact of direct instruction more accurately. Direct instruction would be guided by theory following the recommended stages below [45]:

- Introduction—setting the scene
- Presenting new material
- Teach
- Guided practice
- Feedback
- Independent practice

To address the limitations mentioned below, it is recommended a further study incorporates more participants and is conducted across institutions to elicit a range of responses.

4.6 Limitations

A: Sample size. The author acknowledges that one limitation of this study, is the number of interviews at four, this may be deemed less than needed for saturation [44]. However, the literature is divided on this, with no consensus on firm numbers, and a recognition that small sample sizes are the norm in qualitative research as the aim is for depth rather than breadth [47]. In a busy institute, relying on faculty goodwill to donate their time, this is the response rate the author received; however, as responses are consistent, there are some clear generalizations to be made here.

B: Timing. This study was conducted during the pandemic when all classes were online. Teaching and learning experiences were different than 'the norm' and for some, more challenging with added stresses. This may factor into the credibility of the responses. This timeliness may also be considered a strength, however, as the reality of teaching online and lockdowns may become the new normal [28].

C: This research study was conducted at one Higher Educational institution which may not be representative of HE in the UAE.

5 Conclusion

This paper has sought to bring to the forefront of academic discussion the merits of direct instruction; an oft-seen lesser cousin to indirect instruction. It has illuminated findings from the literature to show both empirical evidence in support of this approach, and a hesitancy among academics to afford it the gravitas or classroom attention it deserves. Perhaps shaped by enduring perceptions of a didactic model of tired teachers delivering content without consideration of their learners. A new vision of direct instruction has now emerged with guided instruction evidenced as a

proficiency practice and which works *in tandem* with indirect instruction to provide an optimal learning experience.

This paper's title: An Exploration of Direct Instructions: Why Teaching Matters invites academics, teacher practitioners, and researchers to revisit the role that direct instruction plays in education. Importantly, this approach is not viewed in the light of being a replacement for or substitute for indirect instructions, which have proven effectiveness. The teaching methodology is not a winner takes all competition, these approaches are not opposites, and this idea that in learning:

> One position must be correct and prevail, while the other must be flawed and thus vanquished (Hannafin and Land, 2000, p. 22) is unreasonable, pedagogically unsound, limiting, and importantly it robs us of the tools at our disposal. Our job as educators is to make sense of these approaches, learn how to successfully transfer their ideals into classroom practice, and to determine in which context they are most beneficial. This is how we wield our authority and direct our knowledge, because; in simple terms: teaching matters.

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Online Effectiveness of Hybrid Blended and Flipped Learning Approaches During COVID-19 Virus in Libya

Rashad Brydan and Fawzi Ikraiam

Abstract The aim of this paper is to provide an insight into hybrid online teaching and flipped learning during COVID-19 pandemic in Libya in pursuit of improving Libyan university students' knowledge and skills as an alternative instrument to continue their studies. However, this brought about some challenges, for both lecturers and students, while teaching undergraduate courses using hybrid blended online lecturing in the context of flipped learning in different subjects and university programs. Using questionnaires and focused group data analyses helped the authors to discover the opportunities ahead to promote further development of online teaching and flipped learning in Libya. The result proved the need for information and communication technology (ICT) skills for students and staff members, considering the hybrid blended online teaching and flipped learning experience and involvement. This was achieved according to four indicators: students' learning experience, students' academic performance, students' final achievements and educators' observations. In conclusion, the study proposes a new online teaching model, called Learn, Believe and Achieve. More studies are still needed to help improving this new teaching methodology in Libya.

Keywords Online teaching effectiveness · ICT integration · Hybrid blended and flipped learning · Online instructions · COVID-19

R. Brydan
Princeton University, Princeton, NJ 08544, USA

Management Department, Faculty of Economics and Political Science, Derna University, Derna, Libya

F. Ikraiam (✉)
Physics Department, Faculty of Science, Omar Al-Mukhtar University, El-Bieda, Libya
e-mail: fawzi.ikraiam@omu.edu.ly

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1 Introduction

Since the first appearance of COVID-19 pandemic different Libyan higher education institutions such as Omar Al-Mukhtar University and Derna University offered varying online courses to undergraduate students. The first online experience was developed at Omar Al-Mukhtar University during the winter of 2020 at the Faculty of Tourism and Archaeology. The primary aim for this new technique was to satisfy general elective requirements of Libyan distance learning scheme. This study was initiated by raising questions about the outcomes of this new online teaching methodology. Questions such as: How would students' performance be? Would students gain information? How about using this method for exams and assignments? Would students' grades be higher or lower? How would Libyan students feel about the online flipped learning style? [1]. Although recent developments in information technology (IT) have produced much promise on the use of information technology (IT) for online learning, it is not entirely clear whether IT will be successful in education. There are persuasive arguments on both sides. Some advocate for the role of IT in education present particularly satisfactory progress, while others still doubt the full functionality of the role of IT in this regard against online education technologies. Libyan university lecturers are under increased pressure to deliver to their students and other constituencies expanded services and greater value with reduced physical presence of students at university campuses.

Therefore, as these technologies are advancing in the higher education sector and developing rapidly, Libyan university academics are confronting significant responsibilities to learn and acquiring them. This enables them to exhibit educational resources in a well-dressed and modern aspects [2]. Furthermore, the rapidly increased usage of latest information and communication technology (ICT) presented alternative prospects for university lecturers to attract and stimulate their undergraduate students, despite their backgrounds, to take advantage of these possibilities. These new higher education online technologies could be utilized in implementing new online teaching and flipped learning models may increase students' enthusiasm and self-independency thus increasing their awareness and progress. As examples of these models, hybrid online teaching and flipped learning are new tools to be used in educational platforms [3]. The flipped learning model (FLM) and the availability of modern technologies changed Libyan instructors' normal teaching tasks and turned upside down their university working day to be more student centered. This offered them more management of the teaching resources and easier online face-to-face meetings with their students [3]. This hybrid online teaching and flipped learning instrument is 100% dependent on using IT availability to change the delivery of educational instructions to individual learning at home instead of the classroom group teaching. This will assist university lecturers to expand individual direct teaching for their students [4]. The additional saved time may be wisely spent by students to collaborate with other students, think profoundly about the subject matters, learn new skills, and obtain advice on their progress. Besides this essential observation, this saved time may be used by instructors to tutor and motivate their students and challenge

them with extra activities. Consequently, online teaching and flipped learning model will appeal to lecturers, researchers, and educators as well as funders round the world to support and encourage such shifts and transformations [5].

1.1 Study Motivation

This century has by now realized enormous advancements and improvements in different technologies in many fields of education, one of which is hybrid online teaching and flipped learning methodologies. Thus, some of Omar Al-Mukhtar University and Derna University students are encouraged to use the available up to date electronic devices and related collaborative activities to enhance their academic achievement. Educators and academics did attempt to explore how to practically integrate these modern technologies in the educational teaching, learning and research processes [6]. Also this may cause including a variety of exercises to help Libyan university students to examine their own behavior, recognize new fields for advancement and acquire new respects of learning.

1.2 Research Hypothesis or Problems

This study is concerned principally with providing an insight into hybrid online teaching and flipped learning during COVID-19 pandemic in Libya that are required for Libyan students for completing their studies and self- improvement. To also assure their academic accomplishment and education outcomes to acquire the needed market skills needed after graduation. Nevertheless, to improve the Libyan higher education quality, there is a considerable requirement for concrete teaching plans and methodologies by joining theory and practical skills of online learning in well-defined strategy. Therefore, this study was developed at quantitative and qualitative levels considering the academics and authors' previous experience. This work aims to answer to these research questions:

RQ1: How effective is the hybrid online teaching and flipped learning methodology for Libyan university students?

RQ2: What is the nature of this modern technology challenges that were faced by Libyan undergraduate students?

RQ3: What are the online teaching risk management skills to help Libyan teachers in better handling unexpected sorts of risks?

1.3 Study Aims and Objectives

The main objectives of this paper are to provide an insight into hybrid online teaching and flipped learning during COVID-19 pandemic in Libya, in overall performance, comparing traditional teaching performances to online ones and to improve Libyan university student's final achievement. Therefore, this study is aiming to:

1. Examine the nature of university hybrid online teaching and flipped learning model through the COVID-19 pandemic in Libya.
2. Find out the nature of this modern technology challenges facing Libyan undergraduate students.
3. Discover the required online teaching skills to help Libyan teachers in better handling all expected and unexpected sorts of tasks and duties.
4. Initiate a new channel and creative source for other researchers to do more related studies.

2 Methodology

This research process started by forming two groups (control and experimental) to establish and find relationships between study variables for 80 Libyan university students. The differences between the two groups were methodological and technological learning skills. The control groups (20 male and 20 female students) received traditional classes with no use of technological sources, while the experimental groups (20 male and 20 female students) received an innovative methodology by means of flipped learning using online hybrid teaching. However, the traditional approach was configured as a collective variable, while the technological practice/approach was considered as an independent variable. This descriptive consideration was applied for 80 students in Economics studies in the first year of studies at the university. In this group of selected students, 50% were boys and 50% were girls. Their average age was 18 years. The students were divided into four study groups, where two of them were controlled in nature and the other two were of an experimental nature and treatment allocation designed on a random base. Only post-test was adopted (see Table 1). Moreover, no pretest was undertaken to discover the groups' beginning level. These groups were reliable for the comparison process as they were at the same level. Therefore, the students had no previous knowledge or experience about the preservation of Economics Studies.

As mentioned before, an applied qualitative approach was employed in the study to collect, analyze, and evaluate the necessary data. This approach was the dominant method in this study to examine the nature of university hybrid online teaching and flipped learning model by asking students in the treatment group fundamental open questions concerning the benefits and challenges of the online teaching method. Therefore, the authors believe that this research is important because of:

Table 1 Design distribution of study

Group	n	Composition	Pretest	Treatment	Protest
Control	20	Natural	–	–	O1
Exp	20	Natural	–	X	O2
Control	20	Natural	–	–	O3
Exp	20	Natural	–	X	O4

1. This research is the first attempt to examine the impact of hybrid online teaching and flipped learning model at both universities.
2. To find if the results of this study support the hypothesis that hybrid online teaching and flipped learning would be beneficial to undergraduate students in Libya.
3. To examine any obstacles that may hinder the application of this new online teaching and learning technology in Libya.

2.1 Studies Related to Flipped Classes

Recently, and in many higher educational institutions, online teaching and flipped classroom models have become common teaching tools. The influence of this new lecturing scheme has been investigated in many studies. As an example, a previous Arabic study considered the flipped classroom model effect on listening comprehension of Egyptian university students [7]. The study assumed one-group pre-post-test design. A pretest on listening comprehension was employed prior to the experiment. Then the post-test was applied. The obtained results showed that the flipped learning model had a considerable effect on listening comprehension. Considering the flexibility of e-learning and to estimate health care students' perception regarding its implementation, a study at King Khalid University was performed for 4 months, from April 2020 to July 2020. This study suggested that efficiency of e-learning was influenced by various existing elements. The research instrument used contained a self-designed, qualitative questionnaire where three domains need to be confirmed using the field pretest method. This was administered among students using social media platforms. Among 254 respondents 59.8% were males and the rest were females. 96.5% of respondents were staying with their families. 10.2% reported medically compulsory quarantine for one or more family members. 59.8% reported that the online classes began too early. 63.4% of the respondents stated that they had no prior experience. The main obstacles to the students were weak network links (32.3%), unawareness about online platforms (29.9%) and poor audio/video qualities (26.3%). Also, there were also several factors that affected the full outcome of e-learning such psychological tension, quarantine requirements and family living conditions. The study concluded that health care students are still skeptical due to the absence of clinical training. This may cause them not to adopt e-learning completely. To collect the data, an English flipped learning writing test along with a questionnaire were

used. As stated earlier, the experimental group was lectured through flipped classroom approach. On the other hand, the traditional teaching method was used with the control group. Both groups were post-tested. The results of the post-test showed that the experimental group achieved better results than the control group. Furthermore, the questionnaire results were in favor of the online teaching and flipped learning scheme. This can be accredited to using digital distance learning and could be applied in similar fashion to Libyan students to make the transition from teacher-centered classroom to student-centered teaching methodology [8].

2.2 Online Teaching and Flipped Learning Problem Statement

At the start of trying this new digital technology method, it was obvious that Libyan students do not have the opportunity to attempt and test the skills learned or to participate in professional use of IT techniques outside of the classroom due to the insufficient communicative abilities. Previous studies examined the variant influence of studying in a Flipped Classroom (FC) environment when compared to a Blended Learning (BL), a Traditional Learning (TL) or an e-learning (EL) scenarios on learning performance, self- effectiveness confidences, students' motivation, and model flexibility, it was found that FC mode is an encouraging approach of improving students' learning performance. Two instructional components were employed in both online and face-to-face modes. These were lectures and guiding questions. The mode of these elements varied in both blended settings (BL and FC). These studies showed that learning accomplishment was better in the FC setting when compared to other learning conditions. The learning performance, when compared to the EL model, of BL students' mode was higher. Furthermore, the study concluded that studying in the FC model had a positive effect on self- effectiveness attitudes and essential motivation. However, this was not noticed on the observed flexibility. The results also suggested that the flipped classroom may stimulate students' inspiration. However, some difficulties were associated with the FC, the students' inadequate preparation for this model. Consequently, students must be trained to employ FC methods with sufficient e-learning means, as well as it is essential to consider the study load for the students as well as providing in-class activities [9, 10]. Moreover, and due to the absence of significant interaction because of applying traditional teaching schemes in most institutions of higher education, the same case is repeating itself, which may be one of the causes behind this. Other studies showed that lecturers employ traditional teaching approaches since they consider these modes more practical and constructive for the students [11]. This may also be because lecturers find these schemes easier to use and do not demand much effort. Due also to the influence of their own experience as students, other lecturers use traditional teaching, repeating their former instructors' role. Besides, most teachers are affected by following beliefs that conventional classroom methods, in which teachers are at the center of control

in their classes and have full command over students' interaction since they are the only resource of skills and information, are the methodology to follow.

2.3 Online Teaching and Flipped Learning Characteristics and Benefits

There are various characteristics and benefits brought about using digital distance learning in Libya as it is convenient for university students since this approach has definite effects. This approach can concentrate on all categories of students [11]. As the academic year evolves, better performance and creative input from students are the expected results of such implantation [12]. Increasing students' engagement time inside classrooms, receiving instant response as well as encouraging the spirit of teamwork are some advantages of using this model. FL may be also regarded as a suitable model for individualizing learning approaches. However, up to now there are no obvious thorough ICT policies in most Libyan universities as well as the application of ICT is still extremely limited in these universities. These factors and others render the integration of ICT in the educational sector which continues to be a considerable challenge for method of evaluation (MOE). Therefore, there is a necessity to implement MOE in an objective and strategic manner by applying and ICT in well-set plans that could be measured, followed, and enhanced continuously [13]. As numerous studies suggest, students' motivation and accomplishment are realized in many manners by applying ICT effectively. However, this still requires more research and studies especially in the Libyan higher education institutions to explore distance students' accomplishment [7, 14].

2.4 Distance Learning Motor Skills Model

This distance learning motor skills model is about attaining various skills due to practicing and experiencing the most frequently cited FL standards. The model proposes that FL effectiveness may be expanded in view of students' feedback. This feedback may be observed as lecturers take corrective measures in cases such as: when students are deliberating too long by interfering, asking irrelevant questions, or losing their interest. This Model engages students by maintaining their self-possession and excitement at a satisfactory level. Once students understand the FL model, it would aid them in developing new skills. Skills such as knowing that the FL will help students to analytically evaluate the efficiency of their employability skills at every level, describing the categorized structure of motor skills and explaining how this suggests the possibility of decomposing complex employability skills into their element parts as well as comprehending the role of the assumed online teaching and FL models in achieving remarkable progresses on students' education.

2.5 Preparation for Online Distance Learning

To substitute the role in the classroom from teacher-centered to student-centered, FL mode can be regarded as a start stage. It reinforces students' interest, either direct or indirect, in addition to their engagements by applying the constructivist approach. However, to use FL standards, Libyan lecturers and educators will have to improve and master the FL appropriate directions [15]. For example, to integrate ICT in teaching and learning activities, Libyan instructors are expected to increase their knowledge of pedagogical procedures through several attributes that may include planning, applying, and evaluating these procedures. For example, generating video does not require recording the lectures inside the classroom while teaching using video cameras. Lecturers may be able to create videos through making a screen cast function by capturing the computer screen, for instance slide show of Power Points presentation, recording voices, including a small webcam of instructors' faces, using digital pen for solving problems and so on. It is found out that the appropriate average video time is about 10–15 min long [1, 4]. Traditional teaching only requires high class professional educators. However, Libyan FL educators must move beyond the traditional lecturing and training and must be determined to shift direct teaching from a group of students to individual ones. This requires how instructors learn to maximize their time with students in the classroom [16]. Additionally, to become a flipped educator and an excellent teacher with plans and practices with a wide range of effective pedagogical approaches is a challenging and demanding task. Along with the instructor's capability to predict student misconceptions, good lecturers should continuously and accurately evaluate the effectiveness of the lectures and to ensure that the educational aims are fulfilled.

Thus, skilled, and professional university teachers are facing a radical pedagogical modification of their teaching methodologies where they must plan and organize their FL classes [17] attentively and cautiously. Therefore, Libyan distance instructors should be able to modify direct instruction from the group to the individual learning environment. In addition, instructors should learn how to maximize direct teaching time between lecturers and students. Thus, flipped lecturers must regularly monitor their students' performance providing them with appropriate reaction at the exact moment and continuously rating this performance [18].

2.6 How Can Libyan Instructors Flip Their Classrooms?

For Libyan lecturers and teachers who would be embarking on this change to flipped teaching approaches, these steps may be followed:

i. Lecturers should select the right technology that fits their needs to make films, edit them and share these videos with their students. This is because FL methods depend on ICT. This is also true for the students where it is essential for them to have access to a hosting service and to be able to manage all its contents where

their instructors can track students' improvement. This may be achieved by a learning management system (LMS) which will streamline all the contents in one place.

ii. Since lecturers will not have to concern themselves about classroom administration, then a 15-min lecture could be delivered in only a five-minute video. Due to the availability of excellent quality open educational resources (OER) sources, students can search for videos and other interactive content from these sources. However, before launching an online lesson, lecturers must be transparent with students and explain what distance learning is and why we are doing it. Since making this significant transfer in the lecturing culture is not an easy task. Therefore, transforming the mindset is a demanding assignment. Thus, lecturers should be well-prepared to deal with students' worries and to answer the "how" and the "why" questions more than often.

iii. Distance learning depends on student participation at-home to be involved with pro-active activities. Monitoring students' participation allows lecturers to help students with their homework, recognize who needs assistance and hold them accountable for their chores.

3 Study Experimental Part (Field Study)

For this study, as already stated, students were divided into two groups: experimental and control (see Fig. 1) to investigate the influence of distance teaching on students' achievement. Academics were questioned to evaluate the advantages and challenges of the FL Model. The result was in support of FL using ICT tools.

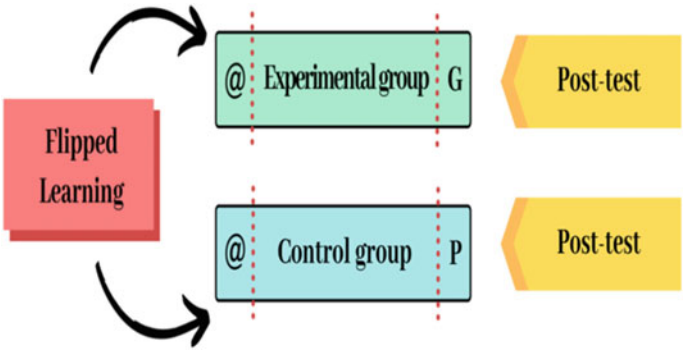

Fig. 1 Flipped learning group samples. (*Source* Flipped Learning Network 2014)

4 Conclusion and Recommendations

The hybrid online teaching and flipped learning method proved its effectiveness in helping Libyan students to develop their achievements by encouraging them to be more independent students, highly responsible for their own learning while improving the relationship with their teachers. Students had also positive thoughts on distance learning to enhance their competences. The students agreed that this approach of teaching would aid them in enhancing their understanding, communication skills and employability competencies. The results were useful as this new digital methodology succeeded in shifting the attention from teachers to students to improve students' accomplishment. The results of this work presented views of distance learning methodology using modern technologies and updated educational facilities. The authors have utilized, believe, and achieve (LBA) model for the best distance learning performance (see Fig. 2).

This study specifically concluded the following findings:

1. Hybrid online teaching and flipped learning are becoming a necessity for the entire Libyan higher education sector.
2. Power supply and good internet service with updated technologies remain to be the essential challenges while practicing distance learning in Libya.
3. Libyan teachers need to improve their skills in utilizing live and recorded video conferencing platforms, such as G-Suite, Zoom, Google Class, Google Meet, and others for better handling all expected and unexpected tasks for online teaching responsibilities.
4. The outcomes of flipped classes were not long-lasting. It is therefore proposed that lecturers should repeatedly use flipped classes in their teaching strategies to have demonstrable influences on the sustainability of collaborative-teaching schemes.

Fig. 2 Flipped learning LBA model

The authors conclude with the following recommendations:

5. Organizing training programs about digital learning for both teachers and their students on employing FL schemes before their implementation.
6. Persuading Libyan lecturers to apply new flipped online approaches in place of conventional teaching techniques.
7. Performing comparable studies in other fields of study to examine the usefulness of FL in increasing students' achievements.
8. Using the LBA online teaching model with the right ICT tools is the prospect for productive higher education procedures in Libya and similar countries to produce quality graduates.

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Proactive Targeted Academic Advising Approach for Students Under Academic Probation and At-Risk Students

Hussein M. Elmehdi, Almehdi M. Ibrahem, and Zaid A. Zaid

Abstract Academic Advising in higher education has received considerable attention in recent years. This is mainly due to the increased focus on improving education quality, student retention and ranking. The current approach focuses on at-risk students, which includes students with a CGPA of less than 2.3. The *Academic Success Program (ASP)* is comprised of three main components, which start early in the semester where the targeted students are enrolled in zero-credit courses on the Learning Management System (LMS), i.e., Blackboard. In the first phase of the *ASP*, we targeted students who are currently under academic probation with the aim to expand the program to include students at risk (students with a CGPA of < 2.3). First, students are asked to answer an online questionnaire, which include carefully designed questions on student status, reasons for academic probation, study habits, social issues, challenges they are facing in their study programs and assistance or services they require to improve their academic standings. Next, students are invited to attend a 2-h workshop that focuses on explaining the various rules and regulations pertaining to academic probation, how to calculate GPA and CGPA along with study plan navigation assistance. The third part of the workshop is a motivational seminar aimed at encouraging and inspiring the students to seek help, talk about the challenges they face, get parents involved and key points on academic success. After the workshop, students are asked to answer an exit assessment that is constructed in the form of a quiz to gauge the gain or impact the program had on the students. The initial results are very encouraging, where 75% of the students who completed the program were able to overcome their academic probation status.

H. M. Elmehdi
Department of Applied Physics and Astronomy, College of Sciences, University of Sharjah, PO BOX, 27272 Sharjah, United Arab Emirates
e-mail: hmelmehdi@sharjah.ac.ae

A. M. Ibrahem
Department of Mechanical and Industrial Engineering, University of Gharyan, Gharyan, Libya
e-mail: al-mehdi.ibrahem@gu.edu.ly

Z. A. Zaid (✉)
College of Law, University of Sharjah, PO Box 27272, Sharjah, United Arab Emirates
e-mail: zzaid@sharjah.ac.ae

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1 Introduction

Academic Advising has received considerable attention in recent years by postsecondary educational institutions. Furthermore, academic advising has been identified as one of the factors that can significantly improve the quality of education by positively impacting students' academic performance and increasing retention rates in colleges and universities [1]. For decades, there has been significant research interest in the topic of how academic advising contributes to the academic success of students. Over the years, it has been shown by many researchers that the old theories that attributed students' success to individual characteristics, skills, work ethics and motivational factors are not entirely valid [2]. Recent research findings have highlighted the role of institutions to provide focused academic advising programs, whose primary goal is to provide guidance to students and assist them throughout their selected academic program [3].

The initial focus of academic advising programs focuses on developmental academic advising programs, where the focus is to work on assisting students overcome the overwhelming experience of the college lifestyle [4]. In recent years, several definitions of academic advising have emerged in the literature, the most popular of which is that of Campbell and Nutt (2008) [5], which states "*academic advising acknowledges and supports individual student characteristics, values and motivation*". They further add "*academic advising connects students to campus and helps them feel cared for, both of which have been shown as essential to student engagement*" [5]. Initially, the focus of academic advising programs was on freshmen students, however, it was soon realized that junior and senior students also needed advising as well.

The main objective of academic advising was articulated in several articles to include several key roles:

- Refer students to resources and opportunities that assist them in achieving their academic goals.
- Motivate students by helping them set high expectations.
- Provide academic support to academically challenged students.
- Provide personal support.
- Offer constructive feedback on students' performance through regular follow-up.
- Conduct regular face-to-face meetings with students to guide them through their academic plans.

As mentioned above, initial research on academic advising has focused on freshmen students to help them cope with or overcome the culture shock some of them faced when they started their college years [6]. This was due to several reported cases where students' failure was attributed to their inability to properly adjust to

the free-style of college life in the absence of the watchful eyes of their parents. In addition, other factors such as course selection, load and instructor preference were identified as factors contributing to students' performance in their early college years. It was later identified by several researchers such as Light [7] who described "good academic advising" as follows: "*the single most underestimated characteristic of a successful college experience*". Other researchers have echoed the same view adding that effective academic advising plays a crucial part in referring college students to resources and opportunities that "*support their engagement, success, and the attainment of key learning outcomes*" [5]. They further add: "*Academic advising is one of the few campus services that promote student interaction with caring and concerned university employees*". The result of these findings led to the common understanding that academic advising should be the responsibility of the institution that must be added to the services provided by the academic institutions to support students in achieving their academic goals. As stated previously, academic advising contributes to students' success in many ways starting with motivation and support to simply help students feel they are cared for.

Over the past few decades, institutions have taken several approaches to provide their students with effective academic advising programs. These approaches are divided into the following three main categories:

- Developmental Academic Advising (advisor takes the role of a counselor)
- Prescriptive Academic Advising (advisor takes the role of bookkeeper)
- Intrusive Academic Advising (advisor takes a proactive role to communicate with a selected group of students usually identified as "students at risk").

According to Light (2001), developmental academic advising is considered a type of counseling that aims to assist students by addressing their social and intellectual obstacles [8]. The focus of this form of advising is to offer support to students in areas such as environmental and interpersonal interactions, behavioral awareness and problem-solving, as well as decision-making and evaluation skills. Furthermore, academic advising is student-centered academic advising that focuses on the personal needs and growth of students [9]. The goals set for the academic advisor include.

- Increase student engagement.
- Enhance students' personal meaning.
- Identify the connection between students' interests and her/his personal goals.
- Regular assessment and monitoring of students' performance.

In prescriptive academic advising, the advisor's role is limited to highlighting to the student what classes she/he ought to take in accordance with her/his study plans [10]. The advisor is also asked to provide her/his advisees with an overview of the regulations and bylaws of the institution. Harrison et al. (2009) reported that prescriptive academic advising is a hierarchical process in which the academic advisor assumes control of the information, and the students take on a passive role as recipients of this information [11]. The example often drawn is the advisor takes the role of the doctor, while the student takes the role of the patient accepting the prescription from the "doctor", hence the name prescriptive [12]. Advising is

conducted over several optional pre-scheduled meetings between the advisor and the student during which the advisor goes over what the student needs to do next. It should be emphasized here that all approaches include meetings between advisors and students; however, in prescriptive academic advising the discussion is limited to policies, regulations, study plans and degree requirements.

The third approach is intrusive academic advising. It owes its name to the intervention strategy taken to conduct academic advising. It is a proactive approach that focuses on providing (or in some cases limiting) academic advising to students who are "at risk" [13]. It involves well-organized and structured steps that start with identifying the targeted group of advisees to be asked to attend a set of special advising sessions. Besides aiding and guidance to selected advisees, additional goals of intrusive academic advising include [14]

- Increase retention rate.
- Reduce early attrition from college.

In addition to academic performance, advisors are also asked to monitor student attendance, their behavior in class and study habits. The advantage of intrusive academic advising is manifested in the fact that it utilizes a systematic approach that solves problems such as the reluctance of some students to participate in or take advantage of academic advising. In addition, it takes advantage of the fact that many college students navigate through college depending on other means of academic advising, especially peer advising, which is considered by many as the most popular form of advising among college students.

At the University of Sharjah (UOS) (Sharjah, United Arab Emirates), academic Advising has been conducted in a prescriptive approach, where every student is assigned to an academic advisor upon enrollment in her/his academic program. Advisors are asked to meet with the students periodically to explain to them the rules and regulations and provide them guidance/assistance with registering for the right courses to ensure they follow their study plan and graduate on time or at the least possible time. Academic advisors are selected among instructors who are very familiar with study plans and well-versed in the field. As a result of the rapid increase in the number of students, academic advisors may find themselves overwhelmed and, at times, unable to meet the expectations established by university academic advising programs. In addition, it has been reported that students do not show up for academic advising sessions due to various reasons, including their reluctance to admit that they need help. To deal with this, the university has experimented with the "pin-code approach", where students are not allowed to register until they visit their academic advisor and get her/his approval on the set of courses they need to sign up for. This approach did not work very well because of the added logistics and administrative layers, which hindered efforts to improve the online registration process. In addition, students who were progressing well in their academic programs and did not feel they need to meet with their academic advisor were not happy with the additional delays they were experiencing. In the end, the University of Sharjah decided to limit the pin-code approach to students under academic probation.

To deal with this, the Registration Department took the lead in offering a special proactive academic advising program, which is a mix of the three previously mentioned approaches. The approach focuses on students who are under academic probation. The approach utilizes the online tools available at Learning Management Systems (LMS) available at the university. The objective of this endeavor is to develop a creative academic advising approach that provides students who are under academic probation with adequate advising, counseling, guidance and much more. Rather than rely on academic staff who are already overwhelmed with teaching load and administrative assignments as well as research responsibilities, the Registration Department took on the responsibility to establish a "mixed approach for academic advising" that relies heavily on the utilization of technological tools in conducting academic advising. As will be detailed in the next section, this creative approach has many advantages, the most important of which is direct communication with the students through LMS tools, which ensures confidentiality as well as personalized emails.

2 Targeted Approach for Academic Advising

As briefly mentioned in the introduction, the approach targets academically challenged students, i.e., students under academic probation, with the following goals:

- Provide structured academic advising.
- Conduct orientations on bylaws and regulations.
- Increase retention rate by helping students overcome their academic probation status.
- Reduce academic dismissal rates.
- Utilize data available in Student Information Systems (SIS) databases in the selection of targeted students.
- Take a more proactive role in academic advising.
- Utilize the existing IT tools to conduct the associate logistics (communications) with students.
- Leverage the narrow age gap among students and registrars to openly discuss personal and social issues faced by students.

Targeting students under probation was taken to be a testing phase of the approach with plans to expand the approach to include *students at risk*, i.e., those with a CGPA less than 2.3.

The targeted students were selected three weeks into the semester after all registration processes are completed. The delay was necessary to account for incomplete grades and any changes in the CGPA of the students due to various reasons. A report is extracted from the SIS database containing all students who are under academic probation in all departments. Figure 1 shows a typical example of one of the batches in the Fall of the 2014–2015 academic year.

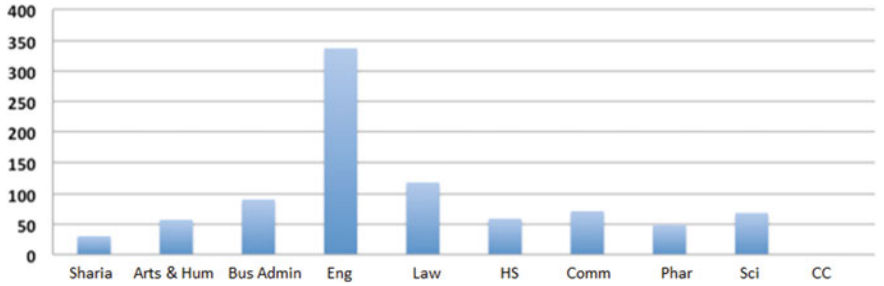

Fig. 1 Distribution of students under probation in every college, the overall percentage of students under probation is about 10%. The data was taken from the Student Information System (SIS) at the University of Sharjah

It should be noted here that the percentage of students who are under academic probation at the University of Sharjah hovers around 10%, which is similar to that reported in the literature. After compiling the lists of the students, a course page is created on the Learning Management System (Blackboard). Students were automatically enrolled into the program, and notification emails were sent to everyone outlining the objectives of the program, the dates of each activity and the deadlines associated with the assignments and activities.

To attract the students, the program was given the name "Academic Success Program", which gave it a positive spin. Students are invited to take part in the following parts:

- Entrance survey.
- Workshop on policies and procedures.
- Motivational seminar.
- Exit survey (in the form of a quiz).

The first activity of the Academic Success Program is the online "Entrance Survey", which is made up of a combination of MC questions, short answer questions and open-ended responses. In addition to demographic questions, the survey was constructed to gain an insight into the main challenges the students face, and the reasons that led to their sub-bar academic performance. The questions also focus on students' study habits, utilization of LMS (Blackboard), interactions with instructors outside classes, test-taking strategies, time management and participation in extracurricular activities, such as sports, social and cultural activities. Students are also given the opportunity to list additional challenges, including domestic and financial difficulties. The survey was conducted online using the tools available on the Blackboard. It should be noted that students were asked to write their student number at the beginning of the survey for analysis purposes acknowledging full anonymity. Students were asked to fill out the online survey before they attend the workshops.

In the second part of the program, students were asked to attend a workshop on policies and procedure pertaining to academic probation. In addition, students were trained on how to avoid academic warnings and how to overcome their academic

probation status. Students are also taught how to calculate their GPA and to predict how much they need to score in their current courses to raise their TGPA and CGPA. In addition, the workshop highlights policies on repeating courses and advantages of department/program changes.

In the third part of the academic success program, students are given an interactive motivational seminar conducted by one of the senior instructors. The seminar is entitled "You are not alone". The focus of the presentation is engaging the students in a discussion type of seminar during which students are encouraged to talk about their challenges and difficulties. The instructor steers the discussion using factual stories and figures and success stories. Upon the completion of the workshops, students are asked to fill out a survey containing quiz-like questions on the material covered. In addition to understanding the policies and regulations, the purpose of the exit survey is to gauge the students' understanding of the real challenges they face and how to deal with such challenges.

3 Results and Discussion

A total of 320 students participated in the program. The demographics of the students showed that the number of male and female students participating in the program was 58% (M) to 42% (F). Students from all colleges took part in the program with the highest number of students from the College of Engineering, which is mainly due to the fact that the College of Engineering has the largest number of students in the University of Sharjah. Data on high school curriculum and ethnic background is currently being examined in another research project and will be reported in due time.

Careful examination of the entrance survey showed that most students (about 76%) go on probation by the end of the second semester. While this is typical and attributed to many factors, which include nonacademic issues such as students' inability to cope with the free-style and responsibility-free college environment [4, 8, 12]. This is evident from the above than average absence and irregular study habits the students have reported. For example, over 67% of the students have reported that they never visited their instructors during office hours, while over 73% reported limited use of the material available on the Blackboard. Over 68% of the students reported they never felt prepared for the exams and experienced high levels of anxiety. Students' involvement in extracurricular activities is very limited, with less than 20% participating in sports, cultural and social activities. When students were asked to list the reasons behind their poor academic performance, the answers varied with the following common issues:

- Do not have enough time to study.
- Taking heavy load and could fall behind.
- Wrong selection/selected academic program did not meet expectations.
- Personal and family issues.

- The system is different than High School.
- I feel stressed most of the time.
- Did not meet with an advisor to discuss personal and academic problems.
- Health problems.
- Lack of academic advising.
- Language barriers.
- Desire to Learn (DTL).
- Must work to support myself (and my family).
- Distractions such as social media.
- Missing assignments and HW.

Surprisingly, when students were asked if they knew what to do to get out of their low academic standing, 78% of them answered yes, they know. One interesting finding is highlighted when students were asked about their level of participation in discussions during lectures, especially answering questions 68% said they did not participate nor did they answer questions in class. These numbers support research evidence and findings that showed a higher percentage of students under probation tend to be among shy and reluctant students [6]. In conclusion, entrance survey responses have revealed that students are facing a number of challenges, some of which are academic while the remaining can be considered as social distractions, personal and family issues, poor time management, poor study habits and health-related issues.

During the interactive workshop and motivational seminar, the focus was to highlight the UOS policies on probation, calculating and forecasting GPA and CGPA and providing students with tips on how to improve academic standing by repeating courses. The workshop was interactive where students were encouraged to participate and ask questions.

In the second part of the workshop, students were asked to attend a motivational interactive seminar entitled "You are not alone". The seminar was given by senior instructors who have an outstanding academic advising track record and are well-acquainted with the issues UOS students face, especially those related to cultural challenges and peer pressure. The objective of the workshop is to list some facts and statistics about academic probation within UOS (Fig. 2), available support and motivate the students to overcome their poor academic performance. Some of the key takeaways from the workshop include.

- There are almost 10% of the University of Sharjah students who are currently under probation and that is below most of the universities in the region.
- The University of Sharjah has designed a special Academic Advising Program to help these students get over their academic probation (Fig. 3).
- Students can overcome academic probation if proper adjustments were taken.

In addition, the instructor also highlights the fact that institutions' approach to academic probation warnings, especially the first two warnings as a signal for immediate action accompanied by immediate actions aimed at overcoming academic

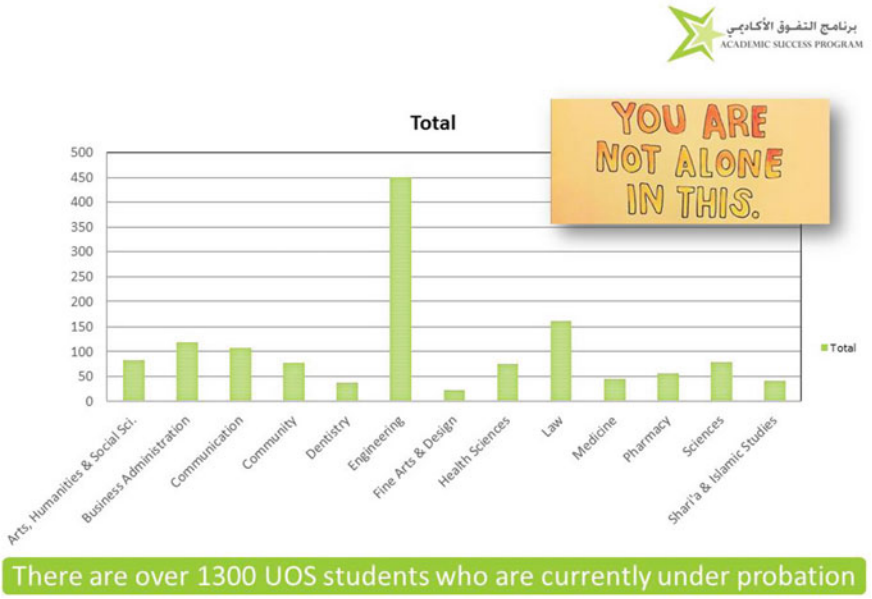

Fig. 2 A slide from the motivational seminar highlighting the distribution of the students under probation among colleges. The figure was taken from the motivational PowerPoint presentation, which was prepared by the authors

Fig. 3 Announcement for ASP, workshop and motivational seminar. The figure was taken from the promotional posters, which were prepared by the authors

probation status. It was highlighted during the seminar that upon receiving academic warnings, students are expected to "hit the panic button" to.

- Revisit their academic goals and priorities.
- Reexamine their study habits.
- Reconsider their college/program selection.
- Reduce their course load.
- Consider seeking help.

After that, instructors listed the five main contributors to academic probation, which are commonly reported in the literature. These include.

- Unmotivated to study.
- Difficulties in adjusting to college life.
- Poor study habits and skills.
- Lack of clear directions/career goals.
- Inability to deal with personal issues (such as financial concerns).

Students are then invited to discuss or share their own experiences with any of the above factors. During the open discussions, students reported additional factors, the most important of which were those linked to the conservative Arabic culture. The first factor was "getting parents involved"! It was evident from the discussion, and, due to various reasons, students tend to hide their academic difficulties from their parents hoping that they can overcome them on their own. Oftentimes, they fail to do so, and the problem is compounded. The second factor is linked to students' reluctance to talk about their problems to their peers or academic advisors simply because of fear of the consequences. This is more pronounced among female students. At the end of the session, students were given enough time to ask questions and raise concerns in the presence of the registration and admission directors and the dean of academic support service.

The last part of the "Academic Success Program" is the exit assessment survey, where students were asked to answer several questions aimed at.

- Feedback for improvement purposes.
- Gauge students' level of understanding of the material presented and their benefits from the program.
- Table 1 summarizes the feedback on the benefit reaped by the students who attended the Academic Success Program. As can be seen, the results show that students indeed benefit from the program, especially in raising their awareness of the UOS policies on academic probation, and calculating and forecasting their GPA. In addition, over 90% of the students felt they have benefited from the motivational seminar. Personal communications and encounters with students at the registration office were very encouraging.

Table 1 Student Responses to some of the exit survey questions. The data was extracted from the survey conducted on the students by the authors

What is your overall rating of the academic success program?	Excellent	40.6%
	Very good	25%
	Fair	15.6%
	Poor	18.8%
Are you now more aware of UOS policies pertaining to Academic Probation?	Yes	96.3%
	No	3.7%
Did you think the ASP (including survey and the workshop) will help overcome your academic probation?	I strongly agree	37.5%
	Agree	59.4%
	I do not agree	3.1%
Do you now know how to calculate and forecast your TGPA and CGPA?	Strongly agree	51%
	Agree	37.5%
	Do not agree	9.4%
	Not at all beneficial	2.1%
Did you find the "Motivational Seminar" beneficial?	Excellent: very beneficial	56.3%
	Very good	40.6%
	Fair	0%
	Poor: Not at all beneficial	3.1%

4 Impact of ASP on the Academic Performance of the Students

To measure the impact of the proactive *mixed approach for academic advising* approach on the academic performance of the students, we conducted the following two exercises:

- Calculated the gain in CGPA over the current semester of the students who attended all activities associated with the program.
- Compared their gain with a randomly selected batch of students who did not attend the program.

For the comparison to be valid, we selected students with almost the same background, i.e., the same academic CGPA, the same college or program and the same level of study. Figure 4 shows the gain of the selected group of students who attended all activities of the Academic Success Program.

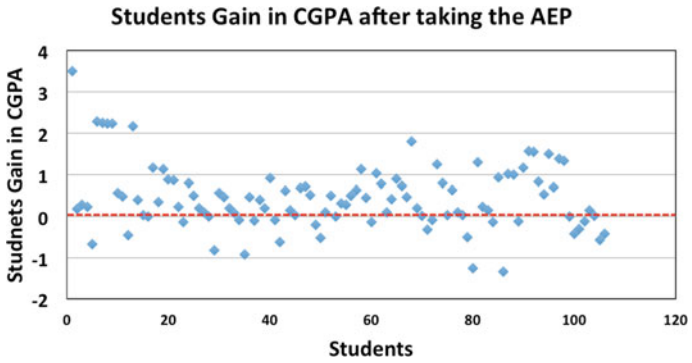

Fig. 4 The students' CGPA gain after taking part in all activities of the Academic Success Program

It is evident from Fig. 4 that our *mixed approach for academic advising* approach had a great positive impact on the students. More than 75% of the students were able to raise their CGPA above 2 and overcome their academic probation status. This result is even more pleasing when the results were compared to the second group of students who did not attend the program, where only 34% of these students were able to improve their academic standing beyond 2.

5 Conclusions

The mixed approach for the academic advising program at the University of Sharjah was conducted twice in the academic years 2014–2015 and 2015–2016 with overwhelming success. The program catered to students who are currently under academic probation regardless of the number of academic warnings they have. Except for the workshop and motivational seminar, all surveys and supporting material were communicated to the students via the Learning Management System (Blackboard).

The factors contributing to students' academic struggles were identified. These will be communicated to higher authorities at the university to design special advising/counseling programs for those who need such services. Students experiencing financial difficulties were directed to proper financial aid offices and special funding agencies.

Students learnt "tricks of the trade" where they were not only exposed to the details of the UOS bylaws and policies, but they were taught how to maneuver within the study plan to avoid academic probation. Examples include repeating courses, mixing up courses in accordance with the level of difficulty, student issues and petitions, grievance requests and change program requests. In addition, students learnt how to calculate and forecast their GPA, CGPA and much more.

The impact of the special academic advising program was very pleasing and exceeded the expectations of the authors. Over 75% of the students who took part in

the program had a significant increase in their CGPA and were able to overcome their academic probation status. The results were very pleasing not only to the authors but also to the university administration.

Organizers faced several challenges, the most important of which is the lower-than-expected attendance rates. The reasons behind this may be attributed to the fact that students were reluctant to participate in the program so their peers do not find out about their academic status. In addition, those who missed the activities reported logistical issues, such as the time and location of the workshop. This will be resolved in the future by offering the program at different times during the semester. In addition, we are planning to expand the program to include more categories of students above the current cutoff, i.e., students with a CGPA above 2.3.

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