OPEN WORLD LEARNING

RESEARCH, INNOVATION AND THE CHALLENGES OF HIGH-QUALITY EDUCATION

Edited by
Bart Rienties, Regine Hampel, Eileen Scanlon
and Denise Whitelock

Open World Learning

This book provides state-of-the-art contemporary research insights into key applications and processes in open world learning. Open world learning seeks to understand access to education, structures, and the presence of dialogue and support systems. It explores how the application of open world and educational technologies can be used to create opportunities for open and high-quality education.

Presenting ground-breaking research from an award-winning Leverhulme doctoral training programme, the book provides several integrated and cohesive perspectives of the affordances and limitations of open world learning. The chapters feature a wide range of open world learning topics, ranging from theoretical and methodological discussions to empirical demonstrations of how open world learning can be effectively implemented, evaluated, and used to inform theory and practice. The book brings together a range of innovative uses of technology and practice in open world learning from 387,134 learners and educators learning and working in 136 unique learning contexts across the globe and considers the enablers and disablers of openness in learning, ethical and privacy implications, and how open world learning can be used to foster inclusive approaches to learning across educational sectors, disciplines, and countries.

The book is unique in exploring the complex, contradictory, and multidisciplinary nature of open world learning at an international level and will be of great interest to academics, researchers, professionals, and policymakers in the field of education technology, e-learning, and digital education.

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Acknowledgements

Chapter 1

Introduction to open world learning

Research, innovation and the challenges of high-quality education

Bart Rienties, Regine Hampel, Eileen Scanlon and Denise Whitelock

1.1 Introduction

The main objective of this book *Open World Learning: Research, Innovation and the Challenges of High-Quality Education* is to establish an informed theoretical and methodological basis for research and practical application of open world learning. With the global pandemic, nearly every person on this planet has been touched by the impact of COVID-19. In part, the unprecedented spread of COVID-19 has been due to the growth of technology and the interconnected nature of our societies across this planet. Thanks to global travel afforded by technology, a "small" infection in one part of the world rapidly infected millions of people across the globe in less than four months. At the same time, thanks to innovative technology millions of teachers and students were able to continue to learn online when many societies went into lockdown. Similarly, the unprecedented global race to find a vaccine would not have been able to complete successfully so quickly without technology and the combined forces of scientific research.

In these unprecedented and strange times, the power and limitations of technology have become even more visible to many. The rate of transition of learning in the 21st century has undergone both subtle and radical transformation as a result of COVID-19. Some of these changes were already starting to become visible in several parts of societies and educational systems in particular, such as moves towards blended and online education (Hampel, 2019). Other changes like working from home, attending online concerts, or creating Zoom discos have led to substantial organisational and personal changes in our daily lives, which we may not have seen for a decade without COVID-19.

Open world learning gives unprecedented access to information, knowledge, and education and provides support to learners across the globe. However, it is not the technologies themselves that represent the biggest change, but the opportunities for openness that flow from their thoughtful application, in the form of availability of and access to formal and informal learning (Ferguson, Jones, & Scanlon, 2019; Littlejohn & Margaryan, 2014). Without research to inform practice the changes in learning may exclude the very people who most stand to benefit from them.

For example, those likely to complete free, online courses tend to be qualified to degree level already (Kizilcec, Saltarelli, Reich, & Cohen, 2017; Rizvi, Rienties, Kizilcec, & Rogaten, 2022). Ironically, the revolution in open world learning is in danger of increasing the digital divide by privileging those with the appropriate digital and learning skills to best take advantage of it (Iwaniec-Thompson, 2022; Nguyen, Rienties, & Richardson, 2020). It is this issue that this edited book on open world learning will address.

The complex (Adams, Fitzgerald, & Priestnall, 2013; Richardson, Mittelmeier, & Rienties, 2020), contradictory (Bayne & Land, 2013; Nguyen, Rienties, & Richardson, 2020; Weller, 2020), and multidisciplinary (Ferguson et al., 2019; Hampel, 2014; Mittelmeier, Rienties, Gunter, & Raghuram, 2020; Scanlon, 2014) nature of open world learning is fundamentally changing society and the foundations of education. This drives an urgent need to review the "enablers" and "disablers" of open world learning for inclusive approaches to learning across educational sectors, disciplines, and countries (Barber, 2021).

The world is becoming a more connected place with the emergence of immediate access systems, such as smartphones and tablets (Kukulska-Hulme et al., 2020; Srisontisuk, 2022), the omnipresence of social media like Facebook (Vogiatzis, Charitonos, Giaxoglou, & Lewis, 2022), Twitter (Bruguera, Guitert, & Romeu, 2019; Rehm, Cornelissen, Notten, Daly, & Supovitz, 2020), WhatsApp (Madge et al., 2019; Vogiatzis et al., 2022), and new methods of working (Bond, Zawacki-Richter, & Nichols, 2019; Bruguera et al., 2019; Kukulska-Hulme et al., 2020; Lucena, Díaz, Reche, & Rodríguez, 2019). This is accompanied by the advent of English as a lingua franca that is helping people to share information and communicate across the globe (Conde Gafaro, 2022; Hampel, 2014; Rets, Stickler, Coughlan, & Astruc, 2022; Rienties, Lewis, O'Dowd, Rets, & Rogaten, 2020; Vogiatzis et al., 2022).

Open world learning seeks to understand access to education, structures, and the presence of dialogue and support systems (Iniesto & Hillaire, 2022; Mittelmeier et al., 2020; Weller, 2020). The challenge of open world learning is to foster inclusion and widen access to information, knowledge, and learning, rather than to allow people, organisations, and governments to increase divisions and build closed groups with privileged access to information and education. One key aspect of open world learning is openness: how approaches to learning can be designed to enable sharing and co-creation of knowledge (Iniesto, McAndrew, Minocha, & Coughlan, 2022; Littlejohn et al., 2019; McAndrew & Scanlon, 2013; Mohamud, Buckler, Pitt, & Twining, 2022; Rizvi et al., 2022). However, these innovations are also changing how societies understand ownership of knowledge, information, expertise, and the process of learning.

Nonetheless, openness also has its disablers (e.g., restrictive quality assurance regimes, required integration across units, accreditation and costs), and the excluding power of "closed" systems (such as classrooms, universities, or corporate training programmes) may seem more persuasive in some situations (Ferguson et al., 2019; Korir, Mittelmeier, & Rienties, 2020). Many open technologies are subject to – and still have in many cases – (over)inflated expectations as change agents (e.g., artificial intelligence-enabled learning, virtual world learning) whilst only providing different practices within the same educational parameters (e.g.,

in the context of a transmission-based approach to learning) (Bond et al., 2019; Neelen & Kirschner, 2020; Rienties, Køhler Simonsen, & Herodotou, 2020). Some of these "technical disruptions" actually contribute to maintaining restrictive educational norms and practices (Bayne & Land, 2013; Nguyen, Rienties, & Whitelock, 2022). This is, for example, the case with many MOOCs, which, despite their aspirations to fundamentally open up education, are not only based on a transmission-based paradigm but also used mainly by well-educated learners in Western countries (Kizilcec et al., 2017; Rizvi et al., 2022).

Similarly, there are ethical and privacy implications, for example, in learning analytics through increasing levels of monitoring, surveillance, and profiling (boyd & Crawford, 2012; Korir et al., 2020; Korir, Slade, Holmes, & Rienties, 2022), or public concerns whether open education will shift the balance of power of governments, schools, and educational institutions to a global, uncontrolled space. Finally, several groups of users (e.g., teachers, older people, people with particular accessibility needs) seem to struggle to embrace and integrate open technology, leading to resistance and anxieties towards new technologies (Bruguera et al., 2019; Iniesto et al., 2022; Iwaniec-Thompson, 2022; Nguyen, Rienties, & Whitelock, 2020).

1.2 Moving from practice to theory (and back to practice)

At the moment, open world practice is leading theory (Gasevic, Dawson, Rogers, & Gasevic, 2016; Herodotou et al., 2019; Neelen & Kirschner, 2020; Weller, 2020), and research is needed to close this gap and allow experiences from particular contexts to inform generalised approaches with strong conceptual underpinnings. This ground-breaking and world leading book is a result of an award-winning (Open Education Consortium 2016) Leverhulme doctoral training programme that was structured to generate evidence, encourage theory construction, and lead to well-described new knowledge that informs practice across disciplines from 18 PhD students at The Open University, UK (OU). The OU has been on the forefront of continuous innovation in open and distance education for over 50 years (Barber, 2021; Ferguson et al., 2019; Lucena et al., 2019; Weller, 2020).

The main question of this book is as follows: **How can open world learning supported by technology help and/or hinder tackling the global challenges that open and high-quality education faces?** First, this book provides an integrated and cohesive perspective of the affordances and limitations of open world learning. We strive to build a bridge that connects a range of research communities (e.g., artificial intelligence, computing, educational psychology, HCI, language education, learning analytics, learning sciences, linguistics, Open Educational Resource) that draw theoretically, conceptually, and analytically from each other, but have not always engaged in discussions to learn from each other's perspectives. Second, this book features a wide range of open world learning topics, ranging from theoretical and methodological discussions to empirical demonstrations of how open world learning may be actually implemented, evaluated, and used to inform theory and practice. Furthermore, this book will provide in-depth analyses of the potential benefits and limitations of open world learning by

bringing together insights from 387,134 learners, practitioners, and educators working and learning in 136 unique learning contexts (e.g., online courses, MOOCs, Internet kiosks).

1.3 Rationale and structure of this book

This book will provide state-of-the-art contemporary research insights of key systems, applications, and processes in open world learning. There is a need to raise awareness of academics, researchers, professionals, and policymakers regarding the affordances and limitations of technologies and approaches related to open world learning, and how this influences daily practice around us. This book provides new and substantial findings from 41 leading and promising early-career researchers and academic supervisors from 13 institutions in open world learning (for a full list, see list of contributors). Furthermore, the chapters focus on a range of countries, including Greece, Italy, the Netherlands, Uganda, and the UK, while five chapters obtained data and perspectives from across the globe.

Although we have developed this book as a collaborative project with a particular and hopefully logical structure, each chapter in itself can be read as an individual piece of academic work. Through clear referencing throughout the book, interested readers can delve into specific sections or chapters or read the book in a non-linear manner. Nonetheless, here is a brief overview of the book.

After a general introduction and overview of the affordances and limitations of open world learning by using both a macro–meso–micro and 4P lens (i.e., people, places, practices, properties) in Chapter 2 (Rienties, 2022), in **Part 1 Learners and the power of language in an open world**, we provide six chapters on how learners across the globe can use the power of English language to communicate together in an open world. The five chapters in **Part 2 Innovative technologies in an open world** provide insight into innovative technologies that have been implemented and evaluated in an open world, including internet kiosks, MOOCs, online games, and sentiment mining. Finally, in **Part 3 Educators and inclusive practice in an open world**, we specifically look at the role of educators in supporting inclusive practices in an open world. In the remainder of this chapter, an overview of each of the 19 chapters provides you, the reader, the opportunity to identify which Part(s) and/or Chapter(s) may be most relevant for you.

1.3.1 Part 1 Learners and the power of language in an open world

A common language is essential for learning in an open world and for learners to be able to communicate with each other. Part 1 comprises six chapters on how learners across the globe can use the power of (English) language to communicate together in an open world. Three chapters focus on adult learners (Conde Gafaro, 2022; Rets et al., 2022; Vogiatzis et al., 2022), two focus on MOOC learners (Chua, 2022; Rizvi et al., 2022), and one on children (Anastasiou, 2022). Furthermore, a mix of methodological approaches is used to unpack the complexities of language

learning in an open world, including qualitative (Anastasiou, 2022) and multiple/ mixed-methods (Chua, 2022; Conde Gafaro, 2022; Rets et al., 2022; Rizvi et al., 2022; Vogiatzis et al., 2022). Finally, a mix of digital and online tools in an open world learning context are used in these chapters, including Futurelearn (Chua, 2022; Conde Gafaro, 2022; Rizvi et al., 2022), Open Educational Resources (Rets et al., 2022), WhatsApp (Vogiatzis et al., 2022), and YouTube (Anastasiou, 2022).

In Chapter 3, Popi Anastasiou (2022) provides a rich and detailed study of 31 Greek primary-school children who in an experimental design worked together in small groups on developing digital stories in science in either a story sequencing activity or story verbalisation activity. The findings indicate that story sequencing allowed children to position themselves as story makers, who employed decision-making strategies to determine the content of the story according to their preferred order of presentation. In contrast, in the story verbalisation groups, children were acting as story re-tellers, who mainly verbalised pre-defined content. Chapter 3 highlights how children from an early age onwards can creatively use a range of open world learning tools to tell their own stories and make meaning in their own language.

In Chapter 4, Dimitrios Vogiatzis et al. (2022) explore how WhatsApp can be effectively used for language learning by adults in a German context. Using a case study design with online observations and semi-structured interviews, the authors explore group interactions between eight learners over 22 weeks. The findings indicate adult learners' reactive participation, and mostly limited interaction, emphasising that the mere use of WhatsApp cannot necessarily guarantee language interaction among participants. This is an important finding as just having a common open world learning tool does not necessarily imply that all learners will be able to successfully interact and learn with these kinds of tools, and points to the crucial area of learning design explored later in this book.

In Chapter 5, Barbara Conde Gafaro (2022) examines the self-regulated learning behaviours of 19 language learners who engage with MOOCs as part of a blend with their language learning courses. Using a mix of thematic analysis and measurements of self-regulated learning, the findings indicate that learners not only set short-term goals but also set multiple reflexive learning goals as part of their MOOC experience. Supporting learners in the process of goal setting may contribute to increasing their engagement with blended language courses.

In Chapter 6, Shi Min Chua (2022) uses an innovative corpus linguistic approach to understand how learners communicate in large open spaces like MOOCs. In a big data exploration of online discussions containing 11 million word contributions from 228,665 learners in 12 Futurelearn MOOCs, the findings indicate how learners use particular communicative strategies can significantly influence whether (or not) other learners are going to reply to a message, and how conversations can be made meaningful when they reply to each other, without causing hard feeling but making it an open discussion. Chapter 6 highlights again the importance of language use and suggests several useful writing tips for learners who would like to open a conversation with others in online discussion.

In Chapter 7, Irina Rets et al. (2022) explore how Open Educational Resources (OERs) could be made more accessible for non-native English speakers using a

mixed method of eye-tracking with simulated recall interviews with nine participants. The findings from in-depth analyses with nine participants indicate that decreasing the complexity level of OERs by text simplification led to a reduction in cognitive load and an increase in higher-level processing. Given the global reach of online learning tools and educational resources, this chapter highlights that teachers need to carefully balance their language usage to make it accessible for both native and non-native language speakers.

Finally, in Chapter 8 Saman Rizvi et al. (2022) provide two studies to explore whether or not MOOCs are culturally inclusive. The first study uses a quantitative approach to investigate the extent to which engagement by 49,582 learners in ten Futurelearn MOOCs varied between geo-cultural contexts, while the second follow-up study examines the link between learners' geo-cultural background and their perspectives about how different elements of learning design contribute towards their learning. The findings suggest that learners from different geocultural backgrounds substantially differed in their engagements in MOOC activities (e.g., articles discussions, videos), while the qualitative findings highlighted large perceived cultural differences in the value of certain MOOC activities, which in part were influenced by participants English language abilities. This further highlights the need for learners and teachers to recognise that while open world learning approaches are theoretically open to all, in practice they are not necessarily inclusive for anyone and everyone.

1.3.2 Part 2 Innovative technologies in an open world

Part 2 contains five chapters focusing on innovative technologies that have been implemented and evaluated in an open world context. Two chapters focus on students (Hillaire, Rienties, Fenton-O'Creevy, Zdrahal, & Tempelaar, 2022; Korir et al., 2022), two use a multi-stakeholder perspective (Iniesto et al., 2022; Mohamud et al., 2022), and one focuses on gamers (Hall, Herodotou, & Iacovides, 2022), Furthermore, a mix of methodological approaches is used to unpack the complexities of implementing innovative technologies in an open world, including qualitative (Mohamud et al., 2022), quantitative (Hall et al., 2022) and multiple/mixed-methods (Hillaire et al., 2022; Iniesto et al., 2022; Korir et al., 2022). Finally, like in Part 1 a mix of open world learning tools are used in these chapters, including digital games (Hall et al., 2022), Futurelearn (Iniesto et al., 2022), solar-powered internet kiosks (Mohamud et al., 2022), Prolific (Korir et al., 2022), and a student sourced sentiment analysis classifier (Hillaire et al., 2022).

In Chapter 9, Francisco Iniesto et al. (2022) explore the accessibility in MOOCs via interviews with 40 MOOC providers designers and 34,026 learners using a mixed method of survey data and an accessibility audit. The findings indicate that while substantial progress has been made over the years to improve accessibility in MOOCs, substantial barriers remain, and at times rather than making designs inclusive some providers have restricted access. Chapter 9 concludes with a call for inclusive design by adding in a consideration of specific learner groups so that they are included, potentially through alternative design solutions rather than one design solution.

In Chapter 10, Khadija Mohamud et al. (2022) illustrate the impact of solar-powered internet kiosks on 50 users in two urban low-income communities in Uganda. The findings highlight how users utilised these centres to empower themselves beyond the use of technology. Specifically, this is related to supporting young people and teachers with instructional resources to bridge gaps in education and providing low-income communities with a social space where they nurtured meaningful relationships cultivating their sense of belonging. Furthermore, Chapter 10 illustrates how the technology allowed others to learn and also raised some safety concerns.

In Chapter 11, Maina Korir et al. (2022) explore how the crowdsourcing platform Prolific could be used to elicit students' data use preferences for learning analytics. In an experimental design, 447 students from different higher and further education institutions in the UK were presented with privacy risks and/or benefits interventions to examine whether and how these would influence their data use preferences. The findings indicate that these interventions did not substantially alter participants' privacy notions and support of institutional use of student data. Participants' responses indicated that they made trade-offs to arrive at what was an acceptable use of student data for them.

In Chapter 12, Johanna Hall et al. (2022) explore how creativity in digital games plays a role in openness to experience, emotional wellbeing, and meaningful learning. By developing a Creativity in Gaming Scale (CGS) instrument based upon the input from 251 gamers, the authors provide a powerful tool for teachers and learners to explore whether their digital games encourage creativity, including problem-solving and appropriation.

Finally, in Chapter 13, Garron Hillaire et al. (2022) explore how student voices and inputs can be used to develop a student sourced sentiment analysis classifier. While most off-the-shelf sentiment analysis tools are developed outside education and educational context, by analysing online contributions by 1,251 students at one university in the Netherlands to an online collaborative experiment and afterwards asking them to code their own and others emotions, an inclusive classifier is developed. The findings indicate that this classifier is able to accurately identify emotions in online chat.

1.3.3 Part 3 Educators and inclusive practice in an open world

Finally, in Part 3, we look specifically at the role of educators, teachers, and professionals in supporting inclusive practices in an open world. Two chapters specifically focus on how teachers make learning design decisions (Iniesto & Hillaire, 2022; Nguyen et al., 2022), one focuses on teachers in early years contexts (Srisontisuk, 2022), one on finance professionals (Chaudhari, Littlejohn, & Cross, 2022), and one on older academics (Iwaniec-Thompson, 2022). Furthermore, again a mix of methodological approaches is used to unpack the complexities of how educators and professionals make sense of an open world, including qualitative (Chaudhari et al., 2022; Iniesto & Hillaire, 2022; Iwaniec-Thompson, 2022; Srisontisuk, 2022) and multiple/mixed-methods (Nguyen et al., 2022). Finally,

like in Part 1 and Part 2, a range of open world learning tools is used in these chapters, including FutureLearn (Iniesto & Hillaire, 2022), learning analytics (Nguyen et al., 2022), and Ipads (Srisontisuk, 2022).

In Chapter 14, Quan Nguyen et al. (2022) explore how the use of data on how teachers design their courses can inform our understanding of students' engagement with online learning activities. By mapping both 70,000 students and 39 teachers' data, this data-driven approach provides teachers with the opportunity to reflect on their course design through visualisations of weekly learning activities which highlights the workload and the variety of teaching approaches.

In Chapter 15, Francisco Iniesto and Garron Hillaire (2022) apply a Universal Design for Learning (UDL) approach to map how effective a range of MOOCs from different providers are in terms of accessibility. When producing educational resources, all stakeholders should be considered in their design and evaluation processes including educators and learners. The iterative and refinement processes shown in Chapter 15 indicate that UDL, as a proactive design framework, can be used for evaluation, and facilitate and help with internalisation of its principles.

In Chapter 16, Pinsuda Srisontisuk (2022) explores the rich and diverse perspectives of nine UK teachers on smartphone and tablets technologies in two classrooms. The findings indicate most children can use tablets with minimal instruction, although there remains a fear amongst teachers around the technology leading to an increase in learners being passive and not engaging in other social and physical activity. Nonetheless, the teachers also reported that one of the most beneficial features was the connectivity to the world wide web; instant access to knowledge and images was a feature they felt has enhanced the learning experience for the children.

In Chapter 17, Vasudha Chaudhari et al. (2022) explore how nine professionals in the finance sector make sense of uncertainty. The findings suggest that although uncertainty is experienced by all professionals irrespective of their level of expertise, there are distinct differences in the way uncertainty is perceived by experts and practitioners. Chapter 17 presents the similarities and differences in perception of uncertainty and discusses the implications of these findings for practice.

Finally, in Chapter 18, Gosia Iwaniec-Thompson (2022) explores how eleven older academics are conceptualising their identity development and use of technology in particular. The manifestation of subjectivities occurs when academics exert influence and take stances affecting their practice and impact on the construal of their professional identity. For some, open world tools like ResearchGate were helpful for developing their identities, while other tools led to uncertainty among the academics of how to integrate these into their teaching practice.

1.4 Discussion

In this book, we will bring together some diverse perspectives and narratives around open world learning from 387,134 learners and teachers working in 136 learning contexts. As highlighted in the final Chapter 19 (Rienties, Hampel, Scanlon, & Whitelock, 2022) and throughout this book, while open world learning approaches, methods, and tools provide many affordances for learners, teachers, and

professionals, not everyone is able to necessarily benefit from these just because these are "open". In this book and in Chapter 19, we suggest a range of practical steps that you as reader can do to ensure that the power of open world learning is as inclusive as possible.

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Chapter 2

Powers and limitations of open world learning

Experiences from the field of education

Bart Rienties

2.1 Introduction

In September 2014, an interdisciplinary group of 18 researchers from four Faculties at the Open University UK (OU) submitted a (successful) £1 million large grant proposal to the Leverhulme Foundation entitled Open World Learning. In its proposal,[1] the group indicated that

> [w]e seek support for a programme of PhD studies to address inclusive approaches to learning across disciplines, integrated by a focus on Open World Learning, for which the OU has a worldwide reputation. Our proposal aims to increase understandings of the complexities of Open World Learning compared to systems and approaches that close rather than open opportunities because of social, geographical, or technical barriers. To do this requires a strong cross-disciplinary approach centred on educational thinking but involving a range of subjects across the University. This cross-disciplinarity means that obtaining funding from domain-specific research councils is not straightforward and there is no targeted programme in this area. The Leverhulme Foundation's Doctoral Scholarship funding, on the other hand, is specifically focussed on cross-disciplinary and complex research topics.

As already described in Chapter 1 (Rienties, Hampel, Scanlon, & Whitelock, 2022a) and argued throughout this book, learning in the 21st century is undergoing both subtle and radical transformation as a result of the impact of digital, networked technologies (Bond, Zawacki-Richter, & Nichols, 2019; Ferguson, Jones, & Scanlon, 2019; Hampel, 2019). Open learning gives unprecedented access to knowledge, information, and education and provides support to learners across the globe (Kizilcec, Saltarelli, Reich, & Cohen, 2017; Kukulska-Hulme et al., 2021; Weller, 2020). However, it is not the technologies themselves that represent the biggest change, but the opportunities for openness that flow from their thoughtful application, in the form of availability of and access to formal and informal learning (Iniesto, McAndrew, Minocha, & Coughlan, 2022; Rizvi, Rienties, Kizilcec, & Rogaten, 2022; Weller, 2020). Without research to gain

deeper understanding, the changes in learning may exclude the very people who most stand to benefit from them.

Within the Leverhulme Open World Learning programme, 18 scholars from 16 different countries have each contributed to understanding how the enablers and disablers of open world learning might have shifted over time, and how each shift might have had expected and unexpected consequences in open world learning. In this chapter, I critically review some of the key events that have shaped our open world learning in the period 2014–2022, and how this might potentially develop over time in a UK, European, and perhaps global context.

This will by no means be an accurate reflection and review of all facts, perspectives, and contexts. I am acutely aware that experiences and reflections are strongly embedded in one's own context (i.e., working in a top UK distance learning organisation, being a white male academic from Europe, having access to nearly unlimited open world learning opportunities). Nonetheless, I hope that by sharing some of my experiences and reflections of working with leading Leverhulme scholars as well as working with brilliant and state-of-the-art researchers across four Faculties at the OU will help to make sense of how leading institutes like the OU are trailblasing the way to make sense of open world learning.

2.2 Making sense of open world learning on a macro-meso-micro level

As conceptually visualised in Figure 2.1, there are both enablers and disablers for open world learning. The fluidity in the 3D shape or space of the open world learning framework highlights that the size and space of open world learning experienced by individual learners and organisations in a particular context, region, or nation might be substantially different from other learners and organisations. Furthermore, the fluidity of the 3D shape and space will inevitably change over
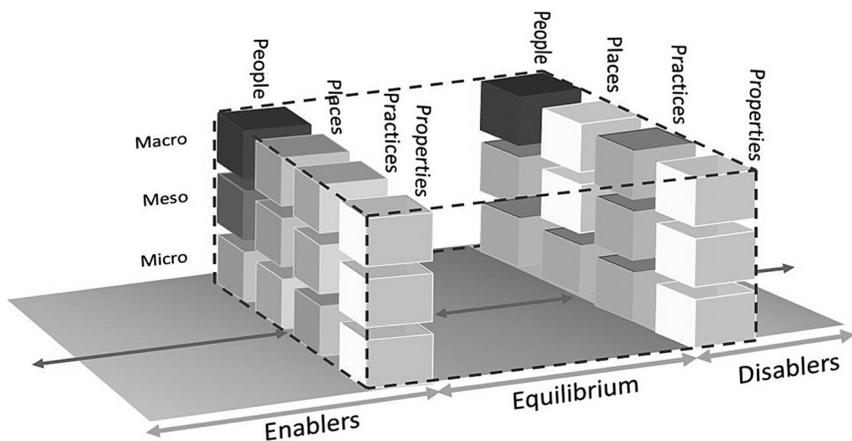
Figure 2.1 Open world learning framework (2014).

time, making the reach, depth, and breadth of open world learning experiences more or less comprehensive. For example, those learners who have no digital devices, no internet access, and/or who live in countries with very strict access policies might at best only experience open world learning in a limited, match-box manner. In Chapter 10, Mohamud, Buckler, Pitt, and Twining (2022) provide a fascinating account of how providing internet kiosks in Uganda opens up a window of opportunity for open world learning. Other learners who have ubiquitous access, competences, skills, and resources to explore open world learning opportunities and who live in a very open country might have nearly infinite opportunities to enable experience and potentially benefit from open world learning.

At the same time, with the growth in access to online education and the increased competition amongst educational providers and arrival of new commercial entrants into the market, there is also an expansion of the "closed" learning industry (i.e., paid-for by learners and/or organisations) by a range of diversification and growth strategies (e.g., apprenticeships, dual degrees, micro-credentials, short-courses). Obviously, there might be trickle-down effects from closed learning to open learning (e.g., free open short courses as spin-offs from closed courses), as well as opportunities for pathways from open learning into formal degree recognition (e.g., using accreditation of MOOC competition to a formal degree). In other words, the "forces" of the enablers and disablers of open world learning hold each other together in a (temporary) equilibrium, whereby a shift in any of the building blocks might change the equilibrium.

In this conceptual model, I distinguish three levels or spheres of influence on a macro, meso, and micro level. Note that the colouring of these boxes in Figure 2.1 was based upon our joined understanding of the literature and practice within an OU context on each of these levels in 2014. More pronounced darker colours indicate a stronger evidence of experience and research, while lighter boxes represent relatively uncharted research areas.

2.2.1 Macro

On a macro (i.e., regional, national, international, global) level, many things have changed since 2014 and will continue to change. In Chapter 2, I highlight three examples of macro changes in 2014–2022 that inevitably have changed the open word learning spaces for large groups of learners, namely technological change and development, rise of populism, and Brexit. First of all, *technological change and development* is continuous. For example, in 2014 the first voice-activated virtual assistant in households was introduced (Alexa) by Amazon, whereby in 2020, 22% of UK households have such a smart speaker in their household (Ofcom, 2020). In 2019, 5G was launched in the UK giving users over a hundred times faster internet on their phones than in 2012, and uptake in terms of smartphones increased from 61% in 2014 to 82% in 2020 (Ofcom, 2020).

While each of the many technologies introduced since 2014 provide their own affordances and limitations, in the last seven years how learners can access online resources has radically accelerated. Indeed, a recent Ofcom (2020) report indicated

that in the UK during lockdown, on average people spent a record 6 hours and 25 minutes per day watching audiovisual content, often on Smart TVs, and spent on average 4 hours and 2 minutes online, mostly via smartphones (Ofcom, 2020). On the one hand, with most Western jobs being desk-oriented jobs and requiring staff to sit behind a computer, many people have unprecedented access to screens and the internet, thus potentially allowing for opportunities for open world learning. On the other hand, the unprecedented access to screens may negatively impact mental health and wellbeing (Lucassen et al., 2018), and learners' willingness to engage with online learning. Indeed, a lot of organisations (Wellcome Trust, 2020) and the public sector (World Health Organization, 2019) are concerned about the unprecedented access to information and technology, and the increase in screen time. Anecdotally, several CEOs of large tech companies including Microsoft and Snapchat restrict the screen time of their children or even forbid them to use technology.

A second major macro-development is the *rise of populism* in many Western countries. Narratives around post-truth and #fakenews are continuing to have a large impact on the perceptions of social media (Ernst, Engesser, Büchel, Blassnig, & Esser, 2017; Isaak & Hanna, 2018), and in particular the perceived value of (higher) education (Quinton, 2019) and recognition of experts (Bruggeman et al., 2020; Kubin, Puryear, Schein, & Gray, 2021). A range of studies have started to explore how people make sense of these complexities and how learners make sense of open knowledge and information. For example, a large-scale study amongst 389 US domestic students by Quinton (2019) showed that students who were more conservative, supported (former) President Trump, and had more negative stereotypes towards international students were significantly less likely to interact with other (international) students. In cross-cultural literature, it is a well-established fact that social interaction between people from different cultures helps to overcome stereotypes and allows people to develop mutual relations and understanding (Jing, Ghosh, Sun, & Liu, 2020).

Furthermore, in a lab-based study with 308 first-year business students, Knight et al. (2017) found that while most participants indicated to have strong internet searching skills, their actual searching strategies and behaviour indicated that participants mainly used lay health advice website sources rather than academic sources to solve a complex health case. Similarly, using in total 15 studies, Kubin et al. (2021) found that personal experience about a (political) issue, in particular negative experience, was weighted more important than having expertise, knowledge, facts, or data. In other words, while many learners have unprecedented access to knowledge and information, substantial development and training will be needed to ensure that learners can develop strong epistemological skills to make sense of open world learning in this post-truth era.

A third macro trend for the UK in particular is that recent political developments have partially undone 40 years of intensive and open collaboration between European and UK companies, public organisations, and research institutions, and has introduced a range of new barriers in terms of how learners can access data, study, travel, work, etc. In a way, this unexpected macro development went against

the grain of increased globalisation and open world learning. In part the unexpected referendum result was blamed on social media, and the impact of Cambridge Analytica in particular (Isaak & Hanna, 2018). In part concerns about international migration and pressure on British identity and values fuelled by (social) media (Gavin, 2018), post-truth, and a divide amongst voters mainly along (higher) education lines (Zhang, 2018) heated opinions. On the one hand, one could argue that open world learning approaches allowed more people to gain access to knowledge, skills, and facts. On the other hand, social media was substantially influenced by political and external parties, and individual (negative) experiences, which may have influenced the referendum result. Perhaps it was not a surprise that the day after asking whether the UK should leave the EU the second most searched question in Google UK was "What is the EU?" (Fung, 2016).

2.2.2 Meso

On a meso (i.e., institutional, cross-institutional, cross-discipline) level, education has experienced some radical changes in the last seven years, not only in the UK but worldwide. For example, there is an ever-increasing shift towards consumerism of education (Bragg, 2014; Langan & Harris, 2019), as well as stronger competition and managerialism within and across institutions (Erickson, Hanna, & Walker, 2020). Furthermore, there are increased pressures on teachers to include technology in teaching (Bond et al., 2019; Herodotou, Rienties, Boroowa, & Zdrahal, 2019; Uerz, Volman, & Kral, 2018; van Leeuwen, 2019), leading to potential burnout and mental stress amongst some teachers (Daniel, 2018), researchers (Wellcome Trust, 2020), and students (Houghton & Anderson, 2017). All these trends were accelerated and exacerbated by the COVID-19 pandemic, where teachers suddenly had to become experts in blended/online teaching overnight (Crawford et al., 2020; Naffi, 2020; Reinholz, Stone-Johnstone, White, Sianez, & Shah, 2020).

Another meso change is the increased focus on Equality, Diversity and Inclusion (EDI) in (higher) education. In part this increased focus on EDI is fuelled by the #metoo and #blacklivesmatter movements that have a macro and meso impact, as well as a range of studies highlighting substantial inequality in opportunity in education (e.g., Bhopal & Henderson, 2021; Lucassen et al., 2018; Nguyen, Rienties, & Richardson, 2020a; Richardson, Mittelmeier, & Rienties, 2020). For example, in Chapter 15, Iniesto and Hillaire (2022) indicate that despite efforts by MOOC providers to make their materials accessible, in practice this often falls short for learners with accessibility needs. Similarly, in Chapter 8, Rizvi et al. (2022) show that despite best intentions, MOOC learning activities are not necessarily fit for purpose for some geo-cultural groups of learners, as the (Western) learning designs of MOOCs do not necessarily fit with their preferred learning approach.

Indeed, a range of institutional and cross-institutional initiatives such as Athena Swan and Race Equality Charter have started to address some of these inequalities of opportunities, including explicit requirements for institutions to report on how they are addressing these inequalities. However, there are substantial tensions in

terms of prioritising which part of EDI to focus on first, as argued by Bhopal and Henderson (2021, p. 167) "[w]hile institutions can claim to be working on structural inequality by focusing time, resources and attention on gender equality, there is little or no imperative to shift the focus to uncomfortable conversations about race and racism in the academy". Both the macro and meso changes in the last seven years have had a substantial impact on the micro level of open world learning.

2.2.3 Micro

Finally, on a micro (within institution, module, student) level, several large changes have occurred that have influenced how educators design courses and how learners learn. For example, with the omnipresence of technology and mobile devices in the classroom, the way students learn and interact with others is rapidly changing education (Kukulska-Hulme et al., 2021; Srisontisuk, 2022). For example, in the OU, while many courses in 2014 had several offline and print-based learning resources, in 2021, nearly all resources are primarily available online (Nguyen, Rienties, & Whitelock, 2020b). Similarly, with the increased availability of free online resources, MOOCs, and other learning opportunities, students and teachers have unprecedented access to knowledge and information (Conde Gafaro, 2022).

A large change on a micro-level is the access to data and learning analytics data in particular. While in 2014 mostly institutions were storing some data for retrospective reporting for accreditation processes and government bodies, an increasing number of teachers and students have gained (near) real-time access to learning and learner data. For example, Herodotou et al. (2020) analysed how the predictive learning analytics tool OU Analyse was accessed by 1159 unique teachers and reached 23,180 students in 231 undergraduate courses in the last four years, and found substantial different adoption patterns between teachers. These in part were explained by how Faculties engaged with predictive learning analytics, how they encouraged teachers as "champions", as well as teachers' digital literacy and their conceptions about teaching online. In Chapter 13, Hillaire, Rienties, Fenton-O'Creevy, Zdrahal, and Tempelaar (2022) show that based upon online chat discourse between 1251 business undergraduate students, a student-sourced sentiment analysis tool can be developed that can accurately predict emotions in written text.

2.3 The 4P approach of Open World Learning

As indicated in Figure 2.1, beyond the macro-meso-micro levels, the 4P approach distinguishes between four important inter-related themes that may influence the enablers and disablers of open world learning: people, places, practices, and properties. Given the nature of open world learning, some of these enablers or disablers of learning might influence the four themes differently.

2.3.1 People

In terms of the theme people accessibility needs (Iniesto et al., 2022), socio-economic factors (Rizvi et al., 2022), and personal learner characteristics such as age (Iwaniec-Thompson, 2022), ethnicity (Nguyen, Rienties et al., 2020b), gender (Richardson et al., 2020), and learning dispositions (Tempelaar, Rienties, & Nguyen, 2021) might influence whether people can benefit from open-world learning. For example, in Chapter 7, Rets et al. (2022) show that Open Educational Resources (OERs) could be made more accessible for non-native English speakers by decreasing their complexity level by text simplification. In Chapter 14 Nguyen, Rienties and Whitelock (2022) shows that teachers make complex decisions when designing closed and open world learning designs, which in part are influenced by their own conceptions of teaching, as well as the culture of the discipline in which they work.

2.3.2 Places

Secondly, places where people work or live might substantially impact on how they get access to open world learning opportunities. For example, Facebook restricted access to news sites in Australia in February 2021, thereby limiting people's access to knowledge and information. In some countries like Myanmar or Belarus, Facebook and other social media sites have been taken offline during social unrest, while in other countries certain topics are censored or even completely barred. Beyond actively restricting content and access to open world learning, even when learning activities are openly available this does not necessarily imply that users will universally make sense of them in the same way. For example, in Chapter 8, Rizvi et al. (2022) show in two studies that MOOCs are not necessarily culturally inclusive, based upon engagement patterns by 49,582 learners in ten Futurelearn MOOCs. In Chapter 4, Vogiatzis et al. (2022) explore how WhatsApp was used by German-language learners on the move, while in Chapter 10, Mohamud et al. (2022) show how internet kiosks in one particular context of Uganda raised some culturally specific opportunities and concerns.

2.3.3 Practices

Thirdly, the practices people and institutions are surrounded by might influence how they engage with open world learning. Although sometimes we seem to live in a global village, the way that education is shaped in countries is mostly determined by policy makers and stakeholders on a national level, whereby consistently substantial differences in practices are noticed on a regional, national, and geo-cultural level (Kizilcec et al., 2017; OECD, 2018; Rizvi et al., 2022). Also, girls are particularly likely to be left behind (Girls' Education Challenge, 2021). An emerging body of research has shown that for example while MOOCs are accessible across the globe, some nations and geo-cultural regions are more likely to benefit from these open world learning opportunities than others. Indeed, accessibility policies of MOOCs are framed and shaped by local and national practices and

policies as evidenced in Chapter 9 (Iniesto et al., 2022). In the context of financial sectors, in Chapter 17, Chaudhari, Littlejohn, and Cross (2022) show that how finance professionals cope with uncertainty and make use of technologies is nested within their practice.

2.3.4 Properties

Finally, properties of open world learning technologies and data will substantially influence the affordances and limitations of how people make sense of open world learning. As illustrated in Figure 2.1, there was a relative paucity of research in 2014 on how properties of data and practices within open world learning might enable or thwart learning. For example, the OU was the first institution to introduce an ethics policy on the use of data with learning analytics (Open University UK, 2014). In Chapter 11, Korir et al. (2022) show that most UK learners are now reasonably comfortable to share their data with higher education institutions, while initially some authors reported concerns about privacy and sharing of data. In Chapter 12, Nguyen et al. (2022) show that OU teachers make substantial use of student engagement data to determine how they design online courses. In particular how they balance assessment, interactive, and communicative learning activities seems to significantly impact student engagement, retention and satisfaction. At the same time, with the triangulation of more and more data and as Artificial Intelligence is becoming more intertwined in education (Rienties, Køhler Simonsen, & Herodotou, 2020), there are substantial concerns about how algorithms are potentially making decisions that could influence behaviour and performance of learners (Baker & Hawn, 2021; Prinsloo & Slade, 2017).

2.4 Discussion and moving forward

In this book, each of the chapters will explore how the enablers and disablers of open world learning may have shifted over time. As indicated in Table 2.1, almost all chapters focus on the people theme of open world learning. This book brings together insights from 387,134 learners and educators in 136 unique learning contexts, from short lab-exercises (Hillaire et al., 2022; Rets et al., 2022), in-class experiments (Anastasiou, 2022), online experiments (Korir, 2022), to longer intensive blended and online courses (Conde Gafaro, 2022; Vogiatzis et al., 2022) and MOOCs (Chua, 2022; Rizvi et al., 2022). Many of the chapters do this mostly on a micro level, focussed on learners, teachers and technologies in one particular context or setting. This is important as a lot of macro studies have already been written on the affordances and limitations of open world learning. There is a dire need to conduct high-quality evidence-based research on the meso and micro level of learners and teachers of what works, and what does not, and why.

The second important theme that will be discussed in this book is the practices in which learners and teachers find themselves. As context is everything in education, unpacking how practice influences learners and teachers to make sense of open world learning will help you, the reader, to use these insights for your own

Table 2.1 Levels and 4Ps of open world learning discussed in this book

Authors	Chapter	Level	People	Places	Practices	Properties
Part I Learners and the power of language in an Open World						
Anastasiou	03 Digital stories in science: The role of story sequencing	Micro	✓			
Vogiatzis, Charitonos, Giaxoglou & Lewis	04 Can WhatsApp facilitate interaction? A case study of adult language learning	Micro	✓	✓		
Conde Gaforo	05 First steps towards self-regulated learning: Setting goals in MOOCs	Micro	✓		✓	
Chua	06 Discourse practices in MOOC discussions: A corpus linguistic approach	Micro	✓			✓
Rets, Stickler, Coughlan & Astruc	07 Simplification of open educational resources in English: Its effect on text processing of English learners	Micro	✓			✓
Rizvi, Rienties, Rogaten & Kizilcec	08 Culturally adaptive learning design: A mixed-methods study of cross-cultural learning design preferences in MOOCs	Meso/ micro	✓	✓	✓	
Part II Innovative technologies in an Open World						
Iniesto, McAndrew, Minocha & Coughlan	09 Accessibility in MOOCs: The stakeholders' perspectives	Meso/ micro	✓		✓	✓
Mohamud, Buckler, Pitt & Twining	10 Internet kiosks in Uganda: A window of opportunities?	Meso/ micro	✓	✓	✓	
Korir, Slade, Holmes & Rienties	11 Eliciting students' preferences for the use of their data for learning analytics: A crowdsourcing approach	Micro	✓			✓
Hall, Herodotou & Iacovides	12 Measuring player creativity in digital entertainment games using the creativity in gaming scale	Micro	✓			

(*Continued*)

Table 2.1 (Continued)

Authors	Chapter	Level	People	Places	Practices	Properties
Hillaire, Rienties, Fenton-O'Creevy, Zdrahal & Tempelaar	13 Incorporating student opinion into opinion mining: A student-sourced sentiment analysis classifier	Micro	✓			✓
Part III Educators and inclusive practice in an Open World						
Nguyen, Rienties & Whitelock	14 Informing learning design in online education using learning analytics of student engagement	Meso	✓		✓	✓
Iniesto & Hillaire	15 UDL and its implications in MOOC accessibility evaluation	Meso			✓	✓
Srisontisuk	16 Practitioner's perspective on young children's use of mobile technology	Meso/micro	✓		✓	
Chaudhari, Littlejohn & Cross	17 Antecedents and consequences of uncertainties perceived by finance professionals	Meso/micro	✓		✓	
Iwaniec-Thompson	18 The identity trajectories of older academics: Workplace affordances and individual subjectivities	Meso/micro	✓		✓	

Note: that all the reported studies included in this book went through formal Human Research Ethics Committee at the Open University UK, and received approval.

practice. Finally, places and properties will be explored in several Chapters. In Chapter 19 (Rienties, Hampel, Scanlon, & Whitelock, 2022b), we will bring together all these findings and insights and discuss how they have shifted our understanding of open world learning.

Note

1 https://iet.open.ac.uk/projects/owl

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Learners and the power of language in an Open World

Digital stories in science
The role of story sequencing

Popi Anastasiou

3.1 Introduction

Stories, along with drawings and narratives, have been found to have a mediatory role in the construction of meaning (Bruner, 1990; Pantidos, 2017). They are a natural form of expression for people of any age and culture (Bruner, 1990). The technique of stories can be used in the organisation of events, facts, characters, and ideas into meaningful units (Hadzigeorgiou, 2016). A story takes its audience through a set of events, all the way from problem to solution and critical engagement with the solution (Polkinghorne, 1996), provoking active thinking and supporting meaning construction (Dettori & Paiva, 2009).

Stories are frequently used in educational settings to support teaching and learning (McEwan & Egan, 1995). As a teaching approach, using stories can stimulate students' critical thinking skills (McDrury & Alterio, 2003) and help them to develop a variety of skills in communication, search, collaboration, and task completion (Di Blas, Garzotto, Paolini, & Sabiescu, 2009). Educators "act as students' role models, agents of socialisation and brokers of knowledge" (Kucirkova, 2018, p. 109), seeking to create and use suitable stories to convey content knowledge and to motivate students to learn (Jackson, 1995). Some educators may decide to create their own stories and then present them to students as a way of introducing new material (Robin, 2006). Others can have their students create their own stories (Robin, 2006). Furthermore, some may choose to co-create a story with their students, as an enjoyable process of negotiating a shared perspective (Kucirkova, 2018). In contrast, as a learning approach the attention is on "finding meaningful ways for the students to make use stories related to their learning tasks, with the aim of facilitating and improving learning" (Dettori & Paiva, 2009, p. 56).

A substantial number of changes in the presentation and delivery of stories is made possible by emerging technologies (Chen, Ferdig, & Wood, 2003). The advancement of technology, alongside the advent of relatively inexpensive (Davis, 2004) digital tools, has shifted the focus from traditional to contemporary types of stories, digital stories. Digital tools enrich the process of creating and telling stories by providing new ways to support story authoring and fostering new forms of creativity (Di Blas et al., 2009), as also illustrated in Chapters 4 and 10 (Mohamud, Buckler, Pitt, & Twining, 2022; Vogiatzis et al., 2022). Enriching stories with digital

tools entail many advantages, such as more variation than traditional methods in current practice; personalisation of the learning experience; making explanation or the practicing of certain topics more compelling; facilitating the involvement of students in the process of learning (Gils, 2005). There is no doubt that the affordances offered by technology are valuable, yet the tools used for the creation of a digital story are transitory; thus, the focus should be on the learning process than the tools with which students engage to create a story.

Sometimes, students are asked to produce a (fictional) story using written prompts, pictures, a wordless storybook, and videos (Pinto, Tarchi, & Bigozzi, 2018). Other times, students listen to a story and are asked to retell it at some later point (Pinto et al., 2018). Prompting students with a title, a picture, or not prompting them at all is a very common story-based technique that schoolteachers use. It is also a common research method to assess students' narrative competence and task-comprehension by asking them to tell a story (Gazella & Stockman, 2003), based on a single prompt.

Science stories differ from stories in the humanities in that they aim to improve the teaching and learning of science (Klassen, 2009). They are considered as a means of translating knowing into telling (Avraamidou & Osborne, 2009) and can prove useful in "communicating ideas and in making ideas coherent, memorable, and meaningful" (Millar & Osborne, 1998, p. 2013). However, it is often hard to accomplish the explanatory purpose in stories (Norris, Guilbert, Smith, Hakimelahi & Phillips, 2005), because of the need to use deductive-nomological explanations for scientific phenomena (Hadzigeorgiou, 2018). This chapter accepts the truth found in this limitation but stands by the view that science stories are not to be considered as a tool for testing concepts or explaining phenomena through experimentation and material evidence.

The purpose of a science story is to describe natural phenomena and physical behaviours through a set of sequenced events to help its audience makes sense of what, how and why a phenomenon happens. Some researchers view as a limitation the use of science stories as descriptive explanations presented in a narrative form (through the use of anthropomorphism), because they are more suitable for young children (Hadzigeorgiou, 2018). This chapter embraces the suitability of science stories, because they are "attractive modes of communicating science" (Avraamidou & Osborne, 2009, p. 21) to younger audiences, helping them to understand the science content in an entertaining and engaging way (Klassen, 2009).

Studies have sought to assess high-school students' conceptual understanding of specific processes (e.g., natural selection) through narrative-based interventions (Prins, Avraamidou, & Goedhart, 2017). While their findings provided valuable insight about how narratives facilitated students' understanding and engagement in a science lesson, their method focused on assessing students' performance after they were exposed to scientific information in narrative format, in comparison to other texts containing the same scientific factual information (Prins et al., 2017). Although it could occur that success or failure in a test situation accurately indicates cognitive development, it could also be inferred that such performance indicates nothing more than the student's ability to read the requirements of the test

(Adams, 2006). Thus, emphasis should be placed not only on the learning outcome (performance) but also on how students engage. Seeking to address this gap, this research placed emphasis on how students could engage in two different digital science-story activities.

Studying digital stories in science learning is of interest because science stories have become an attractive mode of communicating science (Avraamidou & Osborne, 2009). The story perspective on science is based on the fact that scientific theories are fundamentally story-like, in the sense that they rely on metaphors, analogies, and conceptual frameworks (Hadzigeorgiou, 2018). Stories are a conceptual tool for providing coherence, continuity, and meaning to its contents (Hadzigeorgiou, 2016), which makes them a valuable instructional tool, especially in the context of science education, where abstract knowledge needs to be presented in a way that makes sense to the students.

3.2 Literature review and purpose

The research documented in this chapter is concerned with how students engage collaboratively to prepare a digital story on a science subject they have already been taught. Collaborative learning settings encourage the construction of shared understanding through interaction with others, during which the participants are committed to or engaged in shared goals and problem solving (Dillenbourg, 1999).

A digital story can be presented in numerous ways. A story can be typed up as text, be performed, and videoed, be narrated and audio-recorded, be based on students' drawings and photographs, or combine various modes (Kucirkova, 2018). Authoring or editing a digital story does not necessarily require a new story. Students can author or edit an existing digital story by manipulating the presented information in it and determine its "order of presentation" (Hillmayr, Ziernwald, Reinhold, Hofer, & Reiss, 2020, p. 2). Langley (1995) defined order effects as differences in performance that arise from the same set of material being presented to learners in different orders. Order is a fundamental feature of all stories because the order in which story events are narrated relates to their order in thought (Montfort, 2006). The order in which content is presented can "strongly influence what is learned … and sometimes even whether the material is learned at all" (Ritter & Nerb, 2007, p. 3). There needs to be a strong relationship in the ordering of the content, because its presence among the story elements helps to determine the story's plot (Dettori & Paiva, 2009). The story elements do not have a life or meaning of their own; their "meaning is given by their place in the overall configuration of the sequence as a whole – its plot or fabula" (Bruner, 1990, p. 43). Thus, providing students with an opportunity to interact with the story content and determine its order – contrary to other instruction methods that do not allow interaction – by controlling aspects of its presentation (Hillmayr et al., 2020) provokes active thinking and supports meaning construction (Dettori & Paiva, 2009).

In science education, digital stories are often assessed as a project on their own. Students are required to produce and develop a story based on pictures taken with

digital cameras or found online, add subtitles and background, and present their story to their classmates (Hung, Hwang, & Huang, 2012). Results from such projects seem to improve "learning motivation, attitude, problem-solving capability and learning achievements of the students" (Hung et al., 2012, p. 376). Hung and his colleagues (2012) used an experimental study to provide valuable information about the use of digital storytelling in improving learning performance, but failed to evaluate how students might have engaged while working collaboratively. The current research sought to address that gap by taking an in-depth qualitative approach.

Building on this literature, the purpose of this research was to encourage students to actively engage in a science topic through collaborative learning and digital story creation. The science topic was chosen given literature pointing to the fact that matter is among certain topics considered as problematic for teachers and students, who find them hard to teach and learn, accordingly (Clough et al., 2013). The problematic nature of these topics is to a large extent due to students' misconceptions and alternative concepts about matter (Hadenfeldt, Liu, & Neumann, 2014), which are almost the same across different culture, ethnic groups, and class backgrounds (Gregory, 2009). Within the last decade, however, the focus of research has shifted towards investigating students' learning progressions for the concept of matter (Hadenfeldt et al., 2014), meaning attention has been given to how students conceptualise matter, to what extent they are able to explain everyday phenomena, or how they develop an understanding of matter over time (Hadenfeldt et al., 2014). Taking everything into account, it seems that the relation between digital science stories and students' engagement in a problematic topic, such as matter, is still underexplored. To this aim, this research sought to engage students in a difficult-to-learn science topic through a creative process that could lead to deep understanding of the topic of matter which has been identified as particularly problematic. The research questions that guided the research are as follows:

1   How did students engage in each digital story activity?
2   How did students perceive each activity?

3.2.1 Research method and limitations

This chapter utilised a qualitative approach and focused on the design and evaluation of two digital science story activities and aimed at informing teaching practices. The two digital stories were the same in content but differed in presentation. Participants were two groups of primary students, aged 10–11 years old (Grade 5), who were taught the topic of matter two months before this research was conducted. For the purpose of the research, the researcher developed the two digital stories according to the curriculum material, while consulting with one of the Grade 5 teachers in order to make sure that the language and content were appropriate for the students' age-level.

3.2.2 Data collection procedure

This research took place in a suburban public primary school in Athens, Greece. Two classes of students (middle-class, mostly white) aged 10–11 participated in this research. All students spoke Greek fluently. Class A consisted of 16 students and Class B of 15 students and all of them were described by their teachers as mixed-attainers, a statement that was also supported by students' monthly test results in science and other subjects. For the purpose of data collection, students from each class were grouped into small teams of three to four students and worked collaboratively. The two classes completed two different digital story activities on different days, during school hours. The first activity (named story sequencing) included a digital story about matter, broken down into fifteen scenes, which were presented to students in a random order. Students had to first determine the plot by ordering the story scenes, and then narrate it by making written commentaries. The second story (named story verbalisation) about matter was presented to students in its pre-defined order, as a complete story, and students had to narrate it by verbalising its content through written commentaries. Class A completed the story sequencing activity and Class B the story verbalisation activity. Neither activity included any audio or visual commentaries so that students could make their own narration

The content of the stories was based on the curriculum material for the teaching of matter in Grade 5 and was the same in both activities. The ordering of the content in the story verbalisation activity was similar to the teaching sequence for matter taught at school, according to the Greek programme of study for science for Grade 5 (Figure 3.1). The proposed teaching sequence followed a hierarchical presentation of concepts, introducing first the simple concepts before moving on to the more complex concepts of which they are part. It started with an introduction to the three states of matter and then continued with the changes of conditions, such as melting and freezing, and evaporation and condensation. It ended with the concepts of heat and temperature.
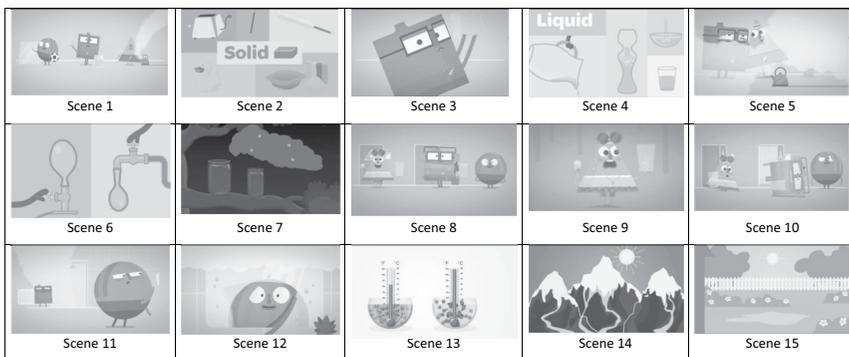
Figure 3.1 The content of the story and its order of presentation in the story verbalisation activity.

Table 3.1 Data collected in response to the two research questions

Data collected	Class A	Class B	Research questions
Resultant stories	Randomly ordered scenes (story sequencing)	Pre-defined order of scenes (story verbalisation)	1 How do students engage in each digital story activity?
Group interviews	2 teams	2 teams	2 How do students perceive each activity?

The role of the researcher was to participate as a silent observer, keeping notes about the nature of students' interaction. With the students' consent, there were also audio-recorders to record each team's interaction. The Class A teacher was present as an observer and alongside the researcher offered practical and technical guidance where necessary.

After the two digital story activities were implemented, follow-up group interviews were conducted with a subset of teams of students from each class. The interviews with the students aimed at collecting information about students' perception of the conceptual nature of each digital story activity. The students were selected in such a way to obtain a representative group in terms of their abilities (medium attainers and low attainers), for which information was provided by their teachers. The research data for this research consisted of the students' resultant digital stories and group interviews, as outlined in Table 3.1.

3.2.3 Data analysis

Seeking to evaluate how students might have engaged through each activity, students' story elements were analysed according to the revised framework of Norris et al.'s (2005) framework for science narratives (Table 3.2). The group interviews were analysed using the hybrid process of thematic analysis (Boyatzis, 1998; Fereday & Muir-Cochrane, 2006). The hybrid process of combining inductive and deductive thematic analysis involved all the steps of the data-driven approach and at the same time allowed the researcher to use pre-conceived theories as a guide for articulating meaningful themes (Boyatzis, 1998). In the case of this research, the analysis started as data-driven, looking for patterns and themes in the data (Braun and Clarke, 2006). Attention was paid to basic concepts that recurred and parts of the data that described similar concepts were color-coded. Then the hybrid process progressed to theory-driven coding and analysis, drawing on codes from the revised science story framework of Norris et al. (2005). The compare-and-contrast phases of this process helped to minimise possible distortions (Boyatzis, 1998) and to overcome the possibility of the researcher biases in the qualitative analysis of one activity against the other.

Table 3.2 Key elements of a science story (adapted from Norris et al., 2005)

Story Element	Description
Purpose	The science story helps to understand the natural world and people's place in it.
Events	The science story events are chronologically related/sequenced, in an explicit or implied way.
Structure	The science stories are structured around two independent time sequences—the sequence of plot events and the sequence in which the events are related.
Agency	The science stories involve human beings or other moral agents who cause and experience events and are responsible for their actions.
Narrator	The narrator determines the point and purpose of the narrative and selects the events and their sequence. The narrator fashions a sequence of events into a significant whole.

3.2.4 Presentation of findings

The analysis of findings according to the science framework (Table 3.1) revealed that the two activities had a different conceptual nature. From the five essential elements, story sequencing (Class A) and story verbalisation (Class B) shared *purpose and agency*, while they differed in *events*, *structure*, and *narrator* (Table 3.3). Both classes provided scientific explanations about matter, which was the *purpose* of the science stories. Also, both classes involved *agency* in their science stories by attributing human-behaving or material behaviours to the story-characters. Where the two classes differed was in how they structured the story *events*, with Class A being free to sequence the story events, determining their chronological order and causal relation. In contrast, Class B followed the pre-defined chronological and causal sequence of events that were based on the proposed teaching sequencing for matter. Another key difference was in the element of *structure*: Class A's activity enabled them to sequence the story events based on how they related to each other, as opposed to Class B's activity that involved a sequence of plot events. Lastly, the role of the *narrator* was distinctively different through the two activities. Class A were free to determine the story plot by selecting the events that related and deciding about their sequence, whereas Class B determined the story plot by verbalising a pre-defined sequence of events.

    In order to visualise the differences found in the story elements of the two activities, Figure 3.2 and Figure 3.3 illustrate the artefacts from two teams (Team A/Class A) and (Team B/Class B) that provide practical evidence of the conceptual nature of each activity. Regarding the element of *events*, Team A students determined the sequence of the scenes starting with scene 4, then scenes 3, 8, 14, 2, 1, 9, 10, 6, 7, 15, 11, 13, 12 and ending with scene 5. With reference to the element of *structure*, students followed a mixed ordering of the scenes. They started with the introductory concepts (scenes 4,3), moved to the changes of conditions (scenes 8,14), back to the introductory (scenes 2,1), to changes (scenes 9,10) again, then

Table 3.3 Analysis of students' resultant digital stories based on the five key elements for science stories

Key elements of a science story	Story sequencing activity (Class A)	Story verbalisation activity (Class B)
Purpose	States of matter	States of matter
Events	Free-choice chronological and causal sequence of events	Pre-defined chronological and causal sequence of events
Structure	Sequence of related events	Sequence of plot events
Agency	Humanlike agents and other entities	Humanlike agents and other entities
Narrator	Determines the story plot by selecting the events and their sequence	Determines the story plot by verbalising the pre-defined events and their sequence

Scene 4	Scene 3	Scene 8	Scene 14	Scene 2
Liquid is a natural state of matter. Liquids flow as their particles move around but they stay close to each other.	- Oh, the frozen lemonade has spilled over my face. - I know what to do! I'll use water to clean myself!	- I am going into the high temperature room - And I'm going into the low temperature room.	Mountains are snowy and cold. When the sun appeared, ice melted, and streams began to form.	Solid is a natural state of matter. Its particles move slightly while keeping their positions.
Scene 1	Scene 9	Scene 10	Scene 6	Scene 7
-Hi everyone! I play football very well! -I can also make a sculpture of myself as a king!	-Oh, no! My ice-cream is melting and the water with ice-cubes got really hot. This process is called MELTING. -Brrrr, it's so cold, 0ºC and I am freezing! This	-Aaah, finally I'm out! Fresh air! -Oh dear! I've never seen so much cold before!	Gas is a natural state of matter. In gases, particles move around by constantly changing their posititions.	Gases can occupy all space in these jars.
	process is called FREEZING.			
Scene 15	Scene 11	Scene 13	Scene 12	Scene 5
Water evaporates due to the sun's heat.	Solidy goes into Greeny's bathroom and changes the room's temperature. First he turns it up and then he turns it down.	Particles are, first, turning hot and then turning cold.	Solidy swept the window with his hand because some gas had been condensed and turned into liquid. Then, an angry Greeny appeared but when he got closer to the window, he almost dropped his towel ... and so Solidy run away.	Gasy drank a liquid that made him burp ... so he scared Greeny, who dropped his liquid onto Solidy, who tripped over his sculpture.
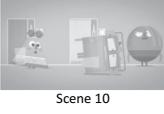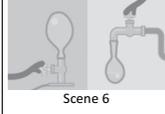
Figure 3.2 Team A/Class A digital story (story sequencing activity).

introductory (scenes 6,7), then back to changes (15,11, 13, 12), and finished with an introductory concept (scene 5). Considering the element of the *narrator*, Team A engaged in a process of manipulating the learning content to match students' preferred presentation.

The story verbalisation activity, by contrast, involved a pre-defined story, with all its pieces together, and students had to narrate its plot by verbalising its existing context, as illustrated in Figure 3.3. The story verbalisation activity did not allow students to make their own decisions about the ordering of *events* or the *structure* of the story. Team B had to follow a pre-defined structure of events, starting with the introduction of the three states of matter in scenes 1–2, 3–4, and 5–7. Then, they continued with the changes of conditions, such as melting and freezing in scenes 8–10 and evaporation and condensation in scenes 11–12. They finished with heat and temperature in scenes 13–15. As such, the role of the *narrator* was that of determining the story plot by verbalising the pre-defined content (from scenes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 to 15). That is, through the story verbalisation activity students engaged in a process of verbally producing an existing content, presented to them as a complete story. Like with the story sequencing activity, students'

Scene 1	Scene 2	Scene 3	Scene 4	Scene 5
-Hello there! Hey, you fatball, make a trick using your solid football. -Ok! -Make a sculpture too! -Done!	In solids, particles do not move away from each other but they stay close to their permanent positions.	-Hmm, why doesn't this come out? -I have an idea! Yam!	In liquids, particles move away from each other but they remain close to their permanent positions.	-Oh, how nice! -Argh, I can't see! - Gloop, gloop (drinking the liquid)... oh no, my stomach...Brrrrrr!! -Argh, my sculpture! I am going to 'kill' you!
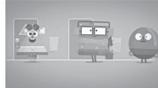
Scene 6	Scene 7	Scene 8	Scene 9	Scene 10
In gases, particles move away from each other as far as possible.	Fire's particles are gases that spread out in a container, taking thus its shape.	-Mmm, my ice cream is so delicious! Luckily, I've got my ice cubes in case I get hot. Can't wait to go inside. -Let's go!	-It's too hot in here! Both my ice-cubes and ice-cream melt! This suggests that melting began. -Brrr, it's too cold in here.. my water turned into an ice-cube. This means that freezing started.	-Taram! Ah, finally! -It was too hot! I melted! -I froze! -Here you go! -Thanks!

Scene 11	Scene 12	Scene 13	Scene 14	Scene 15
-Hmm, I am going in. -Lalala! Oh no, water evaporated! -Let's see here! A ha!	-Hey, you, come here! -Oops, that was close!	The thermometer is at 63 degress Celsius. When an object gets hot, particles move faster. When it cools down, particles move slower.	When the sun is burning, it can make water evaporate in the mountains. The initial temperature is 0°C.	The sun is too intense and water in the yard evaporates ... and from liquid turns into gas.

Figure 3.3 Team B/Class B digital story (story verbalisation activity).

resultant stories from the story verbalisation activity were not compared to the original story, thus there was not a right or wrong plot.

Moreover, the analysis of the group interviews (Table 3.4) resulted in characterising students' perceptions of each activity's conceptual nature. These are presented below in a series of main assertions as those became evident in the data analysis: (a) some students felt that they owned the story sequencing activity more than the story verbalisation activity, (b) most students thought that each activity was enjoyable and exciting, (c) some students felt that story verbalisation was not as hard as story sequencing, and (d) some students were confused about the conceptual nature of story sequencing.

The first theme, *ownership of creation*, revealed that students liked the version of activity on which they worked, and felt they owned it in their way. Class A from the story sequencing activity liked the fact that they were free to order the scenes according to their own understanding and make commentaries about them. However, some students found this level of ownership hard. Unlike Class A students, Class B students from the story verbalisation activity were more excited about the way they owned their activity.

The second theme, *fun*, indicated that both Class A and Class B students enjoyed their activities, and they would like to do them again in other lessons. Class A students said that they had never before worked through similar activities. Class B students found it fun and expressed a preference over the story sequencing activity because story verbalisation was an easier activity.

Finally, the third theme, *conceptual complexity* revealed the complexity of the story sequencing activity's conceptual nature, which sometimes tired and confused students. The absence of visual or audio narration and the presentation of the scenes in a random order seemed to have troubled students. In contrast, students from the story verbalisation activity did not face such difficulties. As findings revealed, some participants showed a preference for easy tasks that did not require much effort. Further evidence from the group interviews' analysis showed that while both Class A and Class B students enjoyed their activity, the story sequencing activity as opposed to the story verbalisation one required harder thinking and more concentration, which tired some Class A students.

3.3 Discussion and moving forward

Chapter 3 explored how students might have engaged in collaborative learning and digital story creation in a science class. The story sequencing activity enabled students to actively engage with the learning content and to manipulate – to a certain extent – the presented information, determining their preferred order of their story. Interacting with the story content allowed Class A students to make their own decisions about the ordering and sequencing of the events, based on their understanding of matter. This process positioned Class A students as makers of the story, and involved physical and mental intensity, attention to detail and reflection. The physicality of manipulating and methodically arranging the story events so that they related and made sense, pushed students to think

Table 3.4 Open coding for students' perceptions of each activity

Perceptions	Ownership of creation		Fun		Conceptual complexity	
	Class A	Class B	Class A	Class B	Class A	Class B
	S5: *we had to first think about ordering the scenes and then invert the plot. This was a bit hard* **S3**: *I liked that we had to order the videos [scenes] in our own way and to make commentaries about them* **S2**: *I liked the fact that we had to make the commentaries*	**S2**: *we had to use our imagination* **S3**: *I enjoyed watching these videos and having to make the plot commentaries*	**S2**: *it was quite fun; we've never done it before* **S4**: *awesome* **S1**: *we should do it again in other classes as well* **S3**: *amusing* **S5**: *fun*	**S1**: *our activity was more fun I think, because it's very confusing when you have to order the scenes* **S4**: *I like animations, they are child-friendly, quite funny*	**S5**: *some scenes gave us a hard time and we got tired* **S1**: *we had to think harder about how to order the scenes and we didn't know where to start* **S2**: *because there were many scenes, it wasn't easy to figure out which scene goes where, which one goes first and so on*	**S1**: *it's easier having to only narrate the plot* **S3**: *our activity was easier, all the scenes were ordered* **S2**: *if we had the other activity, we would think harder and we would get tired at the end. I prefer ours*

not only harder but also differently, which is in itself a reflective meaning-making endeavour (Matthews-DeNatale, 2013).

The process of story making encouraged students to make decisions, think independently, and seek answers (Kucirkova, 2019). Decision-making as an explanation-based process, pushed students as decision makers to make sense of the available information to aid the selection process (Jonassen, 2011). Through story sequencing, students were required to make a choice among alternative claims and generate arguments to justify each option. It is through the process of debate, discussion, and reflection that students engage in the learning process, because they work together to storyboard and edit their digital stories (Standley, 2003). Students' decision-making depended on how they argued for and against each option on the basis of their existing knowledge and how they combined those arguments to reach a joint decision (Jonassen, 2011). Their final decisions resulted from the process of supporting or rejecting alternative claims/decisions and were constructed as an explanatory representation in story form that contained causal accounts of the evidence (Jonassen, 2011).

Positioning students as story makers not only enabled them to control aspects of the story presentation (Moreno & Mayer, 2007), and thus to take ownership of their creation, but also challenged their existing assumptions (Kucirkova, 2019). Engaging in the process of making a story depends on how one can see their understanding of something come together and make sense. The sharing of ideas and information allowed students to make meaning based on their collaborative interaction. The findings indicated that students strategically related scenes together, when they tried to conceptualise matter by matching together chunks of information based on their shared understanding and existing knowledge.

By contrast, findings from the story verbalisation activity pointed out the limited options that Class B students had when asked to determine the plot of a pre-defined story. Having to verbalise the content of the story, students did not have to reflect on either purpose or strategy in linking the science concepts between them. In particular, the story verbalisation activity allowed students to think about the content of the story, not its presentation/order, so students had to rely on retrieving and recalling prior knowledge. This process positioned Class B students as tellers of an existing story, which did not require any active engagement with the ordering of the content. Thus, the strategies of implementation that students followed in verbalising an existing story by determining its plot involved the effort to relate the story parts to previous knowledge. In doing so, Class B students might have tried to recall (parts of) content in the specific teaching sequence they were taught it. Such a sequence is dependent on teachers' and curriculum-developers' interpretation of how specific knowledge should be taught, what certain concepts should precede before others because without them any subsequent knowledge would not be comprehended.

Generally, both digital science-story activities involved a creative process that enabled students to determine either the story content and its plot, or its plot. Each activity had a different level of conceptual complexity involved. Taking

also into consideration participants' attainment level and previous knowledge in the specific topic, it was expected for some students from both classes to face difficulties in engaging with each activity. To conclude, the process of making a story as opposed to telling a story emphasised students' agency in making choices, thinking independently and seeking answers through shared understanding. The argument would be that engaging students in harder versions of the same task could generate better results (Brown, Roediger, & McDaniel, 2014), as students might learn more in the least preferred conditions (Kelly & Tangney, 2006).

3.3.1 Implications for practice

Positioning students as digital story makers gives them the opportunity to take responsibility for every step of the creation process while determining the presentation of the content and negotiating a shared understanding of ideas and information. Whilst students may find the story sequencing activity as conceptually difficult and at times tiring, it could be implied that challenging and hard activities deepen engagement and promote learning by doing, which is a meaning-making approach in itself. Activities that follow the proposed teaching sequence are not always beneficial in engaging students in science learning. The proposed teaching sequence depends on a hierarchical interpretation of knowledge, meaning that certain simple concepts need to be learned before other more complex of which they are part. It is often the case that the fragmented presentation of knowledge through a hierarchical teaching sequence can cause barriers to students' understanding of difficult-to-learn science topics. Therefore, using digital stories to communicate scientific information is valuable and should be further explored to investigate its potential for science teaching and learning.

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Chapter 4

Can WhatsApp facilitate interaction? A case study of adult language learning

Dimitrios Vogiatzis, Koula Charitonos, Korina Giaxoglou and Tim Lewis

4.1 Introduction

The ubiquity of technology and the proliferation of digital technologies in our everyday life have transformed the landscape of education. Technological developments in the 21st century provide opportunities for inclusion and access to a wide range of information, knowledge, and learning. Consequently, today, technology significantly contributes to educational environments in which emerging digital tools are used to facilitate teaching and learning in several ways. The advent of Mobile Instant Messaging application (MIM) like WhatsApp has influenced the ways in which people communicate in everyday life and caught scholarly attention in exploring their potential in language learning settings.

Chapter 4 presents an exploratory case study undertaken in an adult education centre and aims to examine the extent to which WhatsApp can be used as a means of facilitating learner-to-learner and teacher-to-learner interactions. In line with the purpose of this book, Chapter 4 explores the practical applications of WhatsApp and aims to identify the "enablers" and "disablers" of this MIM app for language learning and interaction.

4.1.1 Literature review

The advent of MIM applications like WhatsApp has shaped the communicative practices of people around the globe, as also indicated in Chapter 16 (Srisontisuk, 2022). These mobile communication services differ from traditional SMS, since they enable users to send and receive text messages, images, video, audio, and location information in real-time to individuals or groups of friends at no cost (Church & de Oliveira, 2013). WhatsApp is an internet-based cross-platform instant messaging application for smartphones (also accessible via desktop computers, laptops, and tablets). To date, WhatsApp is the most popular MIM application with two billion monthly active users worldwide (Statista, 2020).

4.1.2 WhatsApp as a language learning environment

The popularity growth of WhatsApp and its features has led many scholars to explore its potential in language learning settings. Specifically, this MIM app was used to develop language learners' writing (Ahmed, 2019) and reading skills (Alzubi & Singh, 2018), as well as their vocabulary acquisition (Lai, 2016) and listening skills (Fauzi & Angkasawati, 2019). A recent systematic literature review conducted by Kartal (2019) explored the effectiveness of WhatsApp and identified 37 studies in the field of language learning and teaching. The review concluded that WhatsApp is a useful tool that can facilitate language learning, but highlighted that the studies examined did not clearly discuss the theoretical underpinnings of WhatsApp use. Moreover, according to Kartal (2019), some of the articles analysed provided neither any information about the levels of participation in the online environment nor any details about the implementation process.

In terms of methods, the studies examined relied heavily on quantitative data (questionnaires and pre- and post-tests), while only two studies used observation techniques to investigate participants' actual use of WhatsApp for language learning. This shows that there is a lack of measurements such as observation of participants' online activities and analyses of their sharing practices. Empirical frameworks for the analysis of sharing practices in Social Network Sites (SNS), as proposed by Androutsopoulos (2014), can capture learners' actual participation in these online environments (see Section 4.3.3).

As regards the educational settings in which WhatsApp has been implemented, the review showed that most of the studies (65%) were conducted in higher education contexts, while none of them examined the effects of WhatsApp in adult education. Adult and community learning is a different environment from higher education in important respects. Learners are more mature (often of retirement age), and they are studying purely for personal interest, rather than formal qualifications. Consequently, their learning is not assessed or graded, while they are much less exposed to the target language than they would be at university.

4.1.3 WhatsApp and language interaction

Interaction is considered one of the main mechanisms by which languages are learnt (Mackey et al., 2012), as also indicated in Chapter 5 (Conde Gafaro, 2022) and Chapter 6 (Chua, 2022). Specifically, Aburezeq and Ishtaiwa (2013) examined the impact of WhatsApp on interaction in an Arabic language teaching course. The findings indicated that most participants (71%) perceived that WhatsApp had the power to enhance peer-to-peer interactions. However, this study relied on interview data and did not provide any empirical evidence on how WhatsApp can facilitate such interactions. As regards student-to-student interactions, Keogh (2017) argued that WhatsApp can increase learners' involvement and accommodate various traits of communities of practice (i.e., co-construction of knowledge, scaffolding, etc.). Nevertheless, this study revealed that there was "a lack of true

dialogue" when learners interacted with each other, while most of the discussion on WhatsApp were teacher-initiated (Keogh, 2017, p. 102).

Another study examined the benefits of WhatsApp to develop second language writing (Andujar, 2016). Findings indicate that WhatsApp contributed to the development of accuracy in second language writing. As regards interaction, Andujar (2016, p. 63) argued that "WhatsApp constitutes a powerful educational tool to encourage second language interaction among participants" and emphasised the need for further research mentioning that "[i]ts tremendous potential to activate students' involvement remains one of the least exploited functionalities of mobile phones".

4.1.4 Aims of the study and research questions

In line with the literature discussed above, Chapter 4 places attention on the opportunities that this MIM application can provide in terms of learner-to-learner and teacher-to-learner interaction (including peer-to-peer feedback interaction). Specifically, the study presented in Chapter 4 seeks to address the following research questions:

1   How do adult learners and their teacher participate and contribute while using WhatsApp for language learning purposes?
2   To what extent can the use of WhatsApp facilitate (or impede) language learning interaction in an adult education context?

4.2 Research context and methods

This study explored the use of WhatsApp by a group of adult learners of German language in an adult education centre in the UK. In this context, learners attended classes once a week (90 minutes to two hours), running for three terms of ten weeks each (September–December, January–April, April–July, 2019–2020). Adult learners in this school typically attended 30 lessons a year (2 hours a week) and were exposed to the target language only intermittently, while the long breaks between the terms made it difficult for them to recall and assimilate knowledge. WhatsApp use in this study aimed to alleviate these challenges by extending the limited class time and providing a friendly online environment that could facilitate learner-to-learner and teacher-to-learner interactions.

4.2.1 Choice of technology and implementation process

The selection of the MIM was made by considering teachers and learners' needs and preferences, as well as their familiarity with the various MIMs available today. A WhatsApp group was created by the teacher, and learners were invited to join the group. The first author was also added as member of the group with the sole aim of observing and recording interactions amongst the members of the group without disturbing the naturally occurring exchanges. Given that one of the aims

was to examine how the teacher and learners adapted to WhatsApp and impulsively used it to facilitate their language teaching and learning, respectively, no formal rules were set by the researcher. Participants were given complete freedom to interact, initiate conversation, and share any information related to their German language learning.

4.2.2 Participants' profiles

Participants were eight native speakers of English who aimed to learn German as a foreign language purely for personal interest. All learners were adults and fell into a range of age categories, while two were in the age range of 40–49. As identified in Chapter 19 (Iwaniec-Thompson, 2022), six learners were in the older category, two in 50–59, respectively, three in 60–69 years old, and one participant being over 70 years old.

4.2.3 Data collection and analysis

The research reported in Chapter 4 is part of a broader PhD thesis that followed a mixed-methods approach, employing pre- and post-questionnaires, combined with online observations and interviews. In Chapter 4, we explore the ways in which online interactions took place in the WhatsApp group by examining the data derived from the online observations and the semi-structured interviews.

Throughout the duration of the study ($n = 22$ weeks), systematic online observations were performed, and all participants' posts and comments were archived and analysed to develop an in-depth understanding of informants' online participation. Androutsopoulos' (2014) empirical framework for the analysis of sharing practices in SNSs was adapted and used for the purposes of this study. The analysis was carried out in three stages.

First, a quantitative analysis of participants' online contributions was carried out. Aiming to examine the extent to which the learners and the teacher participated and contributed to the WhatsApp group, all chat entries were counted, as also described in Chapter 10 (Chua, 2022). A chat entry was identified when a participant published a message in the text-chat window (Cho, 2017), including typed text, embedded images, videos, YouTube videos, emojis, links to web content, or a combination thereof. Counting and coding the chat entries in this online environment distinguishes between initiating and responding contributions (Androutsopoulos, 2014). An initial entry was identified when a participant published a message to initiate conversation on a new topic, while a chat entry was categorised as a responsive contribution when a participant replied to an initial entry within the online environment.

The second step involved the identification and selection of relevant communicative events (or "significant moments", the term used in Androutsopoulos, 2014), which were then qualitatively analysed. As proposed in Androutsopoulos (2015) the basic unit of analysis is not a single post but a communicative event which is defined as a "spatially and temporally delimited, multi-authored sequence of

contributions" (Androutsopoulos, 2014, p. 7) and consists of an initial chat entry followed by other users' responsive contributions. To identify and select communicative events relevant to the analysis, three criteria were followed, namely (1) "repetition", (2) "responsiveness", and (3) "reflexivity" (see Androutsopoulos, 2014, p. 8). More specifically, repetition involved those communicative events in which participants repetitively used similarly styled chat entries. Events in terms of responsiveness were identified when posts receive a significant number of responses by the networked audience. Finally, reflexivity included communicative events where participants self-reflect upon their sharing practices. Such reflections are "elicited in secondary data sources such as interviews" which can "offer important pointers back to acts of sharing in the digital data" (Androutsopoulos, 2014, p. 8).

The third stage involved a qualitative analysis of the selected communicative events aiming to provide an empirically evidenced account of how WhatsApp was used as means of facilitating participants' language learning in this adult education setting. As proposed in Androutsopoulos (2014), this qualitative analysis was performed on three different levels, namely, "selecting", "styling", and "negotiating". Selecting concerns what participants chose to share and why, while styling involved the entextualisation of what was shared (i.e., how participants style their content), and negotiating deals with the audience engagement (i.e., how participants negotiate what is shared with other users) (see Androutsopoulos, 2014, p. 8). It is worth noting that "sharing" in SNSs is conceptualised as a mode of participation that incorporates both communication (where sharing is "telling") and distribution (i.e., sharing digital content) (see John, 2013).

Finally, after the completion of the study, semi-structured interviews (n=6) were conducted to provide more insight into the results derived from the online data and to identify the reasons why learners demonstrated specific participation patterns in the online environment. The interview data were subjected to thematic analysis following the six steps proposed by Braun and Clarke (2006).

4.3 Results

4.3.1 Participation and sharing practices in WhatsApp

As Table 4.1 shows, the learners and their teachers made a total of 243 chat entries. Approximately one-third of chat entries (n=78, 32.1%) were made by the teacher, emphasising that his contribution in initiating, coordinating, and participating in other interactions was key. Apart from the individual messages, the teacher made 22 (56.4%) initial entries and replied to 56 (27%) of the posts. These findings suggest that the teacher had a central role in the WhatsApp group.

Moreover, as Table 4.1 illustrates levels of participation among the learners varied. One learner, Emma, was very active in the online environment posting 52 out of 243 chat entries (21.4%), while others like Petra and Klaus were more passive posting six and only one chat entry, respectively. As regards learners' contribution, the data made clear that their participation in the WhatsApp group was reactive, rather than proactive. Specifically, learners rarely took the initiative to start a new

Table 4.1 Level of participation and contribution

	Teacher	Emma	Louisa	Otto	Frieda	Jürgen	Helmuth	Petra	Klaus	**Total**
Individual chat entries	78	52	27	23	20	19	17	6	1	**243**
Initial Entries	22	9	1	2	3	2	0	0	0	**39**
Replies	56	43	26	21	17	17	17	6	1	**204**

topic as the number of initial entries per learner was very low, while most of their contributions (89.7%) were replies to previous conversations or activities posted by the teacher. The reactive nature of learners' participation was obvious from the early stages of the intervention. A possible reason that elucidates learners' reactive participation emerged from the analysis of the interview data. Specifically, all learners felt that they did not "have the right or the authority to initiate something so we [they] sit back wait for [name of the teacher] and then we respond" *(Louisa)*. The view that only the teacher had the authority to initiate conversation in the online environment points out the different dynamics of participating and sharing when using WhatsApp for language learning purposes. It seems that this was a rule set by learners arbitrarily, as it was never formally set. Instead, learners were given complete freedom to interact, initiate conversations and share any information they wanted on WhatsApp, but opted for reproducing the participation dynamics of classroom interaction in this digital context.

4.3.2 Activities in the WhatsApp group

A total of twelve language learning activities were uploaded by the teacher. Half of them were writing tasks that required the learners to compose sentences using vocabulary and/or verbs supplied by the teacher, while three activities asked learners to describe their weekend using the target language. The teacher also uploaded another activity asking the learners to plan a trip to Germany discussing its practicalities (where to go, what to do, what to see, when to go and for how long), while another activity required learners to compose a dialogue in a restaurant or a shop. Finally, an activity shared by the German teacher asked learners to choose and describe a city in Germany or Austria for their peers to guess which it was.

Three of the activities presented above were chosen and qualitatively analysed following the selection criteria (i.e., repetition, responsiveness, and reflexivity) as discussed in Section 4.2.3 Specifically, the first communicative event satisfied the first criterion (i.e., repetition) and offered a representative example of the activities which were repetitively used by the teacher. The second event (see Section 4.3.4) was selected because it received the most significant number of responses by the learners (i.e., responsiveness), while the third communicative event (see Section 4.3.5) entailed participants' self-reflection upon their sharing practices in the online environment (i.e., reflexivity).

4.3.3 Example 1: "Constructing a sentence using the verb zutreffen auf"

The first communicative event offers a representative example of how the teacher used the messaging application to distribute writing tasks. As Figure 4.1 illustrates, the teacher posted a writing task asking the learners to construct a sentence using the separable verb *zutreffen auf* (apply to). Three learners, Louisa, Frieda and Emma, followed the instructions provided by the teacher and generated sentences using the suggested verb. The teacher did not share any follow-up comments, possibly waiting for the rest of the learners to provide their answers to the writing task. After three days, he posted a text entry thanking the learners who participated in this activity and affirming that they understood the given verb well. His chat entry marked the end of this communicative event.

15 MARCH 2019	
Teacher Kann jemand das trennbare Verb 'zutreffen auf' in einem Satz benutzen? *10:51*	Teacher: Can anyone use the separable verb 'apply to' in a sentence?
Louisa 😕 Vielleicht..? Die neue Regulierung wird auf alle Bürger zutreffen. *11:43*	Louisa: (Emoji) Maybe ...? The new regulation will apply to all citizens.
Frieda Was hat auf uns dann zugetroffen, trifft nun auf Ihnen zu. *16:03*	Frieda: What happened to us then applies to you.
Emma Die Einwände der Britische Regierung gegen den sogenannten Backstop, dass der Backstop teilt Nordirland von dem Rest Großbritanniens, zutrefft genau auf der vorgeschlagenen Zolltarife, die die Britische Regierung kündigte an, die zutreffen auf im Fall einen No-Deal-Brexit. 😶 *22:25*	Emma: The British government's objections to the so-called backstop that the backstop divides Northern Ireland from the rest of the United Kingdom are accurate on the proposed tariffs that the British government announced that it would apply in the event of a no-deal Brexit. (Emoji)
18 MARCH 2019	
Teacher Vielen Dank ⬛, ⬛ und ⬛. Ihr habt das Wort gut verstanden! 👍 *17:38*	Teacher: Thank you (Louisa), (Frieda) and (Emma). You understood the word well! (Emoji)

Figure 4.1 Example of a writing task posted by the teacher.

Teacher

A new activity this week.. Choose a destination in Germany or Austria but don't tell the rest of the group. Imagine you're going to travel there. Write to the group describing its geographical location, how you will travel, what is special about this place and why you suggested it. The rest have to guess where it is. Here goes...
Die Stadt liegt im Norden Deutschlands. Ich werde dorthin fliegen. Die Stadt ist zugleich Stadt und Bundesland. Ich habe diese Stadt gewählt, weil ich als Student da war, und immer nicht Freunde dort habe.
Wo werde ich sein? 🙂   11:46

Helmuth

Es ist Hannover?   11:53

Frieda

Ich glaube, dass die beiden von Hamburg und Bremen Bundeslände sind, und also ist sie eine dieser Städte?   12:10

Helmuth

Ich bin beantworten falsch, aber Hannover war ein Stadt und Bundeslände für 92 Tages einmal 🙂   12:27

Frieda

😄   12:54

Emma

Diese Stadt könnte entweder Hamburg oder Bremen sein. Ich glaube, dass Bremen keinen großen Flughafen hat. Daher wähle ich Hamburg 🤭   13:09

Teacher:

A new activity this week… Choose a destination in Germany or Austria but don't tell the rest of the group. Imagine you're going to travel there. Write to the group describing its geographical location, how you will travel, what is special about this place and why you suggested it. The rest have to guess where it is. Here goes...

The city is in the north of Germany. I will fly there. The city is both a city and a federal state. I chose this city because I was there as a student and always have friends there. Where will I be? (emoji)

Helmuth:

Is it Hanover?

Frieda:

I think that Hamburg and Bremen are federal states, so is it one of those cities?

Helmuth:

I'm answering wrong, but Hanover was a city and a state for 92 days once (emoji)

Frieda:

(emoji)

Emma:

This city could be either Hamburg or Bremen. I don't think Bremen has a big airport. That's why I choose Hamburg (emoji)

Figure 4.1 (Continued)

Figure 4.1 (*Continued*)

As regards learners' engagement, Figure 4.1 shows that they responded to the writing task but engaged in no other type of peer-to-peer interaction. In all six writing tasks uploaded by the teacher, the learners followed the same participation pattern, i.e., sharing their answers individually and responding directly to the teacher.

4.3.4 Example 2: "Guess the city"

The second communicative event "Guess the city activity" presented a different type of activity, which was selected because it received a significant number of responses from the learners (i.e., responsiveness). In this activity, each learner was asked to describe a city in a German-speaking country for others to guess which city it was (see Figure 4.2). Seven (out of eight) learners were engaged in this activity who posted a total of 32 individual chat entries. Out of all WhatsApp activities, the "Guess the city" activity was the one generating the higher number of responses from the learners. The teacher also participated in this communicative event by sharing another 27 chat entries to praise learners' effort (*n*=2), to prompt them to describe their city (*n*=3) and to provide

Figure 4.2 "Guess the city activity" (part 1).

feedback to their contributions (*n*=22). Overall, a total of 59 individual chat entries were made in this activity, which lasted for nine days. Due to the length of this communicative event, in Chapter 4 we provide two of its parts. The first part (see Figure 4.2) concerned how the teacher structured and initiated the activity and showed how the learners engaged with the teacher's initial post. The second part (see Figure 4.3) involved one of the learner's description of a city and his peers' contributions.

In this communicative event, the teacher posted the instructions of the activity using English and then shared a description of his selected city in German. This activity caught learners' attention and nine minutes after the teacher's initial post, Helmuth replied and made a guess regarding the city described by the teacher. In response to the teacher's post, four learners (Helmuth, Frieda, Emma and Jürgen) used the target language and tried to identify the correct city. Learners also tried to negotiate and renegotiate to reach an answer by sharing their own interpretation of the clues and using their knowledge to argue for or against a suggested answer (see Figure 4.2). Once all the learners shared their guesses, the teacher revealed the correct answer and used a thumbs-up emoji gesture indicating approval of their efforts. The teacher ended this online exchange by prompting the learners to describe their city *"Wer ist jetzt dran?"* (whose turn is it now?).

Following the teacher's prompt, Otto took the initiative and shared a description of his city (see Figure 4.3). Frieda made a guess about the city in question, which however was not the right one as indicated by Otto. Once he provided more information about his selected city, Emma followed-up with another guess, which Otto confirmed was the correct one.

Overall, this activity encouraged learners to read their peer's contributions, identify the clues provided and then guess the city. It also allowed them to interact with each other.

4.3.5 Example 3: "Your Bank Holiday weekend"

The third communicative event concerned another activity posted by the teacher and involves learners' self-reflection upon their sharing practices in the online environment (i.e., reflexivity) which emerged from the interview data. To begin with, three (out of twelve) of the activities uploaded by the teacher required learners to provide peer-feedback. Specifically, the teacher asked learners to comment on their peers' sentences and/or correct them. It was observed that even if the learners replied individually to the activities, none of them left any comments related to the learners' language use in any of the chat entries posted by the learners. As Figure 4.4 shows, the teacher instructed the learners to describe what they had done over the bank holiday weekend, including a clear prompt for the learners to comment on each other's contributions and/or correct them. The teacher further stated that he would also provide feedback to the learners' contributions. The teacher followed the same pattern in all activities that required peer-feedback, and

Otto	Otto:
Diese Stadt liegt in der Mitte Deutschlands. Es ist bekannt für seine barocken Gebäude und der Dom hat das Grab des Heiligen Bonifatius - ein großer Hinweis! Man muss zuerst nach Frankfurt fliegen und dann mit dem Zug fahren. 13:20	This city is in the middle of Germany. It is known for its baroque buildings and the cathedral has the tomb of Saint Boniface - a big hint! You have to fly to Frankfurt first and then take the train.
Und - ich habe diese Stadt vor vielen Jahren mit meinem deutschen Freund besucht. 13:27	And - I visited this city with my German friend many years ago.
Frieda Könnte sie Köln sein? 13:35	Frieda: Could it be Cologne?
Otto Nein- Es ist kleiner als Köln und liegt nordöstlich von Frankfurt. 13:39	Otto: No - it is smaller than Cologne and is located northeast of Frankfurt.
Emma Der heiligen Bonifatius stammte aus Der Grafschaft Devon, ein einheimischer Sankt, na so was. So, muss die Stadt Fulda sein. Ich war bisher nie dort 13:58	Emma: Saint Boniface came from the county of Devon, a local Saint. So, the city must be Fulda. I've never been there before
Otto Ah richtig Peter! 14:01	Otto: Ah right (name of the student)!

Figure 4.3 "Guess the city activity" (part 2).

Otto	Otto:
Diese Stadt liegt in der Mitte Deutschlands. Es ist bekannt für seine barocken Gebäude und der Dom hat das Grab des Heiligen Bonifatius - ein großer Hinweis! Man muss zuerst nach Frankfurt fliegen und dann mit dem Zug fahren. 13:20	This city is in the middle of Germany. It is known for its baroque buildings and the cathedral has the tomb of Saint Boniface - a big hint! You have to fly to Frankfurt first and then take the train.
Und - ich habe diese Stadt vor vielen Jahren mit meinem deutschen Freund besucht. 13:27	And - I visited this city with my German friend many years ago.
Frieda	Frieda:
Könnte sie Köln sein? 13:35	Could it be Cologne?
Otto	Otto:
Nein- Es ist kleiner als Köln und liegt nordöstlich von Frankfurt. 13:39	No - it is smaller than Cologne and is located northeast of Frankfurt.
Emma	Emma:
Der heiligen Bonifatius stammte aus Der Grafschaft Devon, ein einheimischer Sankt, na so was. So, muss die Stadt Fulda sein. Ich war bisher nie dort 13:58	Saint Boniface came from the county of Devon, a local Saint. So, the city must be Fulda. I've never been there before
Otto	Otto:
Ah richtig ! 14:01	Ah right (name of the student)!

Figure 4.3 (Continued)

Figure 4.4 provides a representative example of how the teacher structured and initiated these activities.

Two days after the initial post Jürgen replied to the activity by sharing a picture of him and Helmuth who were having holidays in Berlin. Louisa and Otto shared a chat entry in response to Jürgen's picture, and three days later, Louisa replied to the activity by describing what she had done over the bank holiday weekend. The teacher then followed up with a comment related to the uploaded picture, thanking Jürgen and Helmuth for sharing, and prompting the learners to discuss their trip in Germany during their in-classroom lesson. Emma was the last learner to reply to the activity by describing what she had done during the bank holiday.

As shown in Figure 4.4, the learners partially followed the task instructions and their contributions were limited to providing individual answers to the activity. The teacher gave time to the learners to comment on their peers' contribution and when this did not happen, eight days after the initial post he provided feedback to the ones who participated in this. Similar to this activity, all the other activities of this type did not involve any peer-feedback, indicating that the learners in this study demonstrated a reluctance to provide feedback to their peers.

This point was raised in the interviews, where four questions were asked seeking to examine how learners self-reflect upon their sharing practices. Accordingly, interviews were used to identify the reason(s) why learners in this study demonstrated a reluctance to provide peer-feedback. Interview data suggested that learners did not feel comfortable about providing feedback, because it was perceived as potentially offensive, as evidenced by Louisa in the following:

> I wouldn't want to offend them by saying oh I think you should have done this or you could have done that I feel uneasy about that to be honest.
>
> (Louisa)

Indeed, learners did not" *"like to point the finger at anybody (…) because you [they] value that they have taken time to do something"* (Otto). What is more, learners (*n*=3) felt that they were not entitled to provide peer-feedback as they were not proficient enough in the target language and that discouraged them from doing so. These views are articulated in the following quote:


Figure 4.4 Activity involving peer-feedback.

Louisa

Letzte Wochenende… (emoji) Am Samstag Morgen habe ich Fußball gesehen (emoji). Die Junge haben gewonnen und mit diesen drei Punkten die MK-Gebiet Liga gesiegt (emoji). Natürlich war das eine Feier für uns (emoji) und ja wir haben (die Eltern, die Trainers, andere Fans) ein Mittagszeitbier getrunken (emoji). Am Abend habe ich Paella gekocht (emoji) und danach ein bisschen Fern gesehen (emoji). Am Sonntag habe ich im Garten gearbeitet (2 emojis), weil das Wetter so schön war (2 emojis).

09:30

Louisa

312 KB

(3 emojis) 09:31

13 MAY 2019

14 MAY 2019

Teacher

Vielen Dank für das Foto (blurred) und (blurred)! Das Brandenburger Tor ist wirklich sehenswert, nicht wahr?! Ihr könnt uns heute abend vielleixht mehr über Eueren Kurztrip erzählen?! (emoji)

06:58

Emma

Am Morgen des Maifeiertags spielte ich Federball (emoji) mit meinen Bekannten, die auch Mitglieder der Towcesterer Universität des dritten Zeitalter sind. Am Abend des Maifeiertags ging ich mit meiner Frau nach Little Brickhill, um Square Tanzen (emoji) zu treiben, weil es uns viel Spaß macht.

20:23

Louisa:

Last weekend ... (emoji) On Saturday morning I watched football (emoji). The boys won and with these three points they won the MKarea League (emoji). Of course, this was a celebration for us (emoji) and yes, we (parents, trainers, fans) drunk a lunchtime beer (emoji). In the evening I cooked paella (emoji) and watched a little TV afterwards (emoji). On Sunday I worked in the garden (2 emojis), because theweather was so nice (2 emojis)

Louisa:

(Image)

(3 Emojis)

Teacher:

Thanks for the photo (Jürgen) and (Helmuth)! The Brandenburg Gate is really worth seeing, isn't it?! Maybe you can tell us more about your short trip this evening?!

Emma:

On the morning of May Day, I played badminton (emoji) with my friends who are also members of Towcester University of the Third Age. On the evening of May Day, my wife and I went to Little Brickhill to do some square dancing (emoji)because it's lots of fun for us.

Figure 4.4 (*Continued*)

> I wouldn't contribute to that because I don't feel that my knowledge is enough
> to give people feedback.
>
> (Jürgen)

Another reason revealed by the interview data was related to the teacher's role. Specifically, two learners seemed to think that *"that's more [name of the teacher]'s role to do that it's a bit uncomfortable sometimes"* (Otto), also evidenced in the following:

> I was quite happy to suggest things and correct them when we were working
> through some exercises if they welcomed it or not I don't know but I was
> very anxious not to undercut [name of the teacher]'s role who is obviously
> the teacher.
>
> (Emma)

All the above views that emerged from the semi-structured interviews shed light on learners' reluctance to provide feedback to their peers. In what follows, we analysed the communicative events in terms of "selecting", "styling", and "negotiating" as discussed in Section 4.3.3.

4.3.6 Sharing practices: selecting, styling, negotiating

The discussion so far has provided three examples of the activities uploaded by the teacher into the WhatsApp group and showed how learners participated in and contributed to these. In terms of selecting, the language learning activities discussed in this study revealed a recurrent pattern in the sense that they all aimed to enhance learners' writing competence and vocabulary acquisition.

As regards styling, it was evident that the activities discussed above involved different entextualisation patterns. Specifically, the first activity (see Section 4.3.3) was introduced using the German language, while the instructions in the other two (see Sections 4.3.4. and 4.3.5) were given in English. The teacher followed the same styling format in all activities (n=6) which required learners to compose sentences using given vocabulary. On the contrary, when sharing activities with a certain degree of complexity (e.g. "Guess the city activity") he styled the instructions using the English language. Moreover, when introducing activities that required learners to provide peer-feedback (see Section 4.3.5), the German teacher used English. The teacher's choice of language in these activities was possibly made to ensure that the learners had understood the language task and what was expected from them.

The next, and most important, level of analysis was "negotiating", which concerned learners' engagement with the shared activities. The communicative events discussed above showed that learners' responses to the uploaded activities generated different degrees of engagement. In the simplest case, learners' participation was limited to responding directly to the teacher (see Section 4.3.3), while on other occasions (see Section 4.3.4) learners were engaged in more substantial ways. More specifically, and in terms of "selecting", those activities which prompted

learners to reply individually to the teacher's post, and focused on the abstract practice of language form, resulted in no interactions amongst the members of the group. On the contrary, the "Guess the city" activity encouraged learners not only to share their individual responses but also to read their peers' contributions in order to decipher the clues and then provide their answers. This activity also resembled a game (or a quiz) which is rooted in learners' meaningful experience of Germany and necessitates learners to draw on their personal knowledge, share their own interpretation of the clues, negotiate these clues with their peers, and finally reach to the correct answer.

As regards peer-to-peer feedback, and in terms of "negotiating", the discussion above indicated that learners demonstrated a reluctance to engage with such interactions. Apart from the reasons which emerged from the analysis of the interview data, analytic attention should be placed on the "styling" of the instruction in these types of activities. Specifically, as shown in Section 4.3.5, the teacher explicitly asked the learners to comment on their peers' sentences and/ or correct them. The exact same instructions were provided in all activities that required learners to provide feedback to their peers. Moreover, in terms of styling, each of the three activities was divided into two parts. The first part involved the language task prompting learners to reply individually to the activity (e.g. what you did over the Bank Holiday weekend?) and the second part directly asked the learners to comment on or correct their peers' contributions. The design of the tasks prompted learners to provide feedback in an overt way, while the first part of the tasks did not require learners' interaction. Consequently, the selection and the styling of the tasks might have not encouraged learners to engage in such interactions.

Finally, regarding "negotiating", the analysis of the communicative events examined above showed that participants' engagement with the shared activities were not time-bound. Specifically, some interactions in the online environment were synchronous (or near synchronous). For instance, the online exchange discussed in Section 4.3.4 lasted for 41 minutes resulting in a total of six chat entries. This showed that WhatsApp can enable synchronous (or near synchronous) communication and emphasises the potential for immediate interactions in this platform. Nonetheless, in the same activity (Section 4.3.4), participants were sharing their contributions for nine days. Such observations suggest that the MIM application can also afford asynchronous and/or diachronic communication. Moreover, since WhatsApp is an archived online environment, it can enable learners to access previous chat entries retrospectively and re-read as well as decipher what other users had shared. This appears to be a significant benefit of using WhatsApp, since *"You can search back (…) you can look back into the Intermediate German WhatsApp group on your phone or iPad or whatever and you can find the conversation so that was quite good"* (Otto). In a traditional in-classroom learning environment, where learners inevitably do not have the chance to archive any interactions, they are not able to access the learning context over time. In this study, the use of WhatsApp allowed learners to access the discussion threads as well as the learning material at any point.

4.4 Discussion and moving forward

The purpose of Chapter 4 was to study patterns of interaction in WhatsApp, exploring the extent to which this MIM application might provide a favourable environment for language learning. Coinciding with Keogh's (2017) study, the findings revealed learners' reactive and limited participation, while the activity in the WhatsApp group heavily relied on the teacher's efforts to initiate conversation. A reason for these participation patterns emerged from the analysis of the interview data. Specifically, learners perceived that only the teacher had the authority to initiate conversation in WhatsApp. Such perceptions and predefined expectations highlight the different dynamics of participating and sharing when using WhatsApp for formal (or non-formal) language learning as compared to informal everyday life use.

As regards the affordances of the platform, this study showed that participants were able to share their contributions without any temporal constraints. Specifically, it was evident from the analysis of the selected communicative events that WhatsApp can afford synchronous (near synchronous), asynchronous and/or diachronic communication. Another important benefit of WhatsApp indicates that the archived nature of the platform enabled participants to retrieve previous chat entries retrospectively and re-read as well as decipher what other users had shared at any point.

The analysis of the communicative events examined in this study suggests that what is being shared (selecting), and how this is done (styling) can influence the ways in which participants engage with the shared content (negotiating). As regards online interaction, other studies (see Aburezeq & Ishtaiwa, 2013; Andujar, 2016; Keogh, 2017) emphasised that WhatsApp can encourage language interaction among participants. Notwithstanding that this MIM application can afford language interaction, this study showed that learners' participation and interaction cannot be ensured by the mere use of the platform, but heavily relies on task design. Moreover, the effective selection and the styling of the language activities can potentially stimulate other interactions, such as peer-to-peer feedback.

Therefore, we argue that the educational value of this MIM application and its appropriateness as a teaching and learning environment need to be further investigated. Future research should aim to establish a clear theoretical framework for the integration of WhatsApp into the language classroom by developing transparent guidelines and pedagogical strategies which can lead to an effective use of the medium for language teaching and learning purposes.

4.4.1 Implications for practice

Chapter 4 explored the use of WhatsApp by a group of adult learners of German language and their teacher in an adult education centre. The findings suggest that the mere use of WhatsApp cannot guarantee language interaction among participants. Moreover, inflated expectations that WhatsApp can generate more interaction in language settings because of its communicative use in everyday life are

questioned. Consequently, current pedagogical practices cannot be reformed simply by exploiting the familiarity and popularity of this MIM application. WhatsApp can afford online language interactions and might effectively facilitate language learning, but this necessitates extensive training of educators to use the medium to its full potential. Therefore, practitioners should consider the process of planning, designing, structuring, and implementing educational activities in WhatsApp and should not simply assume that the use of WhatsApp will magically increase learners' participation and interaction.

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Chapter 5

First steps towards self-regulated learning

Setting goals in MOOCs

Barbara Conde Gafaro

5.1 Introduction

> I am up for something new. I don't want to be a dinosaur and I want to keep up with things, but I just needed a little bit of help to get started.
>
> <div align="right">Irene, adult language learner</div>

The COVID-19 pandemic has disrupted our way of learning and teaching. Lockdown measures implemented by governments to prevent the spread of the virus have changed our everyday life, including education. These measures have led most educators and learners to step into the world of online learning and opt for learning technologies to replace face-to-face learning environments. Although the work presented in Chapter 5 happened before COVID-19, this contribution's narrative is even more relevant at this time of the pandemic. Learners are expected to be equipped with strategies and study skills to chart a path for their sudden online education without having the constant supervision of an in-class teacher, which is similar to the cases discussed in this chapter.

These unprecedented circumstances have resulted in various opportunities as well as challenges. Learners have the option to assume a responsible role in their online education. When they take responsibility for their learning, they regulate their thoughts, feelings, and actions, i.e., learners become masters of their learning processes for attaining goals (Zimmerman, 2011). Employing self-regulatory processes and being aware of how these processes influence one's preparation and willingness to self-regulate are crucial steps in today's open world learning. For example, learners are anticipated to self-regulate their learning in Massive Open Online Courses (MOOCs) (Milligan & Littlejohn, 2016), since "a MOOC is completely voluntary. You decide that you want to participate, you choose how to participate, then you participate" (Downes, 2012). However, taking part in such online courses becomes a challenge for those who cannot learn independently (Littlejohn & Hood, 2018). Therefore, learners in order to fully benefit from their studies should be independent and know how to self-regulate to succeed in learning at a distance.

In foreign language education, MOOCs have been considered to support language learning at a distance (Gimeno-Sanz, 2021). These online courses provide

opportunities for language learners to practise their target language, either by following courses that are designed to teach a language (LMOOCs) or by selecting MOOCs that are related to learners' interests so that they can study a language for specific purposes, see also Chapter 6 (Chua, 2022). Likewise, the pandemic has influenced a growing global demand for remote language learning. A recent review of MOOC stats and trends listed foreign language learning in the top ten of most popular subjects studied amidst the pandemic – with 815 language courses offered by the main providers at the time of writing (Class Central, 2021; Shah, 2020). Yet, the challenges that MOOCs represent for language learners remain under-researched (Gillespie, 2020; Sallam, Martín-Monje, & Li, 2020). The challenge mentioned above about self-regulation in MOOCs is not much studied in relation to languages (Alonso-Mencía et al., 2020), especially the forethought processes that language learners are anticipated to adopt so that they can initiate their self-regulated learning in those online courses.

Hence, Chapter 5 aims to provide a deeper understanding of the forethought processes, with particular reference to goal setting and goal orientation. Both processes were employed by 19 adult language learners during four weeks of engagement with MOOCs as part of their classroom-based language courses. The findings from Chapter 5 may contribute to support learners' self-regulated learning and, last but not least, encourage learners to assume responsibility for their language education in which active learning is the new normal.

5.2 Self-regulated learning

Self-regulated learning (SRL) is conceptualised as a dynamic group of processes that learners employ to initiate, sustain, and assess their learning towards goal achievement. Zimmerman (1989) was one of the first to cover the aspect of metacognition in his triadic model of self-regulation. Metacognition refers to two clusters of activities, namely learners' self-awareness of how, when, and where to use different cognitive strategies and the regulation of those strategies that direct their learning (Flavell, 1979). Winne and Hadwin's (1998) SRL model also included this aspect of learning; however, it failed to consider the interaction of metacognitive processes with other motivational and social aspects of self-regulation (Greene & Azevedo, 2007). This missing interplay evidenced in the latter was presented in a redefined SRL model posed by Zimmerman and Moylan (2009). They designed an integrative three-phase model to explain potential interactions among metacognitive and motivational processes that occur during learning efforts.

Zimmerman and Moylan's (2009) cyclical model of SRL introduces the notions of metacognition and motivation throughout a preparatory, a performance, and a reflective phase, described below:

1   Forethought Phase: it refers to learning processes and sources of motivation that are contemplated in preparation for efforts to learn and affect learners' willingness to self-regulate their learning.

2   Performance Phase: it involves processes that are employed during efforts to learn and influence learners' self-control and self-monitoring of their performance.

3   Self-reflection Phase: it refers to processes that follow efforts to learn and subsequently influence learners' reflection and affective reactions to that learning experience. "These self-reflections, in turn, influence forethought regarding subsequent learning efforts, which completes the self-regulatory cycle".

(Zimmerman & Moylan, 2009, p. 301)

The three self-regulatory phases are composed of 20 metacognitive processes and sources of motivation. However, this chapter's scope focuses only on the processes of goal setting and goal orientation included in the forethought phase. The forethought phase consists of two main categories: task analysis processes and self-motivation sources. In the first category, learners are anticipated to unpack a learning task, set educational goals, and outline a strategy to be prepared for the task and its environmental setting. Goal orientation is part of the second category and reflects learners' beliefs about the purposes of engaging in learning or performing tasks (Zimmerman & Moylan, 2009).

The SRL cyclical model places goal setting at the top of the learning processes that learners are anticipated to deal with in the forethought phase. Setting goals enables learners to initiate their learning and monitor their progress towards those goals and adjust their learning, if necessary (Zimmerman, 2000). There are two types of goals identified in the socio-cognitivist literature: distal (long-term) goals and proximal (short-term) goals. Several studies show that setting proximal goals is more effective than focusing on distal goals (Zimmerman, 2008). The most effective proximal goals are challenging for learners, specific to the task, and align with other goals (Zimmerman, 2008). Altogether, research suggests that learners should set specific outcomes in time, either driven by learning or performance-oriented goals, to learn more effectively on their own. The following section expands on the importance of goal setting in flexible learning environments by covering works that examine successful learning in MOOCs.

5.3 MOOCs and goal setting

MOOCs appeared in online education when Siemens, Downes, and Cormier facilitated a way of learning in the networked world to a total of 2,200 people via an online course called "Connectivism and Connective Knowledge (CCK08)" (Downes, 2009). MOOCs have continued to provide large-scale participation and access to subject-specific resources via the web since then. In the case of LMOOCs, these have been designed for anybody interested in learning particular aspects of a foreign language due to the limited time they are offered, between four and six weeks (Gimeno-Sanz, 2021).

Although MOOCs represent the growth of online learning delivered at a massive scale, their principle of open access to learning for everyone has been questioned (Littlejohn & Hood, 2018), and subsequently, their commitment to open

world learning. MOOCs welcome people worldwide to access online education content without any academic prerequisite needed. However, the access to discussion forums (Chua, 2022), multimedia material, and quizzes offered in those courses is limited to people who can learn independently; see also Chapter 8 (Rizvi et al., 2022) and Chapter 9 (Iniesto et al., 2022).

MOOC learners have the advantage of choosing their learning path (instructor-paced or self-paced online courses), managing the resources they want to cover, and the time they want to invest in the course materials (Beaven, 2013). However, such flexible learning approach embedded in the design of MOOCs might only favour "those who are able to self-regulate their learning, leaving the most disadvantaged behind" (Littlejohn & Hood, 2018, p. 31). By way of illustration, learners who have formal academic qualifications typically enrol in and complete MOOCs at relatively higher rates (Kizilcec, Saltarelli, Reich, & Cohen, 2017). Similarly, university students with a master's degree or PhD often report higher levels of goal setting, strategic planning and task strategies than people with lower qualifications enrolled in MOOCs (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). Therefore, SRL becomes a crucial tool kit for learners who want to access online educational content and achieve success within such learning environments.

Likewise, Gimeno-Sanz (2021, p. 53) also argues that in most cases, MOOC learners "have to self-regulate their learning, very much relying on cognitive and resource management strategies". Goal setting is one of the self-regulatory processes employed by successful learners in those online courses. A recent study that surveyed 643 MOOC learners found that "MOOC completers reported significantly higher use of the goal-setting SRL subprocess than did MOOC non-completers" (Handoko et al., 2019, p. 50). The findings are aligned with previous studies that identified goal setting as a common metacognitive process among successful learners in MOOCs (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017; Milligan & Littlejohn, 2016). These studies examined the types of goals (proximal/distal) and how they influenced learning in MOOCs related to educational technology and STEM subjects. However, little is known about how learners set goals in LMOOCs or specific content-based MOOCs, particularly when preparing to work on these online courses as part of their classroom-based language courses. This gap in the literature raises the question of how language learners set their goals when engaging with MOOCs to support their classroom-based language education, and that was the main aim of the empirical study reported in this chapter.

5.4 Research methods

The empirical study described in this chapter was framed within a multiple-case study research. A case study examines a contemporary phenomenon in depth and within its real-world context (Yin, 2018). The phenomenon, also commonly known as the case, can involve persons, events, or decisions (Thomas, 2011). A multiple-case study comprises two or more cases to gain a detailed understanding of a situation. Examining multiple cases also contributes to having richer and more

rigorous findings than the ones obtained solely based on a single case. Hence, conducting a multiple-case study was suited to capture the complexity of learners' goal-setting processes in MOOCs based on different language learners' experiences. As explained by Thomas (2011, p. 513), case studies can be "studied holistically by one or more methods". The design of the multiple-case study reported in this chapter employed multiple research methods that included three quantitative and qualitative instruments:

1 Four weekly monitoring surveys (WSURV1/2/3/4), with mostly open-ended questions, administered during each week of engagement with the MOOCs. The second question in the WSURV (*what was your learning goal for this week?*) allowed the researcher to delve into the type of goals participants set for the online courses.
2 An online SRL questionnaire (SRLQ) sent in week five of the project to survey participants' SRL processes. The SRLQ consisted of 29 items in total, but this chapter focused only on the first three that dealt with goal setting processes (*1. I set specific short-term (daily or weekly) learning goals for the MOOC I chose. 2. I set specific long-term learning goals (monthly or for the whole MOOC). 3. I set realistic deadlines for learning in the MOOC.*). The study did not aim to compare participants' SRL processes before and after their engagement with the MOOCs. Thus, the questionnaire was only administered at the end of the learning process.
3 A semi-structured interview (INV) conducted at the end of the project to probe participants' forethought processes of goal setting and goal orientation in their online courses.

The SRLQ was adapted based on the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991) and the INV was an alteration of an interview designed by Littlejohn and Milligan (2015). The research design of a multiple-case study follows a "replication logic", i.e., cases replicate the exact conditions of the first case to predict similar or contrasting results based on anticipated reasons (Yin, 2018). The extent of the replication logic presented in this chapter involved the exact three instruments to collect data in each case. The cases also shared the following conditions: small groups of adult language learners attending face-to-face language courses while engaging with MOOCs for a month to enhance that classroom-based instruction. The learners within those groups were the cases in this multiple-case study research.

   Specific characteristics were considered within the selection criteria of the cases. The researcher contacted gatekeepers who run language courses for adult learners and included independent learning and/or interactive technologies as part of their syllabi. The 19 participants, who voluntarily joined the multiple-case study research, were learning languages for different purposes in two different contexts. In Case study 1, ten participants were taking face-to-face language courses in Spanish, Italian and French at a community learning centre in Milton Keynes (UK). The gatekeeper in Case study 1 regularly asked learners to complete a learning plan and

record of achievement where they had to write their learning goals and marked if those were achieved by the end of the course. In Case study 2, nine participants were taking an English for academic and professional purposes course (ESP) offered as part of a local association in Ferrara (Italy). The gatekeeper contacted in Case study 2 usually asked students to use MOOCs within her ESP lessons to work on their motivation and academic performance. The gatekeepers' familiarity with the study's core ideas, goal setting processes and MOOCs, diminished accessibility issues in the recruitment process.

All participants were asked to engage with a MOOC of their choice, since students who find personal interests in a learning task are more likely to regulate their learning (Zimmerman, 2000). They were asked to use Class Central, a search engine tool to browse MOOCs by subjects and providers. Whereas learners in Case study 1 selected LMOOCs that suited their intermediate language proficiency level and personal interests, learners in Case study 2 chose specific content-based MOOCs that matched their disciplinary specialisms and advanced language proficiency level. At the start of the project, the former self-reported a lower language proficiency level than the latter. This advantage in terms of language expertise enabled the ESP learners to select their MOOCs from a wide range of online courses that moved beyond the linguistic content usually offered in LMOOCs. Once participants selected their courses, they were free to decide how and when to work with the online material, though a minimum of two hours of study per week was suggested. They were also given pseudonyms, whose initial letter indicated which of the languages they were studying.

A substantial critique of case study research is that cases are not sampling units; hence, they cannot be generalisable. This perceived limitation can be addressed by connecting the case study to a theory so that "analytic generalisations" can be made, i.e., expanding theories at a higher conceptual level rather than extrapolating probabilities with "statistical generalisations" (Yin, 2018). Therefore, the researcher identified and classified learners' goal setting and goal orientation processes following a deductive approach within the qualitative data analysis based on Zimmerman and Moylan's (2009) forethought processes. The qualitative information was triangulated with the responses from the SRLQ to answer the question raised in this chapter. Altogether, the study's research design used three instruments to establish a chain of evidence concerning the goal setting and goal orientation processes that 19 participants in two case studies employed while engaging with MOOCs during four weeks of their face-to-face language courses.

5.5 Results

5.5.1 Goal setting of community-based language learners (Case study 1)

Participants were asked to reflect on their goals in the second question of the weekly monitoring surveys (WSURV), in which they had to write down the learning goal for each week of their LMOOC-based learning. All ten participants set goals that

covered the revision of grammar topics, vocabulary learning and the mastery of language skills (mainly listening skills). Another common pattern found around goal setting was learners' preferences for specific proximal goals. Figure 5.1 indicates a preponderance of specific-short term goals' over specific long-term goals among participants.

Based on the responses from the SRLQ illustrated below, six out of ten participants reportedly set specific short-term goals rather than specific long-term goals when working with their LMOOCs. Figure 5.1 also shows that most learners claimed to have set specific short-term goals alongside realistic deadlines for learning in their LMOOCs. The element of time is crucial when setting specific and achievable learning goals. Unfortunately, there was not much evidence in the qualitative data that showed learners formulating specific and time-limited goals during their LMOOC-based learning.

Despite the lack of realistic goals observed in the qualitative data of Case study 1, learners often elaborated multiple goals as part of their LMOOC experience. Eight out of ten participants set numerous targets during the four weeks of online learning. Most of them were targeting two different aspects of language, and others even reported having three goals in one of the weeks. By way of illustration, a learner of Italian said in the third weekly survey that she wanted to "revise the perfect tense of reflexives [sic] [verbs] and broaden my vocabulary plus continue to practise my listening" (WSURV3-Irene). The variety of goals set up by community-based learners reflected the different aspects of language they dealt with while engaging with the activities and audio-visual content offered in the LMOOCs.

Regarding participants' goal orientations, they reported having goals oriented towards learning linguistic and sociocultural topics and language skills development. Almost all their goals were mastery-oriented goals aimed at revising an
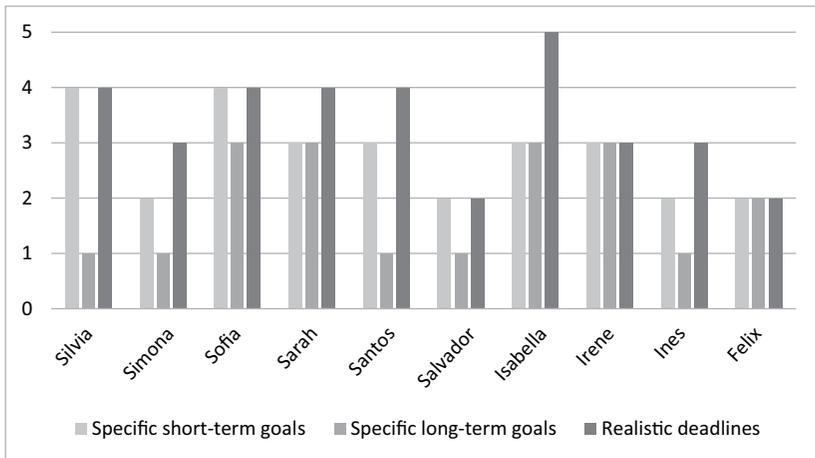

Figure 5.1 Type of goals reported by community-based learners in their LMOOCs (Likert Response 1–5).

Table 5.1 Comparison between mastery-oriented goals and performance-oriented goals set by community-based learners

Mastery-oriented goals	Performance-oriented goals
• "*Practise with tenses*" (WSURV4-Salvador)	• "*to get as many chapters finished*" (WSURV1-Silvia)
• "*to revise reflexive verbs*" (WSURV2/3-Irene)	• "*To complete the first week with FutureLearn out and about*" (WSURV1/2/3/4-Sofia)
• "*do more listening*" (WSURV2/3-Simona).	• "*To complete week 1 of the structured course*" (WSURV1/2/3/4-Sarah).
• "*I need to improve my pronunciation*" (WSURV3-Sarah)	• "*Complete module one about plans*" (WSURV1-Santos)
• "Improve my grammar" (WSURV3-Felix)	• "*spend more time [on task]*" (WSURV3-Isabella)

element of grammar, language skills improvement or learning about everyday spoken vocabulary/specific sociocultural content. Nevertheless, six out of ten participants also self-reported performance-oriented goals focused on LMOOC completion or performing well in the online course tasks, as illustrated in Table 5.1.

Learners who often reported specific performance-oriented goals appeared to set more realistic deadlines than learners who included mastery-oriented goals as part of their online learning experience. For example, Sofia and Sarah set clear goals that focused on completing the four weeks of the MOOC (Table 5.1); both learners also scored high in the third SRLQ item that measured realistic goal setting (Figure 5.1). Conversely, Salvador and Felix, who tended to set mastery-oriented goals (Table 5.1), presented a low score in the last item of that questionnaire (Figure 5.1). One of the learners' mastery-oriented goals reported in week four of their online learning, "*vocab-pronunciation. Verbs in the past tenses*" (WSURV4–Salvador), implied some work on the aspects of vocabulary, pronunciation, and grammar. However, such work remained unclear and possibly intangible, since it did not target a specific outcome to be achieved at a particular point in time. The wording of most proximal mastery-oriented goals revealed a vague idea of what learners wanted to attain within a specific time limit, questioning the realistic nature of these goals that focused on learning rather than performing well in an LMOOC.

5.5.2 Goal setting of ESP learners (Case study 2)

The nine ESP learners self-reported more proximal goals than distal ones when they engaged with specific content-based MOOCs. Most of their self-reported goals identified in their four weekly surveys had a clear focus, such as "writing a report (one page)" (WSURV4-Elton) or "understanding the deception [MOOC topic]" (WSURV3-Erik). A few learners self-reported distal goals that usually included future work beyond their MOOCs. For example, Ethan concluded by the end of week one: "I think that I should speak a lot: I have already a B2 level and it

means I could improve speaking with native speakers. I think it would be the best thing I could do" (WSURV1-Ethan). Likewise, Edwin aimed to use formal expressions "in a more proper and more conscious way in the future" (WSURV3-Edwin). The main pattern of setting clear proximal targets for learning in the MOOCs was also evident in the SRLQ responses, as indicated in Figure 5.2.

Half of the learners in Case study 2 favoured proximal goals within their online learning experience, based on the responses from the SRLQ illustrated below. Meanwhile, those learners who reported specific distal goals typically formulated targets that extended beyond the work with their MOOCs, as previously stated by Edwin and Ethan. Most learners also claimed to have realistic deadlines for their engagement with specific content-based MOOCs (Figure 5.2). Nevertheless, they did not specify time-limited goals when completing the WSURV or taking part in the INV.

Concerning goal orientations, ESP learners reported setting mastery-oriented goals that focused on language skills improvement. All nine participants set goals aimed at developing receptive and productive language skills. Six out of nine participants also deployed goals that involved learning about the content of their MOOCs. For example, participant Elsa explained that her "main aim was to understand the basics of that course…how data works and how I can use them in my job" (INV-Elsa). Another participant also stressed that "I needed to improve my English competencies, skills, but I also needed to understand what the MOOC talked about" (INV-Erik). The mastery-oriented goals for almost half of the participants were twofold: strengthening their target language for academic/professional purposes and understanding the MOOC content, which they chose based on their specific area of knowledge.
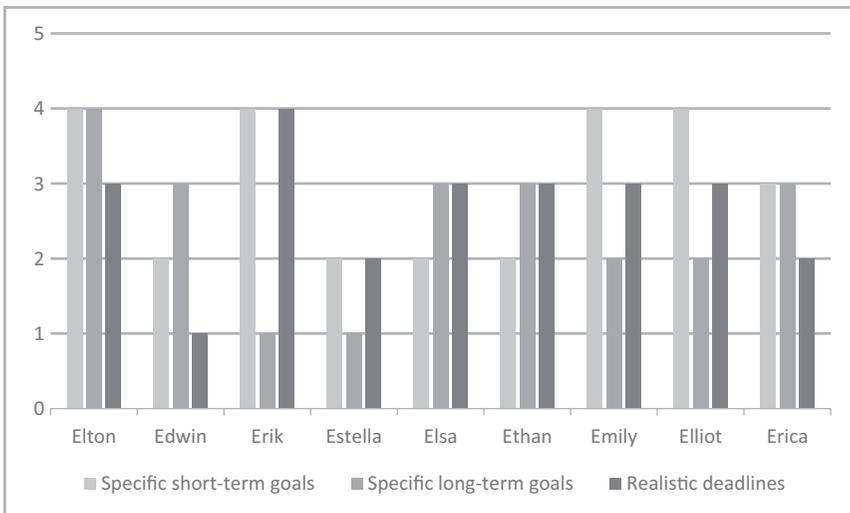

Figure 5.2 Type of goals reported by ESP learners in their MOOCs.

A few participants also set performance-oriented goals while following their MOOCs. Four out of nine learners focused on completing the online courses or outperforming their prior language performance. Elliot, for example, wanted "to test my English with a topic I am familiar with" (WSURV1–Elliot). Similarly, Elton aimed at "writing more and better letters, articles and other English texts" (WSURV2–Elton) after working on his writing skills in week one of the MOOC. Although some learners' goals oscillated between performance and mastery-oriented targets, ESP learners commented most frequently on pursuing mastery-oriented goals than performance-oriented ones in the weekly surveys and semi-structured interview responses.

5.6 Discussion and moving forward

Chapter 5 addressed the goal setting and goal orientation processes employed by 19 adult language learners in two case studies to chart their learning path in selected MOOCs. Findings have shed light on how adult learners set goals over four weeks of engagement with MOOCs to support their classroom-based language learning, including the type of goals, goal-oriented preferences, and common difficulties when setting clear targets. Most learners in both case studies reported setting more proximal goals than distal goals. They also recorded more mastery-oriented goals than performance-oriented ones in their chosen online courses. However, it was difficult for participants to specify time-limited goals when initiating their self-regulated learning in MOOCs.

Community-based language learners and ESP learners formulated more short-term goals in their LMOOCs and specific content-based MOOCs, respectively. This preference for proximal goals was arguably linked to the delivery mode of the online courses, which was described in the platforms that offered the MOOCs. There were not many instructor-paced courses available when conducting this study, so most participants selected self-paced online courses, i.e., no start or end date and less supervision by educators. "This delivery mode affects the way enrolees work in the course, fostering the establishment of short-term goals (which are not necessarily self-defined) that allow learners to persist in the MOOC" (Alonso-Mencía et al., 2020, p. 327). The number of weeks in a MOOC and the way content is delivered (whether the material is released gradually or from the beginning) affect how learners deploy different strategies to self-regulate their learning process (Ferguson et al., 2015). Hence, setting proximal goals was a self-regulatory process employed by participants to cope with the self-paced learning in selected short-term MOOCs.

All participants also preferred pursuing mastery-oriented goals over performance-oriented ones in their chosen online courses. Most learners were not planning on completing their MOOCs or obtaining certificates as an outcome of this online learning experience. They were formulating goals oriented towards revising specific aspects of the language, learning about subjects that were meaningful to them, and practising their language skills while covering the audio-visual material. In common with others (Beaven, 2013; Gimeno-Sanz, 2021), all participants found

opportunities to revise their linguistic knowledge and practise their language skills by studying different topics in the target language.

Nevertheless, participants' learning goals were not very explicit concerning the outcomes they wanted to achieve at a particular point in time. Although they claimed to have set realistic deadlines, they did not include a specific time when formulating their goals. Not all learners may find the need to set a specific goal in a MOOC, particularly if they opt for relying on "predetermined objectives, rather than learner-defined goals" (Littlejohn & Hood, 2018, p. viii). However, "goal setting produces an explicit feedback loop that requires self-evaluation on a specific time" (Zimmerman & Moylan, 2009, p. 302). Thus, this lack of realistic deadlines evidenced in both cases may become an obstacle for learners when attempting to fulfil goals focused on learning and skills development in self-paced MOOCs.

This multiple case study suits the COVID-19 era, which has led most learners into an open world learning where they are anticipated to employ effective strategies to sustain their education at a distance. The findings have indicated that language learners can engage in goal setting processes when studying beyond the classroom in an LMOOC or a specific content-based MOOC, at least within the context of this study. Participants formulated outcomes they wanted to attain while learning independently in such online courses. However, they did not include time-bound goals, which raises questions about the realistic and achievable nature of the outcomes they set for their MOOC-based learning. The online learning experience described in Chapter 5 can count as the first steps towards SRL. Yet, learners still need to overcome various obstacles, such as setting vague and unrealistic goals, to initiate their self-regulation in the face of adversity.

5.6.1 Implications for practice

It is crucial for educators and learners to identify how learners set and assess their goals when learning independently. Researchers and educators need to understand and facilitate goal-setting processes beyond the classroom, especially the self-evaluation of outcomes on a specific time. Educators can take advantage of the MOOCs' potential for independent learning to encourage learners to initiate their self-regulated learning. Clear guidelines on setting specific, realistic, measurable, and attainable goals should be incorporated into those initiatives so that learners can effectively self-regulate their learning in an open world.

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Discourse practices in MOOC discussions

A corpus linguistic approach

Shi Min Chua

6.1 Introduction

In massive open online courses (MOOCs) the discussion function allows learners to exchange information, experience and ideas with each other (Ferguson & Sharples, 2014; Poquet, Dowell, Brooks, & Dawson, 2018). The discussion has been hailed as beneficial for socio-constructive learning (Sharples & Ferguson, 2019). In a socio-constructive process, humans co-construct meaning, knowledge and the social world through social interactions with others (Vygotsky, 1978). Language is one means for such co-construction. However, limited MOOC research has investigated learners' language practices in online discussions. Instead, most studies have focused on evaluating learners' comments in the discussion, such as whether a comment showed a learner engaged in critical thinking or a comment was on-topic (Kellogg, Booth, & Oliver, 2014; Wen, Yang, & Rosé, 2014; Wise, Cui, & Vytasek, 2016). Other MOOC studies in the field of educational technology also centred on the implications for learning and technological design (Almatrafi & Johri, 2019), as also illustrated in Chapters 5, 8, and 9 (Conde Gafaro, 2022; Iniesto, McAndrew, Minocha, & Coughlan, 2022; Rizvi, Rienties, Kizilcec, & Rogaten, 2022).

As will be elaborated in the next section, the analysis of learners' comments in MOOC discussions in previous studies was mainly quantitative in nature (Kellogg et al., 2014; Wen et al., 2014; Wise et al., 2016). However, the richness of the textual data in the learners' comments was often lost in the quantification process of these analyses, such that learners' discourse practices in the socio-constructive processes were not revealed. Therefore, there is a lack of understanding of learners' discourse practices in initiating and engaging in conversations with others in the MOOC discussions. Discourse practices refer to the recurring ways a community uses language to do things in their social context – above and beyond a sentence (Herring, 2004). To fill this gap in MOOC research, I conducted a corpus linguistic analysis of MOOC discussions in my PhD to explore discourse practices that facilitated and hampered conversations among learners. In this chapter, I will introduce this methodology and summarize the main findings from my PhD to illustrate the importance of language practices in MOOC discussions.

6.2 Previous research on MOOC online discussions

To the best of my knowledge of the literature and based on the systematic review by Almatrafi & Johri (2019), most studies on MOOC discussions used a coding and counting paradigm of content analysis to analyse learners' comments either manually or automatically by machine-learning techniques. The comments typically were analysed individually, rather than discursively to understand how a conversation was co-constructed by learners. These studies categorised learners' comments − for example, whether a comment was on-topic or off-topic (Wise et al., 2016), whether a comment indicated that a learner engaged in higher order thinking or paid attention (Wang et al., 2016) or whether a comment was positive or negative (Wen et al., 2014) − rather than how a comment was written, for example, how a question or a disagreement was raised to engage with others.

In these studies, learners' textual contributions were reduced to codes for counting purposes such that their comments in the discussion could be quantified and (cor)related to other variables statistically, such as learners' learning outcome, participation pattern, or course design, as, for example, done by Rizvi et al. (2022). The coding also formed the basis for automatic recommendation of quality comments to learners, monitoring of the discussion space, and prediction of learning performance (Almatrafi & Johri, 2019; Wise et al., 2016). These studies were useful for evaluating the quality of the discussion, and might inform educators or designers for further improvement of their MOOCs.

However, equally important are the socio-constructive processes that are realised by learners' actual language and discourse practices (Vygotsky, 1978; Wegerif & Mercer, 1997; Wise & Paulus, 2016). Several researchers have argued that learners need to be aware of discourse practices that are suitable for online communications, especially for negotiation in online discussions (Herring, 2004). For example, in a small-scale online learning discussion, sharing of experience could be a way to reach agreement and affiliation in co-construction, or could be rejected by others as authoritative, depending on how learners oriented it in the ongoing discussion (Käntä & Lehtinen, 2016). In another online learning discussion, Littleton & Whitelock (2005) found that in the process of socio-constructive learning, learners did not necessarily employ reasoning but could express uncertainty instead, for example, "Just some ideas which may or may not be of help". A learner also responded to another learner's question by asking another question to give a hint to the solution rather than giving away the answer.

As shown in both studies, the way how an experience or idea was shared could impact the dynamic of the ongoing conversations as well as the social relationships among learners. These findings, although not based on MOOCs, highlight the importance of investigating the comments discursively within discussion threads as well as examining the role language plays in socio-constructive processes.

6.3 A corpus linguistic approach to MOOC discussions

To harness both the big data available from MOOC online discussions and the rich language data to explore discourse practices employed by learners, Chapter 6

introduces a mixed methodology, corpus linguistics, to MOOC research. This is also an attempt to promote linguistic perspectives and methodology in the field of education where textual data are investigated. This mixed methodology provides quantitative evidence without reducing the textual data into codes, unlike the content analysis used in previous MOOC research.

A corpus linguistic approach consists of a set of established procedures and methods, including keywords analysis, concordancing, and collocation analysis (to be introduced in the following subsections), that can be used in combination to investigate language use and patterns in large bodies of textual data (McEnery & Hardie, 2012). All these methods are based on the assumption that with a corpus of a suitable size, recurring (and rare but important) language patterns can be identified and analysed to reveal language usage, discourse practices and language users' construal of the social world and their interactions.

6.3.1 Keyword analysis

Keywords refer to words used statistically significantly more often in the corpus when compared to another corpus, thus suggesting the "aboutness" and "styles" of the corpus under investigation (Baker, 2004). A word is considered a keyword when the p-value for the log–likelihood ratio test is p-value $< .000000000001$ when comparing to another corpus (Flowerdew, 2008). The keywords found can then be subjected to more in–depth discourse analysis to understand how the keywords are used in discourse practices. In short, keyword analysis is a corpus-driven, or data-driven approach that starts from quantitative analysis, then moves onto qualitative analysis for interpretation.

6.3.2 Concordancing

Concordance lines show the word of interest in their co-text, i.e., a span of characters or words, in a vertical format, as shown in Figure 6.1 which is a display from corpus tool Antconc (Anthony, 2017). The usage and senses of the word of interest across the corpus could thus be analysed qualitatively (Sinclair, 2003). It can be considered as the main method for qualitative analysis in corpus linguistics (McEnery & Hardie, 2012). The concordance lines facilitate the observation of recurrent language patterns around the keyword or word of interest. It is based on the assumption that the meaning or social function of a word is contributed by the other words regularly co-occurring with it.

6.3.3 Collocation analysis

Similar to concordancing, collocation analysis is used to examine recurrent language patterns. Collocates refer to words co-occurring often with the word of interest or keyword, typically within a five-word window preceding or following the word. An effect size measure, mutual information 3 (MI^3) is used to indicate how much the observed co-occurrence frequency of the two words exceed expected frequency (McEnery & Hardie, 2012).

Vitally important.   An example of how it went wrong........ A few years ago a company (I had
the ability to " "sense" " were the students goes wrong (a good teacher can diagnose what the problem
others result, the time to get there looks wrong. A non-NASA story, sources from NASA: On
my own spoken corpus. What am I doing wrong? " A very powerfull talk, but I do wish
someone who refuses to believe that they are wrong about something, that is human nature. I am
round. please, let me know if I am wrong about this. "from pandas.io.wb import download
lot and I started to remember all the wrong actions I took in the classroom. I was
do not realise when they have spelled them wrong.Add in short-term memory issues and spelling |
4 bit windows. I assume there is something simple wrong All done and same answer, good-o! Did
can't be correct. What have i done wrong? All help gratefully received! Thanks" "I may be
s that grammatically make sense, but seem somehow wrong all the same. i.e. they are not'
as Lapetus or have I been getting it wrong all these years? I notice that one of
the pages or their overwhelming content. Am I wrong? Although the theory was all wrong the operation
and reversals of number e.g., withdrawing the wrong amount of funds from an ABM. Tom might
or fibers. I believe the " "diet" " approach is wrong. An approach like " "what nutrients we should tak
be so useful in that context. Am I wrong? 56 and a half day transit + fuel. 9 days on
stand health messages and are health literate are wrong, and are often confused by conflicting "evidence"
amount of incredibly difficult reading texts, am I wrong? And as I work in a franchising language
would like to understand what I'm doing wrong and can fix it in a healthy way"
can give warnings where things may be going wrong and give people the opportunity to step in
was childbirth (not infectious disease). Is this wrong? and how would we know? Also: no, no
to change so I didn't get them wrong and I had to hold down my notebook
right but a right as another hence wrong and if you dock points the answers should

Figure 6.1 Concordance lines of *wrong* in my corpus.

These three procedures reveal repeated patterns of language usage in the cor-
pus, thus facilitating the observation of discourse practices that are common in
the language community. Both concordance reading and collocates can be used
to further investigate how a keyword is used in a corpus and realises discourse
practices.

6.3.4 *Quantitative and qualitative analysis in corpus linguistics*

A corpus analysis typically involves both quantitative analysis and qualitative analy-
sis (Biber, Johansson, Leech, Conrad, & Finegan, 1999; McEnery & Hardie, 2012).
Quantitative analysis is conducted on the frequency data, i.e., the number of occur-
rences of words or linguistic patterns in the corpus, typically achieved by keyword
analysis, frequency count, and collocation analysis. The qualitative analysis is con-
ducted on the co-text or context where a word occurs in the corpus, typically
achieved by concordancing (McEnery & Hardie, 2012). Both analyses are usually
conducted in synergy to examine the form and function of language use (Biber
et al., 1999). Forms, that is words, or collocates, are the basis of quantitative analysis,
whereas function is examined by the qualitative analysis. Usually, some kind of
discourse analysis is conducted for the qualitative analysis alongside concordancing
in corpus analysis (Baker, 2004).

6.4 Previous corpus analysis on MOOCs

A brief corpus analysis was conducted on a MOOC "How to read your boss" by a
corpus linguist (Collins, 2019). Collins employed keyword analysis, concordancing
and collocation analysis to investigate learners' use of a technical term taught in the

MOOC, *face*, in their comments to explore evidence of their learning. In his corpus, *face* was found a keyword that was used significantly more often when compared with British National Corpus of written English (BNC, Leech, Rayson, & Wilson, 2001). However, it was used mainly when learners responded to the discussion prompt in the course materials, "Is 'personal face' or 'social identity face' more appropriate for your workplace?". This was evidenced by a collocate of *face*, *social identity*, which also appeared in the discussion prompt. Collins (2019) found that this technical term was seldom used in other contexts, suggesting that learners might not have acquired the concept of the term to generalise it to other contexts. Nonetheless, Collins' concordancing of the keyword *face* showed that learners might engage in the socio-constructive process of learning in MOOC discussions. For example, learners explicitly invited others "Would somebody explain the difference between Personal Face and Social Face?" (p. 142) or expressed their uncertainty "I don't feel I fully understand the difference between personal and social face" (p. 142). However, he did not further explore this aspect of learners' discourse.

Collins (2019) also investigated keywords in posts and replies to explore interactivity in the discussions, by comparing each type of comments to BNC. Keywords found in the posts included *identity*, *boss*, *personal*, *I*, *am* whereas keywords found in the replies included *hi*, *I agree*, *you*, *I*, *am*. However, he did not explore discourse practices realised by these keywords. That is, he stopped at the quantitative analysis of keyword analysis. Collins (2019) himself suggested more in-depth discourse analysis was needed to understand learners' conversations in MOOC discussions.

Although Collins' study focused only on one concept taught in the MOOC, he successfully showed that, besides the often-used coding and counting paradigm, a corpus linguistic approach could reveal textual evidence of users' learning and interactions in MOOCs. He showed that educators could use the corpus methods to examine learners' learning in the MOOCs they teach. He also showed a preliminary finding that discourse in posts and replies were different, although how learners employed the discourse to engage in conversations remained unexplored.

6.5 Present study: a large-scale corpus analysis of MOOC discussions

Building on Collins' study (2019), I conducted a large-scale corpus analysis of MOOC discussions in my PhD to explore discourse practices that facilitate or hinder socio-constructive processes of learning. My corpus consisted of 11–million-word learners' contributions (202,787 comments) in 12 FutureLearn MOOCs. For information about FutureLearn, the compilation of the corpus and ethical considerations of analysing learners' comments, readers are referred to my PhD thesis (Chua, 2020).

In my PhD, I asked the question of how learners initiate and engage with each other in MOOC discussions. To answer this question, I conducted two keyword analyses: (1) comparing posts that receive replies, i.e., initiating posts that initiate a conversation, to those that do not, i.e., independent posts which are not part of a conversation; (2) comparing replies to these two types of posts. The first keyword

analysis aimed to reveal discourse practices that are more likely to initiate a conversation, while the second keyword analysis to reveal how learners respond and engage with others. The corpus analysis thus provided insights to the beginning and sustaining of the socio-constructive process among learners.

The analysis found 69 keywords of initiating posts (initiating keywords), 77 keywords of independent posts (independent keywords) and 57 keywords of replies (reply keywords). I then conducted concordancing and collocation analysis of each type of keywords to examine the discourse practices realised by these keywords. It is not possible to elaborate and present statistics for every single keyword in Chapter 6, so in the subsequent sections, only selected findings are summarized, with keywords italicised.

6.6 Findings

6.6.1 Discourse practices in initiating posts

Different discourse practices were employed in initiating posts and independent posts. Firstly, compared to independent posts, learners tended to use more modals (*might, would, could*) and hedges (*perhaps, seems, sort of*) to soften their claim (e.g., This *could perhaps* mean that British fiction, in comparison with American fiction, uses more dialogue?) in initiating posts. This softening was also expressed by indicating their uncertainty (I *wonder*, I am *wondering*), not knowing (I do*n't* know), possible mistake (I might be *wrong*, am I *missing* something?) or *if*-conditionals. This softening or qualification of one's claim ensured that their posts did not come off as bare assertions or authoritative that did not allow alternative voices (Littleton & Whitelock, 2005; Martin & White, 2005). Rather, these initiating posts framed in tentativeness created room for others to pitch in, thereby increasing the chance of receiving replies and beginning a socio-constructive process with others.

Secondly, in the initiating posts, although learners did not know who was going to reply them, they established a dialogue with potential conversational partners with *anybody* and *anyone* (e.g., does *anybody* have a good suggestion; *Anyone* heard of Hildegard von Bingen's contributions to plantlore?). This framing indicated their invitation to any learners in the MOOC to join their conversations. Besides, these two initiating keywords were also used to seek shared experience or problems (e.g., *Anybody* else not counting calories?; *Anyone* ever had HAD to use the old fashioned earth toilet). This framing suggests that learners co-constructed their experience in the discussions. Additionally, learners addressed other users with *anyone* and *anybody*, instead of addressing only facilitators, suggesting that learners were aware of the socio-constructive learning function of MOOCs, i.e., learning via conversation with each other, instead of an educator–centred transmission model (Sharples & Ferguson, 2019).

Thirdly, meta-language, that is language used to explicitly refer to learning or discussion (*article, question, example*) were also used more frequently in initiating posts. Using these words in their posts to highlight what they referred to (e.g., *Question*: If climate change is; That was quite hard for me to comprehend the

article; A fine *example* can be found) provided a concrete common ground for others to reply to.

In short, discourse practices that indicated tentativeness addressed potential conversation partners, referred explicitly to a common ground seemed to increase the chance of receiving replies and initiating a conversation. The discourse practices facilitated socio-constructive learning by welcoming alternative voices or shared experiences pitched by others, and explicitly referring to issues to be discussed.

6.6.2 Discourse practices in independent posts

Learners used fewer initiating keywords and the discourse practices explained above in the independent posts. This might explain why independent posts did not receive replies. In contrast to addressing other learners, in independent posts, learners engaged in self-references (*I, my, our*) and expressed appreciation (e.g., *Excellent* range of resources, *thanks!*). Instead of stating their uncertainty, learners tended to express their learning goals (e.g., I'm *really looking forward* to learn) or outcomes (e.g., I *enjoyed* this *course* and *definitely learned* a *lot*). These expressions of self-references, appreciation and learning goals and outcomes could be prompted by the learning activities or content at the start (e.g., Describe your interest in … and … tell us what you hope to get from this course) and at the end of each MOOC (e.g., What have you found to be good, useful or interesting during this course?). Since learners were responding to the prompts, the posts might not be written to engage with others. Learners' own reflections with the learning activities and content also played an important role in learning (Ferguson & Sharples, 2014).

Learners also voiced their opinions in independent posts, as evidenced by the independent keywords *think* and *agree* (e.g., *I think we should* be open to the possibility; *I agree* … so it enables…). However, nobody joined the conversations to exchange opinions, so the socio-constructive process of engaging with each other did not happen. There were times that learners merely expressed their agreement without further elaboration. Although these agreements indicated their presence in the discussions and created a positive environment, the lack of additional substance in their independent posts might explain why nobody replied to them.

More importantly, most of the independent posts with phrases *I think* and *I agree* seemed to be in response to learning activities with prompts "Do you think" and "Do you agree". The framing of the prompts might have primed learners to self-reference and respond to the questions on the page, thus very few learners responded to each other to co-construct their ideas. Admittedly, it is fairly common that internet users respond to content on the page more often than engaging with each other (Herring, 2013). Therefore, the occurrence of independent posts in the discussion was not solely due to the framing of the learning activities.

In short, the discourse practices in the independent posts were mainly appreciation of the MOOC, reflection of learning journey, or voicing of opinions, all of which seemed to be addressed towards the prompts of the learning activities. This might explain why these posts did not receive any reply since these discourse practices did not create room for others to pitch in.

6.6.3 Discourse practices in replies

91% of the initiating posts received between one and four replies, suggesting that most conversations among learners in the discussions were relatively short-lived, and might not be conducive for socio-constructive processes. Most replies were expressions of agreement (*yes, agree, agreed, true, right, exactly, absolutely, totally, indeed*) and expression of appreciation (*thanks, thank*). The expression of agreement, especially in short replies, might not generate a conversation. However, it was a way for learners to indicate their engagement with the posts, as shown in the short thread below. The expression of agreement could be considered a socio-constructive process of shared experienced.

> INITIATING POST: It's interesting that the issues Dyslexic students may extend into aural aspects of language…… I like the idea of focusing on receptive subskills…… I think we often make the mistake of focusing on product over process in learning, and it seems to me that for Dyslexic students, a focus on process is absolutely essential.

REPLY 1: *Yes* – I'm guilty of this.
REPLY 2: I would strongly *agree* with that!

Although the reply keyword *agree* and *agreed* were mainly used for expressing agreement, the concordance reading of *agree* revealed that users employed the phrase *agree to disagree/differ* in replies, especially in long discussion threads. The phrase was used to end their discussions when they could not reach agreement after voicing their disagreement. In these conversations, although they did not manage to co-construct a final verdict, they were at least exposed to different views, suggesting socio-constructive learning.

Another discourse practice found in replies was indication of tentativeness, similar to the discourse practices in initiating posts. However, it was realised with hedges *maybe* and *probably*, which are used more often in oral language, suggesting the dialogic nature of replies (Biber et al., 1999). The function of these two hedges in a socio-constructive process is best illustrated in one discussion where a few learners employed these two hedges to provide advices to a learner who posted about difficulties in providing their stepchildren a healthy diet. Two of the replies were shown here. The numbering of the replies indicated its order within the discussion thread.

REPLY 3: …… The idea of a family meal in your case sounds pretty hellish but, *maybe*, there are other things going on in their minds and it is not just food?……
REPLY 9: It must be soul-destroying for you, but you are *probably* wise not to let meals become more of a battleground……

In these two replies, the hedges made the advice-giving less directive and authoritative. This was evidenced by other replies by learners contributing these

two replies, "Hope that doesn't sound awfully patronising!" "sorry if it sounds simplistic". The learner who asked for advice also took on the advice by saying "Thank you everybody for your comments, I am agreeing and……". The hedges might have created room for the learner to respond to the advice and explain their situations more. The advice-giving and learner's further explanation in response to the advice suggested that learners engaged in a socio-constructive process.

Another discourse practice found in the replies was meta-language referring to each other's comments (*reply, posting, comment, post, point, said, say, you, your*), suggesting that learners engaged with others' comments. The meta-language could be a double-edged sword. On one hand, it was used to clarify each other's comments, and facilitate resolution of misunderstanding, as shown in the following exchange between two learners.

REPLY 4: I did not *say* it is a waste but it seems to be a waste if you dispose of it without taking any benefits from it…..

REPLY 5: sorry, I thought you *said* supplements with added protein are clearly a money making scheme. It does make you think though, which is the point of the course…..

On the other hand, using meta-language to question others' comments without acknowledging their clarification could lead to stalemate in a discussion, hindering the socio-constructive process. The exchange below illustrates this situation, which came from a discussion thread where these two learners repeatedly criticized each other's comments.

REPLY 4: …… In another *post*, about apple cider vinegar, *you* specifically *say* 'Two words – Take It.' In this post *you* tell us 'trust me, it works'. That sounds to me as if *you* are recommending it to anyone who reads that *comment*……

REPLY 5: ……It seems as though *you* consider my phrasing to have been flippant but *you* don't have to *post* long, in-depth comments on everything……

In short, learners' discourse in replies indicated their engagement with others' comments, although most discussions were short-lived. Expressions of agreement and appreciations created a positive space in the discussions, while framing responses with tentativeness facilitated co-constructions of solutions. Meta-language seemed to be useful to clarify misunderstanding for socio-constructive learning, but overusing it could lead to stalemate.

It is worth noting that a keyword analysis comparing replies in long conversations (more than five replies) versus short conversations (fewer than five replies) found no keywords in long conversations, suggesting either that there might not be any word or expression that could increase the chance of sustaining a thread, or that discourse practices sustaining a thread were not realized by particular keywords or expressions. Therefore, an in-depth discourse analysis was conducted to further examine long threads in my PhD, which will be presented in future publications.

6.6.4 Unexpected reply keyword: link

As mentioned earlier, keyword analysis is a data-driven approach that could unravel unexpected observations in the data. One such observation was the reply keyword, *link*, which was used by learners to refer to URLs. Based on concordance reading and collocation analysis, learners typically appreciated others posting *link(s)* in the discussions (see Figure 6.2). However, very seldom did the URLs posted generate a discussion, and learners sometimes did not write much about the URLs posted, as shown below.

> Eat it. Much better for you than seed oils and polyunsaturates. https://www.ncbi.nlm.nih.gov/pubmed/24723079

There were a few rare cases where learners discussed extensively about URLs posted, suggesting a socio-constructive process. This happened when the learners held on opposing views and each posted URLs to support their own views. Although it is encouraging that learners critiqued each other's posted URLs, they seldom discussed the content linked to the URLs but the credentials of the authors. Most of the time, they remained unconvinced by each other's posted URLs and arguments. Learners may need to be prompted to move beyond the URL itself but to discuss the content linked to the URL to facilitate the socio-constructive process.

6.7 Discussion and moving forward

MOOC discussion is a space where learners engage with each other to exchange information and ideas. Commenting in the online discussions differ from oral or written language, such that learners need to be equipped with language skills suitable for communicating and learning in this new medium (Herring, 2013; Littleton & Whitelock, 2005). However, previous MOOC research has not yet

only managed to find her interview in Guardian. Thanks Michele, for the link to exercises on concordances.
nts and research funds. Very interesting Julian, thanks for that link @Carole Pope. Hi Carole,
        the link. Thanks for the link! Very helpful! "Thanks for the link! When I live on Mars
aters in the maria adn craters within craters. " Thanks for the stellarium link :) "Do you have a
eiYzRfd2taTFplQ0U/BE06_AntConc_compat.txt" Thanks for he link Simon. The by-products of
        that comes up Three days behind ya, Andy! Thanks for this link. Are these telescopes in orbit
y+23%2C+2008 very useful link Thanks for the link Phil, very interesting. Many thanks for the link
        which confirm that the view noted in the link has been superceded.   " Many thanks David for your
                I think that they will be to you." Thanks for the MMM link, Carol. I'm already
to funding the wars etc that Mike mentions." Thanks Mark, great link shows just how bad 'common
        have a look at your account of spelling: thanks for sharing the link. "Thank you for the
                't work Jonathan, that is such a useful link! Thank you - Thanks for your comments and the
soil horizon photo with helpful measurements. Thanks for the link to Soil Science page. (I'

Figure 6.2 Concordance lines of *link* in my corpus.

paid attention to the language use in the discussion. By conducting a corpus analysis of 12 MOOC Futurelearn courses, Chapter 6 successfully unveiled useful discourse practices that learners can employ to initiate and engage in conversations with others in MOOC discussions. The analysis showed that there were indeed differences between initiating posts that receive replies, independent posts that do not receive replies, and replies.

Chapter 6 illustrated that a corpus linguistic approach is useful for examining big language data available from MOOC discussions while enabling discourse analysis of actual language usage at the same time. This mixed methodology revealed both the general patterns and specific discourse practices in the discussion. The quantitative component of keyword analysis or collocation analysis pointed to a specific keyword or collocate which discourse functions were examined qualitatively by concordancing.

More importantly, this integration of quantitative and qualitative analysis can guard against the possible presumption of the researchers regarding the discourse functions of certain words. For example, the keyword *wrong* did not necessarily carry a negative meaning but was used typically by learners to express their uncertainty, whereas the keyword *link* was not used to establish logical reasoning, but to refer to a URL posted. Both keywords *wrong* and *link* might be coded otherwise in coding and counting paradigm in other MOOC research, which might prevent us from understanding learners' actual discourse. Furthermore, current machine-learning techniques used in MOOC research (e.g., Wise et al., 2016) and discussed in Chapter 13 (Hillaire, Rienties, Fenton-O'Creevy, Zdrahal, & Tempelaar, 2022) typically discard function words, such as modals, grammatical words, and pronouns which have been well-established as linguistic resources for social relationships (Biber et al., 1999). As shown in Chapter 6, some modals were used to initiate conversions with others. This shows that a corpus linguistic approach may have much to offer for exploration of discourse practices for socio-constructive processes.

6.7.1 Implications for practice

Based on the findings in Chapter 6, several writing tips for online discussions can be provided for learners and facilitators:

1 Do not make sweeping generalizations and bare assertions. Rather, use modals, hedges, *if*-conditionals to soften or qualify your claims, such that others' alternative views are not rejected.
2 Express uncertainty and tentativeness in your claims, such that others will be more willing to fill in the gap.
3 Be explicit in referring to the issue or topic you are writing about, such that a common ground can be established.
4 Use oral language to address potential audience, and seek others who share similar experiences or problems.
5 Recognize others' viewpoints and acknowledge what others have written.

6   You can agree to disagree, rather than having a "winner" in a debate.
7   It is ok to ask for clarification from others regarding their comments, but do not repeatedly criticize their ways of posting.
8   Write about the relevance of the URLs to the current discussions.

The findings in Chapter 6 could also inform design of the discussion prompts. Although the prompts "Do you think" and "Do you agree" typically introduce a question that requires learners to voice their opinions, this framing inevitably prompt learners to post rather than replying to others. Perhaps additional prompts such as "How do you find others' view in relation to yours?" can be added. At the same time, the number of questions in the prompts can be reduced, such that learners have a focused common ground to engage with each other. Nonetheless, the effectiveness of this suggestion awaits to be examined. It is also worth reiterating that online users tend to post in response to content on the page than respond to others. Therefore, it is unavoidable learners do not necessarily reply to others but the prompts.

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Chapter 7

Simplification of open educational resources in English

Its effect on text processing of English learners

Irina Rets, Ursula Stickler, Tim Coughlan and Lluisa Astruc

7.1 Introduction

Open Educational Resources (OERs) are an increasingly important part of the contemporary provision of education. Discussions about OERs are generating substantial interest regarding how these resources can reduce educational inequality, and decrease the cost of education, particularly in developing countries (e.g., Cobo, 2013). At the same time, a number of concerns have been raised about OERs failing to widen access to education (Casserly & DeBarger, 2020; Papathoma et al., 2020). Despite the aspirations to fundamentally open up education, OERs are still mainly used by well-educated learners residing in the Global North, and most OERs are offered in English (Farrow, de los Arcos, Pitt, & Weller, 2015).

A recent study by Rets, Coughlan, Stickler and Astruc (2020), which examined text complexity of 200 OER reading materials across different educational levels and subject categories from two major OER platforms, provided some empirical evidence supporting these concerns. The study showed that more than 86% of the examined OERs require an advanced level of English language proficiency. Thus, there might be a gap between many potential OER learners' language abilities and OERs that are expected to enable inclusive education. As a number of studies showed that one size does not fit all, particularly in online education, which gives immense opportunities for a personalised learning (e.g., Rets, Rienties & Lewis, 2020; Rienties, Lewis, O'Dowd, Rets & Rogaten, 2020), it is important to evaluate solutions that can make OERs more accessible globally.

Despite the scepticism of open education to help learners from non-English-speaking backgrounds, there is a lack of OER studies that conceptualise and test solutions for improving the linguistic accessibility of OERs to this global audience. Some solutions described in these OER studies focus on how to customise OERs to specific national contexts, such as translating OERs into local languages. Yet, such approaches do not generalise to a wider learning context (Casserly & DeBarger, 2020).

One solution that can potentially increase the linguistic accessibility of OERs is text simplification. Text simplification is the process of modifying authentic texts, or texts written for native speakers of a given language, with the intent to reduce the language level of these texts and increase their accessibility for the non-native

speakers of this language (Tickoo, 1993). Previous studies on text simplification showed that simplified materials can enhance the learner's comprehension of the text, increase learner autonomy, and provide more opportunities for a learning success scenario (e.g., Crossley & McNamara, 2016).

At the same time, several questions arise from the existing text simplification research. First, empirical evidence in previous text simplification studies has been obtained using traditional methods of reading research, such as comprehension tests, which might limit the breadth and depth of the analysis. Since reading is a cognitive activity that involves lower- and higher-level processes, there is a need to also explore the "processes of reading" rather than only investigate the "product of reading", which is text comprehension (e.g., Brunfaut & McCray, 2015). Secondly, no previous research on text simplification has been conducted in the OER context, despite the calls for more accessible OERs. With this in mind, the primary goal of this chapter was to obtain emerging evidence on the effect of OER text simplification on text processing of non-native English speakers (NNES). This research primarily used eye-tracking stimulated recall methodology and was underpinned by Khalifa & Weir's model of reading (2009), which are described next.

7.2 Eye-tracking stimulated recalls to investigate text processing

An increasing number of studies investigate text processing through the use of eye-tracking (Conklin, Pellicer-Sánchez & Carrol, 2018). In the field of reading research, eye-tracking is defined as the real-time registration of an individual's eye movements, typically as they read the information on a computer screen with an eye-tracking technology integrated or attached to it (Conklin et al., 2018). Eye-tracking is also used as a stimulated recall interview technique in reading research, as part of which the recorded eye movements of the reader are played back to them after the reading task in order to stimulate the thoughts they were having during reading (e.g., Brunfaut & McCray, 2015).

Conceptualisations of processing levels vary depending on the focus of the underpinning reading theory. This research was mainly informed by Khalifa & Weir's model of reading (2009). This model was particularly relevant for this research due to its componential approach to researching text processing, which makes the model amenable to transformation into a research instrument to be used for data analysis and data coding purposes. The model comprises a hierarchical system of eight distinct cognitive processes, which are thought to tap into different levels of processing complexity and which by working together result in text comprehension. These comprise the following:

- so-called lower-level processes – word recognition, lexical access, syntactic parsing, and establishing propositional meaning;
- higher-level processes – inferencing, building a mental model and creating a text level or intertextual representation.

Amongst the studies that explored text processing of NNES and were both informed by this model and used it as a coding framework for qualitative data analysis is Brunfaut and McCray's work (2015). The study used eye-tracking stimulated recall interview data to describe the kind of text processing participants were engaged in during reading in language test conditions. The study showed that almost the entire range of cognitive processes, as specified by Khalifa and Weir (2009) (except for intertextual representation), was used by participants while completing the test reading component. This suggested that the test quite comprehensively tapped into the construct of reading. Furthermore, the study found some processing trends associated with participants' language proficiency, such as relatively more frequent use of syntactic parsing and paragraph-level representations, but less frequent use of lexical access processing by more proficient participants.

Chapter 7 aims to pilot a potential solution for increasing the linguistic accessibility of OERs to NNES by eye-tracking stimulated recall interviews. Underpinned by Khalifa and Weir's model of reading (2009) this research allowed a comparison between the types of processing strategies verbalised by participants across the two text conditions – simplified OERs and authentic (unmodified) OERs. As such, the research question of this chapter was as follows: What is the effect of text simplification on text processing, as evidenced in the frequency of use of cognitive processing strategies by NNES in eye-tracking stimulated recall interviews?

7.3 Materials and methods

7.3.1 Participants

Our aim was to recruit a sample that would reflect the diversity of the population of OER learners. Since OERs are developed as universally available educational resources (Cobo, 2013), OER learners constitute a diverse audience of learners regarding their educational background, age, and location. As the overall aim of this chapter was to explore how lower-level proficiency NNES respond to OER text simplification, only participants' language proficiency was controlled during sampling.

Twelve adult NNES took part in this research on a voluntary basis. Due to calibration problems and common problems with eye-tracking data quality (Catrysse, Gijbels & Donche, 2018), only data of nine participants (M_{age} = 37.6, SD = 5.41) were available for the analysis. All participants were female, which was a reflection of the population from which they were recruited and which was a predominantly female group. All participants were recruited from the same class, an intermediate (B1) English language course, at a local adult community learning centre in the UK. Their language level was determined by this education centre through the entrance language examination and was benchmarked against the Common European Framework of Reference for Languages (CEFR) (Council of Europe, 2001). In terms of participants' educational background, most participants were university graduates (n = 6), n = 2 had vocational degrees, n = 1 had an A-level qualification. Participants' language backgrounds varied to reflect the diversity of the OER learner population generally.

7.3.2 Texts

Two OER texts in the domain of natural sciences were selected from the OpenLearn (2020) platform: Text 1 (160 words, two paragraphs) was selected from the OER course "Why sustainable energy matters", and Text 2 (145 words, one paragraph) – from the OER course "Galaxies, stars and planets". Both selected texts were part of the first section of introductory courses; the courses required no prior educational background. To control for the learning effect in each reading, the selected texts represented different topics, but were within a largely similar topic domain. As there is no single approach to simplifying texts, text simplification in this research was performed in line with the text complexity categories revealed in the earlier works of the first author (Rets, Coughlan, et al., 2020; Rets & Rogaten, 2021). The text simplification strategies used in this chapter are presented in Table 7.1.

The final version of simplified Text 1 contained 164 words, two paragraphs; simplified Text 2 contained 147 words, one paragraph. Thus, a total of four texts (two original texts and two simplified versions of these texts) were used. For further details of the formatting of the text, and the technical characteristics of the eye-tracking equipment, please, see Rets (2021, pp. 128–129).

7.3.3 Procedure

The session started with participants signing a consent form, completing a participant background questionnaire, and receiving oral instructions for their reading task. It was explained to participants that in this research their text comprehension would not be tested. However, since reading is a purpose-driven process, and in line with Catrysse et al. (2018), they were asked to read the texts as if they were taking the final language examination at their language learning centre. Reading was self-paced, and participants were asked to indicate they finished reading each

Table 7.1 Strategies used to simplify OERs

Text simplification strategy	Description of the strategy
Sentence length	Reduce the average number of words per sentence
Word repetition	Increase the proportion of repeated words in the text
Word length	Reduce the average number of syllables per word
Noun elements per sentence	Reduce the average number of noun elements per sentence
Amount of elementary and advanced lexis	Decrease the proportion of advanced lexis in terms of CEFR
Word frequency	Increase the proportion of commonly used lexis
Logical connectives	Increase the proportion of logical connectives between/within sentences

text by pressing the escape button on the keyboard. After receiving the task instructions, a technical eye-tracking calibration test was conducted. This was followed by participants reading from the computer screen, while their eye movements were recorded. The texts were presented one at a time on the screen. Each participant read two texts: they first read either an authentic or a simplified OER, on one of the two topics outlined in Section 7.3.2.

The reading of each text was immediately followed by a stimulated recall interview in English on participants' cognitive processes during reading. The interviews were conducted using the gaze plot videos produced by the eye-tracking software. Before each interview, each gaze plot video was visually inspected to check the eye-tracking data quality. Eye-tracking data from three participants had a drift, and stimulated recalls were not conducted with these participants.

In the gaze plot videos with the remaining nine participants, a moving red dot represented the point of fixation and the size of the dot was an indication of how long a fixation lasted. The replay was slowed down in order to give participants time to verbalise what they were thinking about during reading. The replay was paused after each fixation and a look–back (the times each participant looked back in the text). The research protocol with the interview script used in this research included such questions as:

Here you fixated a lot / you are going back in the text.
Why, do you think, you fixated on / looked back at this element in the text?
What were you doing / thinking about?

The stimulated recall interviews were recorded using a video camera to capture both the eye movement replay and participants' verbalisations. The entire session with each participant lasted approximately 90 min. The visualisation of the research procedure is presented in Figure 7.1.
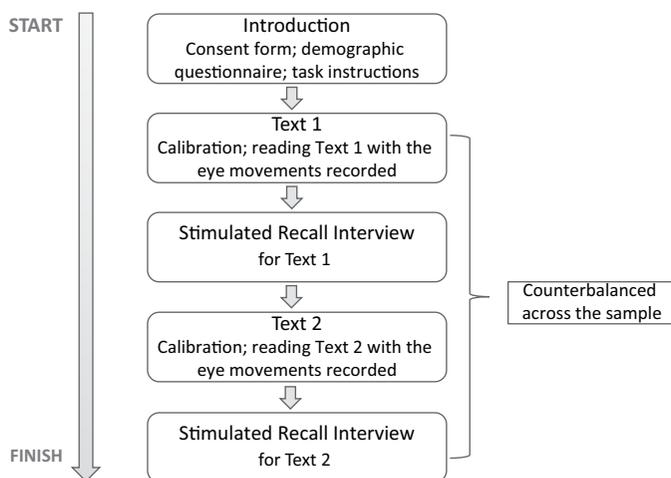
Figure 7.1 Visualisation of the data collection procedure.

7.3.4 Data analysis

Our research question was concerned with the effect of OER text simplification on text processing of NNES using the qualitative evidence from the eye-tracking stimulated recalls. Data analysed were comprised of 18 stimulated recall interview sessions ($n = 9$ with participants reflecting on their reading of simplified OER texts, and $n = 9$ – on their reading of the authentic texts). All 18 interview sessions were transcribed manually from the videotapes. The data were then manually coded in the qualitative analysis software package NVivo11, using the content analysis approach, as outlined by Neuendorf (2016). The aim was to analyse and code participants' thought processes during each eye fixation and look-back in the authentic and simplified texts they verbalised during the stimulated recalls. The average length of the transcribed interviews was 4000 words.

In the first coding cycle deductive coding was employed, using Khalifa and Weir's (2009) model of cognitive processing in reading as the a priori coding scheme. The last level of the original model – creating an intertextual representation – was removed from the coding scheme as participants read and reported on only one text at a time. In the second coding cycle inductive coding was employed to identify new processing strategies specific to the context of this research, which might not be reflected in the model of Khalifa and Weir's (2009), since their model was primarily used for test validation. Three additional codes were arrived at during the inductive coding process. In line with Neuendorf (2016), two inter-rater reliability sessions were conducted to finalise the coding scheme. The percent agreement after the first inter-rater reliability session was 75%. Having revised the coding scheme, paying particular attention to the category descriptions, the second inter-rater reliability session was conducted with a different independent rater. The final coding agreement with the third rater was 90%. Altogether, 80 codes were identified, which were then assigned to one of the ten cognitive processing strategies featured in the final version of the coding scheme. The final coding scheme used in this research with example quotes for each category is presented in Table 7.2.

7.4 Results

7.4.1 Cognitive processing strategy use across the sample

The first two strategies that concerned lower-level processing, namely word recognition and lexical access, were featured in participants' verbalisations when participants gave an account as to why they focused on a particular word in the text. Such accounts were mostly linked to participants experiencing confusion or difficulty in understanding the meaning of single words they encountered. Word recognition strategy seemed to be in use when participants tried to say the words out loud to themselves that they did not immediately recognise during reading.

> Participant 8: I don't think I've seen the word "current" before. I wasn't sure how to pronounce it. Usually pronouncing the word to myself helps me identify what kind of word this is and keep this word in my mind during reading.

Table 7.2 Final version of the coding scheme used in the study with example
quotes

Level of processing	Category	Example quote
Lower level	word recognition	"When I saw 'encompasses', I tried to pronounce it properly".
	lexical access	"Nevertheless…I was thinking to myself, is it 'unless' or something?"
	syntactic parsing	"I didn't know the previous word, that's why I slowed down".
	establishing propositional meaning	"I think I didn't understand this at all: replicated? On Earth? In Laboratories? Aren't we talking about the Universe?"
	emotional resonance	"Thousands", "billions" – "Oh, that's a lot of stars, I thought to myself".
	mother tongue interference	"1970s" – "I said the year to myself in my language and then I realised I need to speak to myself in English!"
	vocabulary and grammar learning	"The Universe" – "we just learnt when to use 'the' in our English lesson yesterday, and I wanted to see how it is used in this context".
Higher level	inferencing	"When I saw the word 'atom' – I remembered a line from my physics book in high school: 'as small as an atom'".
	building a mental model	"When I was nearly to the end of the text, I tried to understand everything before I finish the text".
	creating text level representation	"Having finished reading the text, I reread the title – 'Where do we get our energy from?' 'We' – I established the reference with 'we as humans', and then I reread the first sentence and the last two sentences of the text to remember its key points".

The evidence that participants used lower-level processing strategies when struggling with the meaning of single words in the text was particularly salient when analysing the lexical access processing strategy. Lexical access was featured in participants' verbalisations when they reflected on the reasons for their long fixations on certain words in the text, talked about not knowing the meaning of those words, and trying to compare those words in their mind with the words they already knew that looked similar:

Participant 3: I confused the word "scarce" with "scary". I think I looked at this word longer because I don't know the meaning of this word.

The other two strategies that constituted lower-level processing – syntactic parsing and establishing propositional meaning – were also used in the instances when participants could not understand the meaning of single words in the text. However, these strategies were used beyond fixating on only those single words and concerned fixating on larger lexical chunks in the sentence, such as word collocations and clauses. Both strategies were mostly associated with look-backs in the sentence. Syntactic parsing was used when participants tried to associate the meaning of a single word by looking back at a few surrounding words because they formed a conceptual unit together. Establishing propositional meaning was reported to be used when participants were looking back at larger context within a single sentence.

Participant 4: Maybe I focused on the word "reserves" and then looked back at a couple of preceding words because I tried to read these two or three words together rather than understand them separately [when talking about reading the collocation "fossil fuel reserves"] [syntactic parsing].

The three remaining strategies on the lower processing level, as presented in Table 7.2, were the additional categories added to the a priori coding scheme after the inductive coding cycle. These categories – emotional resonance, mother tongue interference, and vocabulary and grammar learning – mostly concerned fixations on single words. However, in some instances these strategies also included look-backs at the preceding context in the sentence, similarly to the syntactic parsing and establishing propositional meaning strategies. Emotional resonance was reported by participants in the instances when the information they were reading in the text surprised them or resolved a previously held misconception about the fact described in the text. In some cases, participants also reflected on fixating on a word because they had strong emotional associations with it:

Participant 6: I think I focused on the temperature in the universe –273C, because I thought: oh, my God! How many degrees is that!

Mother tongue interference was closely connected with the lexical access processing described earlier. Among the reasons participants gave for fixating on certain words was the need to translate these words into their mother tongue to better understand their meaning. As part of the final category within lower-level processing, vocabulary and grammar learning, participants associated the long fixations they had during reading with their attempts to learn the use of certain language structures in the text:

Participant 7: I think I paid attention to such word combinations as "have been built" and "in the long term", "they will" because I want to understand

better the grammar topic of tenses and time indications in English. It was interesting for me.

While lower-level processing included the strategies participants took to understand the text on a sentence level, the three categories within the higher-level processing – inferencing, building a mental model, and creating text level representation – were concerned with participants integrating sentences in the text together into a cohesive whole.

Participants used inferencing strategy when they tried to activate their background knowledge of the topic of the text to understand better what was being read, or to interpret the meaning of a series of words in a paragraph using their everyday experience. Similar to the emotional resonance processing, inferencing mostly concerned factual information in the text: geographical places, numbers, historical events:

> Participant 2: When I read "Gulf War", at first, I confused it with the WWII but then I realized it is a different event.

Building a mental model was used by participants to either confirm their understanding of how ideas in the text were developed, or to resolve any conflicting understanding they had when reading the different parts of the text. In contrast, the strategy of creating text level representation was mostly used when participants tried to apprehend what the text was going to be about when reading the title and opening sentences, or to rehearse the key points in the text to remember them better:

> Participant 5: When I finished reading the text, I looked back at any numbers, places, factual info that the text contained to make sure I remember them, as well as the last two sentences in the text. Usually these are the key points to take away from the text [creating text level representation].

A recurring observation that was made during the qualitative data analysis concerned the plasticity of cognitive processing. In cases when the use of one cognitive processing strategy did not facilitate text comprehension, participants reported having turned to another processing strategy to compensate for this failure. To exemplify, if lexical access was unsuccessful, participants would turn to syntactic parsing, establishing propositional meaning or building a mental model to make a better use of the context of the text:

> Participant 8: I don't know the word "overwhelmingly" and that's why I couldn't understand the preceding sentence and went back to re-reading the previous one [establishing propositional meaning].

7.4.2 Cognitive processing in authentic versus simplified OERs

The analysis of the eye-tracking replays showed that there were more fixations and look-backs to discuss in each participant's gaze plot video that corresponded to their reading of the authentic OER. Thus, in order to proceed to the analysis of

stimulated recall interviews and identify the frequency of use of each cognitive processing strategy, the number of each processing strategy from the content analysis was divided by the total number of processing strategies. By calculating this relative measure, it was possible to control for this difference in the amount of cognitive processes verbalised by participants during their reading of authentic and simplified texts.

The results of the stimulated recall data analysis are presented in Table 7.3, which gives an indication of the amount of use of the different cognitive processes in the total number of readings of authentic OERs (n = 9 readings / stimulated recall interview sessions) and simplified OERs (n = 9). No comparative statistics were run because of the relatively small sample size in this research.

Overall, the most used processes for both authentic and simplified texts, as judged by the relative frequencies of categories' occurrence in participants' verbalisations, were lower-level processes – lexical access, establishing propositional meaning and syntactic parsing. When exploring the differences in the frequency of use of different cognitive processing strategies for authentic vs. simplified OERs, three main differences became apparent. The key difference was in the amount of use of lower- vs. higher-level processing. Participants seemed to rely substantially less on lower-level processing when reading simplified OERs, as compared to their reading of the authentic texts. As has been outlined in the previous section, lexical access, syntactic parsing, and establishing propositional meaning were mainly employed when participants tried to resolve confusion in understanding the meaning of single words or clauses they encountered in the text. Using fewer strategies within these three categories for simplified OERs might indicate that participants experienced fewer comprehension difficulties, and their reading of the simplified

Table 7.3 Stimulated recall data analysis results: authentic vs. simplified OERs

Level of processing	Category	Authentic OER n = 9	Simplified OER n = 9
Lower level	word recognition	7	3
	lexical access	66	43
	syntactic parsing	40	28
	establishing propositional meaning	45	36
	emotional resonance	7	11
	mother tongue interference	4	5
	vocabulary and grammar learning	6	0
Higher level	inferencing	5	12
	building a mental model	15	25
	creating text level representation	11	10

OERs was smoother. In contrast, increased use of higher-level processing, particularly inferencing and building a mental model, when reading the simplified OERs indicates that participants had more capacity for connecting the text to their personal experiences and focus on the main themes of the text. Among the higher-level processing strategies, creating text level representation was used slightly less when reading the simplified OERs. A potential explanation of this finding could be that participants did not have to take an additional effort, reread and rehearse the text as they might have had more capacity to understand the text well during their initial reading.

The other two differences in the use of processing strategies for authentic vs. simplified OERs concerned the frequency of use of the strategies that were added to the coding scheme after the inductive coding cycle. On the one hand, "vocabulary and grammar learning" was mentioned only with the authentic OERs. On the other hand, as can also be seen from Table 7.3, the use of the strategy "emotional resonance" was slightly higher for the simplified OERs, as compared to the authentic texts. The latter finding suggests that, similarly to the case with higher-level processing, participants might have had more working memory capacity available to ponder over the simplified texts and to resolve a previously held misconception about a fact described in the text, or to draw stronger emotional associations with it. The frequency of appearance of "mother tongue interference" strategy was largely similar between the reading of authentic and simplified OER, which suggests that at times participants turned to the resources of their mother tongue to understand the texts, irrespective of the complexity of these texts.

7.5 Discussion

Open educational resources (OERs) are learning, teaching and research materials in any format and medium that are freely available in the public domain. Although pioneered with the intent to widen access to education globally, very few studies explored solutions on how to improve their accessibility to non-native English speakers (NNES). Chapter 7 aimed to obtain emerging evidence on the effect of OER text simplification on text processing of NNES at lower levels of proficiency, using qualitative evidence from eye-tracking. To that end, this research focused on comparing the frequency of use of different cognitive processing strategies at lower- and higher-levels of processing, as verbalised by participants in the eye-tracking stimulated recall sessions after they had read an authentic and a simplified OER.

Chapter 7 showed that participants engaged in a wide range of cognitive processing when reading both authentic and simplified texts. This finding is partly in line with the earlier test validation studies that used eye-tracking stimulated recalls (e.g., Brunfaut & McCray, 2015) and showed that the entire spectrum of processes specified in the central core of the Khalifa and Weir (2009) model were elicited by the test questions during reading. Yet, Brunfaut and McCray (2015) also found that the frequency of use of lower- and higher-level strategies was largely similar across the sample. In contrast to this research, the research at the centre of this chapter identified proportionally lower reported usage of higher-level processing

(inferencing, building a mental model and creating text level representation) when reading both authentic and simplified OERs.

Overall, the most used processes in this research were lexical access, syntactic parsing and establishing propositional meaning, as evidenced in the stimulated recall data. This finding might be due to the fact that participants knew there would be no comprehension assessment after reading. Reading the text for an immediate comprehension test is likely to have elicited a wider use of different cognitive processing strategies when reading authentic and simplified texts. This finding might also be due to the proficiency level of participants in this research. As has been shown in the study of Brunfaut and McCray (2015), participants at lower levels of language proficiency used lower-level processing strategies more frequently than participants at higher levels of proficiency. This could be the case in this research, where all recruited participants were from an intermediate (B1) English language course.

In the comparison of the frequency of use of different cognitive processing strategies when reading authentic vs. simplified texts one key difference was observed in the amount of use of lower- vs. higher-level processing. Although lower-level processing was still dominant, participants seemed to rely less on the use of lower-level processing in the simplified OER. To exemplify, the use of "lexical access" strategy implied that participants made an effort to understand the meaning of a word in the sentence (Khalifa & Weir, 2009). The less frequent use of this strategy during the reading of the simplified OERs suggests that participants had fewer points of confusion or doubt about the meaning of a word, as compared to their reading of the authentic texts. This tendency was also observed when exploring the replays in the eye-tracking software which showed that there were fewer areas in the simplified texts where participants had to stop and make long fixations.

Chapter 7 also provided some empirical evidence that text simplification facilitated higher-level text processing. The categories that concerned higher-level processing occurred more frequently in participants' verbalisations for the simplified OERs, as compared to their reflections on authentic OER reading. It can be assumed that participants had fewer instances where they had to use lexical access and other lower-level processing strategies to understand the text on a sentence level. Besides the use of lower- vs. higher-level processing, another difference in processing of authentic vs. simplified OER concerned the frequency of use of the "emotional resonance" strategy. Since in this research "emotional resonance" referred to the instances where participants talked about feeling surprised, as well as about their emotional associations or ability to learn a new fact from the text, this strategy can also represent situational interest. Situational interest is defined as a relatively short-lived psychological state of focused attention, curiosity, and positive affect (Soemer & Schiefele, 2019). When defined through the lens of situational interest, the evidence from this chapter concerning the increase in emotional resonance when reading the simplified OERs is in line with the study of Soemer and Schiefele (2019). The authors showed that more difficult texts were perceived by the readers to be less interesting, and less interest, in turn, was associated with reduced focus of the readers towards the text. The finding of this research on

increased emotional resonance to the simplified text suggests that text simplification provides opportunities for the creation of stronger bonds between linguistic and emotional content, which is an aid for foreign language reading. Drawing from the aforementioned piece of evidence in the literature (Soemer & Schiefele, 2019), higher emotional resonance suggests a positive effect of text simplification on text processing among NNES.

The final difference in processing of authentic vs. simplified OERs was the use of the strategy "vocabulary and grammar learning". This strategy was mentioned only with the authentic texts. The reason for that might be a higher lexical diversity of the authentic OERs, which might have given participants more instances of exposure to various lexis and grammar structures. Thus, this finding suggests that simplified texts may limit incidental vocabulary learning. However, since learning with OERs is primarily concerned with subject content comprehension, rather than with language acquisition, incidental vocabulary learning might not have immediate relevance in this context.

7.5.1 Implications for practice

Chapter 7 provided emerging evidence in support of the use of text simplification to increase linguistic accessibility of OERs to NNES. The important practical implication from this research is to encourage OER material writers to check the text complexity level of their materials prior to publication and to linguistically simplify them, where possible. Simplification strategies such as splitting sentences, choosing words of a shorter length and higher frequency, using fewer nouns and more connectives between/within sentences have a beneficial effect on the text processing of NNES. Simplification stimulates greater focus and more interest towards the content of the text. As long as the linguistic accessibility of open education is being ignored, and OERs continue to draw on native speaker capital in language, the capacity of these resources to widen access to quality education will only remain that: a potential.

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Chapter 8

Culturally adaptive learning design

A mixed-methods study of cross-cultural learning design preferences in MOOCs

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8.1 Introduction

Over the past decade, open online learning environments have changed the educational landscape all around the world. Increasingly, formal degrees are taking a hybrid form or being replaced by digital literacy products, such as Massive Open Online Courses (MOOCs) (Shah, 2019). MOOCs, as large-scale, freely accessible learning environments, are primarily recognized for their potential to facilitate universal learning access, as previously identified in Chapters 5 and 6 (Chua, 2022; Conde Gafaro, 2022). A learner can learn from these courses as long as they have access to appropriate resources such as a computer, laptop or mobile device and an adequate internet connection (Jansen & Schuwer, 2015). Still, emerging data suggest varied persistence and achievement gaps for learners from various regions (Reich & Ruipérez-Valiente, 2019). In contrast to the expectations of MOOC enthusiasts (Bozkurt & Aydın, 2018; Jansen & Schuwer, 2015), there is substantial inequality and disparity in the global digital learning landscape, with regional and cultural backgrounds influencing the way learners engage with MOOCs (Guo & Reinecke, 2014; Kizilcec & Halawa, 2015; Kizilcec et al., 2017; Ogan et al., 2015; Reich & Ruipérez-Valiente, 2019).

The way MOOCs are designed – in short learning design (LD) – can substantially influence learners' persistence in MOOCs. Typically, in MOOCs this entails various types of learning activities, offered in a predetermined order. Recent literature suggests that a centralised LD containing prearranged, fixed number of activities, may not work for all learners (Bearman, Lambert, & O'Donnell, 2021). Additionally, LD and other pedagogical factors (e.g., teaching methods and content) may have a predictive and causal link with learners' progression and whether (or not) they stay in the course (Xing, 2019; Guo, Kim, & Rubin, 2014). However, there is limited focus on how and to what extent the influence of LD varies with geo-cultural contexts. Previous work suggests that various geo-cultural groups have a distinct preference for particular learning activities, but the research is limited on the ways to adapt and tailor LD accordingly (Joksimović et al., 2017). The overall results from this research helped us to understand the association between learning activity types and learners' persistence in MOOCs. In Chapter 8 we will explore how such association varies between geo-cultural contexts.

8.1.1 Learning design and learning behaviour

The critical role of pedagogical factors, such as LD, in learner persistence has been widely acknowledged in formal learning environments (Nguyen, Rienties, & Toetenel, 2017; Rienties & Toetenel, 2016; Rienties, Nguyen, Holmes, & Reedy, 2017) as well as in MOOC learning environments (Rizvi, Rienties, Rogaten, & Kizilcec, 2020; Xing, 2019). In Chapter 8, we conceptualise LD as a course development process, i.e., a process of designing a series of learner-facing activities. The process produces a course as a sequence of learning activities of different types (e.g., reading material, instructional audios, videos, and discussions). The designed activities can be reused when needed. To the best of our knowledge, MOOC learning designers tend not to modify or adjust the course LD once the course has been offered. Few studies have examined learners' interaction with MOOC learning resources, specifically with various content types, for example, text-based resources (Rizvi et al., 2020; Uchidiuno, Koedinger, Hammer, Yarzebinski, & Ogan, 2018), instructional videos (Davis, 2019; Guo et al., 2014), course assessments (Juhaňák, Zounek, & Rohlíková, 2017; Li & Baker, 2018), and participation in discussion forums (Allon, Van Mieghem, & Zhang, 2016; Sunar, White, Abdullah, & Davis, 2016; Yang, Sinha, Adamson, & Rosé, 2013), as also indicated in Chapter 6 (Chua, 2022). Recent work suggests that a centralised LD containing a fixed number of sequenced learning resources may be convenient and even be beneficial for most learners, but this does not guarantee that it will be useful for all learners (Bearman et al., 2021; Margaryan, Bianco, & Littlejohn, 2015).

In Chapter 8, we leveraged FutureLearn MOOCs as a primary source of data, where the basic course element in LD is called a *step*. This step represents a learning activity in a MOOC and could be of several types: Article, Discussion, Peer Review, Quiz, Text, Video/Audio, Exercise (Sharples, 2015). The content and structure are designed in accordance with the course needs and then activities are grouped together in a sequence. A title is used to describe the overall learning objective of that group. As illustrated in Figure 8.1, most FutureLearn MOOC designs primarily contain four types of activities; Articles, Videos, Discussions and Quizzes (Sharples, 2015).

For the learning activity categorisation, we used the OULDI theoretical framework (Cross, Galley, Brasher, & Weller, 2012), which is further described in Chapter 14 (Nguyen, Rienties, & Whitelock, 2022). According to the OULDI framework, reading articles or watching videos are referred to as assimilative activities, i.e., learning activities to develop, process, and attain information in an online course. Next, discussions are categorised as communication-based activities which allow learners to participate in course-related discussions. It is important to highlight here that although discussion-steps are considered an integral part of LD, FutureLearn MOOCs also offer a commenting space underneath every learning activity that comprise a social media-style feed. In the commenting space, a learner can start, like or comment on a discussion or follow their peers and instructors (Sharples, 2015). The FutureLearn platform explicitly embeds discussions in the LD of all courses and aims to make MOOCs a *social learning space*

Figure 8.1 An overview of one set of activities in a FutureLearn MOOC.

(Manathunga, Hernández-Leo, & Sharples, 2017). Finally, assessment activities such as Quizzes were taken into consideration, as the role of assessments is widely recognised as critical to the learning and engagement. We have been specifically focussing on these four main learning activity types.

This research was driven by the motivation that limited research has explored how different proportions of the various learning activity types (i.e., reading material, videos, quizzes and discussion-based activities) can be potentially linked with MOOC learners' persistence, and that most of the existing research fails to address learners' perceptions about these activity types. Ideally, there are several pedagogical factors that can be made flexible and modifiable either midway or between course runs. These factors include learning activity types, sequence of those activities, and content difficulty level. Therefore, it is imperative to understand how learners' persistence is linked with these learning activities in a course and then unpack the learners' perspectives about these activities.

8.1.2 Geo-Cultural background and learning behaviour

In the context of participation in MOOCs, several researchers have found vast regional and cultural differences in behavioural engagement and persistence (Reich & Ruipérez-Valiente, 2019; Kizilcec & Halawa, 2015). For example, studies reported differences in course assessments (Liu et al., 2016; Kizilcec & Halawa, 2015), video watching behaviour (Liu et al., 2016; Uchidiuno et al., 2018) and social interactions within a course (Liu et al., 2016; Ogan et al., 2015). Between various geo-cultures, distinct learning patterns have also been noticed in reading versus video-watching behaviour (Uchidiuno et al., 2018; Liu et al., 2016; Reinecke & Bernstein, 2011). One way to approach this issue could be by designing an open, online course that adapts itself to the dynamic cross-cultural needs.

In line with previous research (Mensah & Chen, 2013; House, Hanges, Javidan, Dorfman, & Gupta, 2004), we used the GLOBE geo-cultural framework for learners' categorisation. This framework distinguishes global regions and their cultural constructs by categorising them into ten culturally similar clusters: Sub-Saharan Africa (AF), Anglo-Saxon (AS), Confucian Asia (CA), Eastern Europe (EE), Germanic Europe (GE), Latin America (LA), Latin Europe (LE), Middle East (ME), Nordic Europe (NE), and Southern Asia (SA). By categorising learners using these ten clusters, first we examined the association between the number of learning activities and learners' persistence in the MOOC. Second, we explored certain activity types that were an enabler for one geo-cultural group while limiting for another. Lastly, in a follow-up study, we explored the learners' experiences and their views on various activity types.

8.2 Case studies

In the first study (Rizvi et al., 2021a), we used a quantitative approach to inspect trace data for learners enrolled in ten large FutureLearn MOOCs (n = 49,582). The sample was diverse and heterogenous, with learners from all ten geo-cultural

regions. The largest subgroup belonged to the Anglo-Saxon countries, closely followed by South Asian, and African learners. The smallest subgroup originated from Nordic Europe. We examined whether (or not) differences regarding the number of assimilative activities (articles and videos), communication activities (discussions), and assessment activities (quizzes) within a MOOC could be used to predict learners' persistence. Next, we compared the predictive associations between the ten geo-cultural groups.

It is noteworthy that most quantitative methods remain biased in favour of the largest subgroup that exists in the data. Therefore, empirical studies often reflect the results fitting to the needs of the largest subgroup (Anglo-Saxon participants in our case), which may (not) be appropriate for other subgroups. To overcome this methodological issue, we used interaction terms in our analysis which takes into consideration the geo-cultural subgrouping as well as predictors, such as the number of the various learning activity types across the ten MOOCs. Advanced statistical methods associated with survival analysis were used to predict the outcome variable *persistence*. Persistence represents the learners' progression in the respective course using the percentage of course activities accessed by a learner before they dropped out.

The follow-up qualitative study utilised semi-structured interviews to collect information on learners' perceptions about the various types of learning activities in FutureLearn MOOCs. To understand these varied perceptions, several in-depth interview questions were used, for example, *Which learning activity type (article, video, quiz and discussion) did you enjoy most/least?* While we had a sample of 22 participants from seven geo-cultural groups, we were unable to recruit participants from Confucian Asia (CA), Latin Europe (LE) and Nordic Europe (NE). The study employed well-established and widely used method of thematic analysis (Braun & Clarke, 2006) to understand participants' perspectives and experiences. It is important to note here that we have only shared some of the relevant quotes, describing participants' experiences with the respective activity type, and not the entire outcome of the thematic analysis. The detailed results can be accessed via other publications that relate to this study (Rizvi et al., 2021b).

8.3 Selected findings

In order to explore if changing the number of learning activity types is associated with learners' greater persistence in MOOCs, we used a number of various learning activity types to predict learners' persistence in the respective FutureLearn course (Rizvi et al., 2021a). We quantified the predictive link and found distinct links for each of the activity types. The findings suggest that irrespective of the geo-cultural background, a large number of learning activities in a course design was not liked by most learners.

8.3.1 Assimilative activities: articles

The LD of most MOOCs examined in this study tended to include one or more reading activities that either contain reading material or links to other reading resources, or both. We found that increasing the number of reading activities was

associated with an increased risk of dropout. For the dataset we used, the analysis suggested an increased dropout risk of 14% for every 20 short reading steps added in a course, if the course already had around 52 such reading steps. The interaction analysis suggested that this dropout risk was most severe (and statistically significant) for learners from Latin American region (48%), followed by learners from Anglo-Saxon (28%) and African (7%) regions. During the follow-up interviews, this is how some participants shared their experience of reading activities.

> I didn't perceive articles as reading content. And sometimes you can come across quite dense written word or content there. It has to be engaging, because it can be almost like reading a newspaper article. Yeah, quite long in length? I tend to find them to be a little bit, for-information-purpose-only type of thing, and not necessarily engaging.
>
> (Participant13, Male, AS)

The quantitative results suggested that non-native English speakers, particularly from South Asian and Middle Eastern regions, were relatively less affected by the large number of articles in some courses. However, they deemed articles as *boring* or even *unnecessary* at times. Language barriers were mentioned frequently by non-native English speakers, as something negatively influencing their engagement with reading activities, as was also found in Chapter 7 (Rets, Stickler, Coughlan, & Astruc, 2022).

> When you're studying (from an article) in [*participant's native language*], you can pick it quite in a limited time. But when it's in English, it takes you time to pick up those points and absorb that information.
>
> (P6, Male, SA)

We found this result to be aligned with the previous literature that suggests that learners from non-English-speaking background tended to spend more time on assimilative (reading, watching) type of learning activities in online courses (Nguyen, Rienties, & Richardson, 2020).

8.3.2 Assimilative activities: videos

MOOC learning environments are generally recognised for their video lecture-based LDs. During the overall data analysis, we found a small yet significant link between the number of videos and persistence. Taking into consideration the presence of our ten geo-cultural groups, the link was not only quantifiable but also a large significance was noticed for several groups, particularly for South Asian learners. In other words, every increase of 9 videos in a course reduced the dropout risk for South Asian learners by 6% (given that the course already contained around 22 short instructional videos). In contrast, a small negative association was found between the number of videos and persistence for Anglo-Saxon learners, but further analysis found the risk to be not statistically significant. The most significant

association was found for Middle Eastern learners (9% increase in dropout risk). Furthermore, the interviews indicated that participants from Anglo-Saxon and Germanic Europe regions consistently reported their dislike of instructional videos in FutureLearn MOOCs, finding most of the videos to be far from engaging, perhaps *too slow* for their taste.

> I am less likely to watch the videos as I am more likely to read the [*video*] transcripts…I think if I am watching a video, I am more likely to lose focus and to kind of, for my thoughts to like, kind of drift somewhere else.
>
> (P3, Female, AS)

Participant 16 echoed this opinion,

> I mean they [*videos*] are slow because they are always speaking very clearly, and slowly to make sure that you understand. Well, I've now lost my focus and I'm already at some other planet. It's just far too slow for me. It doesn't work and if you speed it up, gets on mentally, really weird! So, it doesn't work. Speeding it up doesn't work. So, that's why I dislike videos that are just far too slow for me.
>
> (P16, Female, GE)

Learners from Anglo-Saxon regions tended to dislike instructional videos. In contrast, South Asian learners reported a strong preference for learning from videos.

> The most favourite part I enjoyed is watching videos, the HD videos, which was just virtually…I was thinking as teacher is just teaching me sitting in front of me or I'm sitting in a virtual classroom and learning.
>
> (P14, Male, SA)

8.3.3 Communication activities: discussions (instructor-led / user-led)

Almost all mainstream MOOC providing platforms now feature a social learning space in form of either a separate discussion forum, or a discussion space located directly underneath every learning activity (FutureLearn design approach) or both. Overall data analysis suggested a rather small, negative association between the number of discussions and persistence in the course (a 3% decrease in dropout risk with six more discussion-based steps added in a course already containing 14 discussions). A subgroup analysis suggested that the impact was again dissimilar across the various geo-cultural subgroups. For example, a negative association between early dropout risk and number of discussions was found for learners from Anglo-Saxon, Confucian Asia, Nordic Europe, Germanic Europe, Latin Europe and Latin America, with learners from these geo-cultural groups engaging less with the courses containing fewer discussions. In contrast, African and South Asian learners' did not favour a large number of discussion steps in a MOOC LD (i.e., early

dropout risk increased by 9% and 23%, respectively). Follow-up interviews suggested that learners from geo-cultural regions who were interested in discussions were still more inclined towards user-led discussions, and not towards instructor-led discussion. However, we found several differences in opinion within and across various geo-cultural groups, and our overall analysis remained inconclusive (Rizvi et al., 2021b). Still the respondents provided useful insights into their views on communication and social interaction in MOOCs.

> I guess online, you might have thousands of people, making a point in front of thousands of people. It is completely different because there's very little chance that many of them will be listening or paying attention. So, I guess if it's a really large group, I feel more comfortable with that.
>
> (P17, Female, AS)

In contrast, the large number of discussants participating asynchronously was an issue for others.

> When you don't have time to engage every day, by the time you would log on the discussion, they would already be 20 or 30 posts.
>
> (P20, Male, AF)

Furthermore, a lack of privacy or agency over one's comments was another concern raised by most participants, but primarily by female participants from Middle Eastern or Eastern European regions. Other participants identified a need for frequent interaction from the instructors' side to improve engagement, along with an inclusion of social-media style features in MOOC commenting spaces.

> There was another thing I think should be included more often, and it is for example, participating in the discussion forums. I like using for example, the symbol at (@), like tagging people. So, they know that I'm mentioning them in my in my comment. But it's not that easy to come up with. Sometimes it works, sometimes it doesn't. But I think that is a good way to engage other learners in the conversations we are having in the discussion forums.
>
> (P1, Female, LA)

8.3.4 Assessment activities: quizzes

Assessment activities are considered an essential part of the learning process, even in flexible, self-paced learning environments like MOOCs. However, in our research an increased number of assessment activities (i.e., quizzes) was found to have a negative association with learners' persistence in the respective course. With the sole exception of South Asian learners, the pattern was the same across all geo-cultural subgroups. We found, for example, that adding seven more quizzes in a course that already had around seven quizzes, tended to increase the average drop-out risk by 15%. As discussed before, this pattern did not mirror the view of the

second largest subgroup of South Asian learners, where the association was positive, slightly favouring more quizzes in MOOC LD. The large elevated risks we noticed were for learners from Middle Eastern, African and Anglo-Saxon countries (7%, 9%, and 21%, respectively). The follow-up analysis to explore learners' perceptions about quiz-based assessment activities in MOOCs revealed various dimensions.

> I do like quizzes. I think quizzes can give you a real sense of you know… One, they are fun, and two, it's good to sort of check. So, I think the quizzes are important because in some ways I know it sounds very old school, but like quizzes and tests and so on, are probably part of my own experience of education.
>
> (P12, Female, AS)

Since in MOOCs most learners tended to prefer a pick-and-choose learning behaviour, they remained hesitant on being quizzed on the content they might have missed. But often learners did not consider frequent assessments to be a useful part of the MOOC LD.

> I'm not there to be tested on, I would like to, you know, to discover new things. But I don't really like to feel that I am tested upon.
>
> (P21, Female, EE)

8.4 Discussion

In Chapter 8, first we aimed to explore the predictive link between the number of different types of learning activities in an LD and learners' persistence in 10 FutureLearn MOOCs followed by 49,582 learners. While doing so, we also examined the extent to which the link between LD and persistence, differed between geo-cultural contexts. Second, we scrutinised learners' perceptions and their self-reported experiences with various types of learning activities using 22 in-depth interviews. As a whole, most learners preferred to have fewer rather than more activities in the LD of an MOOC. A notable exception was learners from South Asian countries, who chose to engage longer with MOOCs that contained a large number of small bite-sized learning activities. In contrast with previous work that pointed towards the critical role of discussions in MOOC learning (Manathunga et al., 2017; Allon et al., 2016), Chapter 8 found that LDs which provided many opportunities to interact with peers by instructing learners to discuss certain course topics actually averted active participation of learners from non-English-speaking geo-cultural regions, such as Sub-Saharan Africa and South Asia. We found that such an approach only slightly supported learners from Anglo-Saxon and European regions (GE and LE).

In addition, we found learners overall persisted more in the courses containing a greater number of assimilative learning activities (i.e., articles and videos), specifically those with instructional videos. As all the content in the ten MOOCs we analysed was offered in English, we expected greater engagement from native

English-speaking learners. However, most learners were found to disapprove of large amounts of reading materials. Increasing the number of articles increased the early dropout risk for all learners, even for those residing in the Anglo-Saxon regions and neighbouring regions (such as Germanic and Latin Europe).

Since most early MOOCs were offered in a video-lecture format, instructional videos have long been assumed to be a central feature in a MOOC LD. Our analysis of ten MOOC LDs with a varied number of videos revealed a minimal link of increasing the number of videos with learners' persistence. The only significant link we found was that only South Asian learners engagement lasted longer by increasing the number of videos. Our qualitative analysis revealed that learners had contrasting opinions about course videos. For example, in line with Uchidiuno et al. (2018) who found non-native English-speaking learners to engage least with the videos that contain narration with no other visual support, Middle Eastern learners reported a desire to learn from either vibrant videos or from something "richer" than the videos (i.e., detailed informative articles) and learners from Anglo-Saxon regions and from Germanic Europe deemed clear, slow-paced videos to be disengaging.

Participants from all around the world consistently raised a need for more interactive videos or videos with embedded quizzes. Concerning the assessment activities in MOOCs, we found learners to persist more in the courses that offered quizzes in moderation. While learners from English-speaking and European regions liked to be quizzed in moderation, a slightly negative yet statistically strong association was found between the number of quizzes and persistence of learners from South Asian and Middle Eastern groups.

8.5 Limitations and moving forward

There are several limitations with the approach we used in Chapter 8. For example, all MOOCs used during the quantitative analysis were offered via the same MOOC platform (FutureLearn) and were designed by the same LD team at the Open University, UK. Moving forward, a better approach would require experimental manipulation of LDs, possibly during and between the course runs. A cross-platform analysis might also yield different results. Also, since all MOOCs under analysis were offered in English language, a comparison of monolingual versus multilingual MOOCs could reveal different patterns of engagement in dissimilar geo-cultural contexts.

As for the qualitative analysis phase, all semi-structured interviews were conducted in English, while a large number of participants (16 out of 22, or 73%) were non-native English speakers. The odds remained high that those participants might have struggled to verbalise their thoughts when asked about their experiences with the LD. Finally, the only demographic factor that was taken into consideration in Chapter 8 was learner's location at the level of the geo-cultural region. There could be several other individual and demographic factors potentially influencing learners' persistence and their overall experience with the course LDs. Such factors include age, gender, socio-economic status, and employment level. We acknowledge that

these factors can be part of learners' broader cultural experiences, but these factors are beyond the scope of current research. Along with the cultural dimensions, analysing the socio-economic and individual factors may yield interesting insights as few participants themselves pointed out.

> Is there a standard African learner? Do you prefer them to be English language speaker, second speaker or third speaker? Do you prefer them to be male and unemployed or female and pregnant?
>
> (p20, Male, AF)

8.5.1 Implications for practice

Our findings suggest that the link between persistence and changes in LD (changing number of various types of activities) varies with the geo-cultural context. Perhaps there is no ideal combination of learning activities that facilitate learners from all around the world and Chapter 8 provides some explanations as to why there is no single, universal LD for MOOC that can work for all learners. We found that a fixed, predetermined LD can hardly be inclusive, and our qualitative results echoed the quantitative findings. Until we reach the (difficult yet attainable) milestone of a flexible, culturally adaptive MOOC LD, we recommend taking a balanced approach by combining different types of learning activities, not just video-based, or reading MOOCs. Despite the fact that development of culturally adaptive MOOCs may not always be cost-effective, cultural adaptation in designs of open online learning environments is still strongly recommended, not automatically perhaps, but if chosen by the learners.

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Innovative technologies in an Open World

Chapter 9

Accessibility in MOOCs

The stakeholders' perspectives

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9.1 Introduction

The reported work on how accessibility is embedded in the design of Massive Open Online Courses (MOOCs) seems to be limited (Sanchez-Gordon & Luján-Mora, 2017). At the same time, the need to incorporate greater access has been highlighted. Two significant events have contributed to the call for attention to the accessibility of online learning including MOOCs. The first event took place in 2015 when edX, a MOOC provider, had to reach an agreement to include accessible content on its platform. edX decided to change its policies and include accessibility in its software development cycle. The following excerpt from the settlement includes arguments that continue to be important (US Department of Justice, 2015, p. 1):

> MOOCs have the potential to increase access to high-quality education for people facing income, distance, and other barriers, but only if they are truly open to everyone. This landmark agreement is far-reaching in ensuring that individuals with disabilities will have an equal opportunity to independently and conveniently access quality higher education online.

The second event in 2016 led to a different approach being taken by the University of California at Berkeley when facing a similar situation (Jaschik, 2016). The University of California decided to remove more than 20,000 audio and video files from its online open-access platforms, requiring learners to sign in with University of California credentials to view or listen to them instead of investing in making the content accessible. In both events, legislation was a driver for accessibility. Technologies used in MOOC platforms are not necessarily accessible (Sanchez-Gordon & Luján-Mora, 2017), which may then block access to learning for a significant number of learners. Furthermore, the use of videos within MOOCs, peer-to-peer assignments that involve learners evaluating each other's contributions, quizzes, and tests, or, in general, activities that increase the need for collaboration in online learning all can create additional challenges for accessibility (Rodrigo, Iniesto, & García-Serrano., 2020), see also Chapters 5 and 6 (Chua, 2022; Conde Gafaro, 2022).

MOOCs can be beneficial when compared to other online learning opportunities because of their characteristics of openness within a structured learning framework and low cost of learning (Iniesto, 2020). The scope of individual planning regarding learners' self-organisation of time, the use of their preferred devices/equipment, opportunities for social learning, and the chance to gain new knowledge are some additional advantages (Conde Gafaro, 2022). The importance of accessibility to online educational resources is widely acknowledged (Acosta & Luján-Mora, 2016), but there is limited discussion about the accessible design of online learning courses including MOOCs. Providing accessible MOOCs could offer the flexibility of learning and benefits to all learners. Indeed, the Porto Declaration on MOOCs (EADTU, 2014, p. 2) highlights the aspect of providing opportunities to all:

> MOOCs must not be seen as the outcome or exemplar of online education. Rather they need to be understood in a wider context as there is a long history of research on open and online education and a variety of approaches and tools to provide quality learning opportunities to all.

A published report on inclusive teaching and learning in higher education (Department of Education, 2017) encourages higher education providers to care and offer support, and to develop an optimal environment for learners with accessibility needs. The lifelong learning paradigm integrates education, work, and personal life in a continuous process and allows learners to be able to access knowledge and develop it both personally and through work (Butcher & Rose-Adams, 2015). In this respect, if accessible, MOOCs have the characteristics to provide an appropriate mode of study for learners with accessibility needs. Chapter 9 summarises the doctoral research programme which has yielded an understanding of how MOOC providers cater for learners with accessibility needs, the motivations of those learners when taking part in MOOCs, and how MOOCs should be designed to be accessible (Iniesto, 2020).

9.2 MOOC Stakeholders and accessibility

When reviewing the literature, there is a lack of research about the efforts that MOOC providers are making towards MOOCs accessibility, the number of learners with accessibility needs and their interest in MOOCs, and the current state of MOOC accessibility (Iniesto, 2020). First, there is limited research on course team (authors') experiences of MOOCs, and how instructors/tutors are trained and interact with MOOC learners (Papathoma et al., 2020). In particular, little is known about how MOOC providers develop their platforms or courses by taking into account learners with accessibility needs. For example, Smith, Dowse, Soldatic, and Kent (2017) provided an overview of the process of developing a MOOC that included accessibility from the experiences of educators involved, whereby the authors aimed to explore what they named "disability pedagogy" in MOOCs. Smith et al. (2017) reflected that much of the work on MOOC development and

design was very ad hoc, showing how difficult it is to get development teams working together.

Second, in terms of the learners' perspective, it is often difficult to know the actual number of learners taking part in MOOCs (Guo & Reinecke, 2014). However, the definition of success needs to relate to the learner and finishing the MOOC is not necessary the goal for all learners (Liyanagunawardena, Parslow, & Williams, 2017). The motivations of online learners are diverse, and specifically for the MOOCs, as also indicated in Chapter 8 (Rizvi et al., 2022). Some learners at university level showed particular interest in "having a full-time job" (Ilgaz & Gulbahar, 2017) while using online environments for social interaction or leisure (Serdyukov & Serdyukova, 2015). Particular research on learners with accessibility needs participating in MOOCs has been investigated by Liu, Kang, and McKelroy (2015) who highlighted the importance of usable MOOC designs because difficult navigation and unintuitive interfaces can have a negative effect on the learning experience and perceptions of the course. Similarly, Park, Jung, and Reeves (2015) reinforced the idea that MOOCs can be a challenging experience and should be as flexible as possible to meet the needs of diverse learners.

Finally, the trend in many studies related to MOOC accessibility is towards technical reports where accessibility is evaluated using human–computer interaction (HCI) techniques and the Web Content Accessibility Guidelines (WCAG, 2018), a de facto standard of web accessibility. In these studies, expert evaluation dominates, where one or more accessibility experts applied certain heuristics using automatic tools (Akgul, 2018). Other authors complement heuristic evaluations with user-participation in the assessment process, such as users who were partially sighted, or have other visual impairments (Królak, Chen, Sanderson, & Kessel, 2017), or the elderly (Bong & Chen, 2016). Most published studies report evaluating a single MOOC and corresponding platform and often involve vision impaired learners as participants. For a better understanding of the accessibility barriers in MOOCs, studies should be conducted that cover a combination of different accessibility evaluation methods and a broader sample of end-users with diverse accessibility needs and not just visual impairment.

As Seale (2014) argued, there is a need to understand the multiple viewpoints of stakeholders in accessibility practice. Research with MOOC providers is needed to capture their practices and constraints of integrating accessibility. Furthermore, the motivations and barriers of the learners who have accessibility requirements need to be investigated. For example, Rodrigo and Iniesto (2015) argued the need to provide a holistic vision for creating accessible MOOCs. Therefore, several HCI accessibility evaluation methods are needed to evaluate MOOCs, to provide indicators of the accessibility barriers and to develop processes to be addressed. Therefore, the following research questions are addressed in Chapter 9:

1   How do MOOC providers cater for learners with accessibility needs?
2   What are the motivations of learners with accessibility needs when taking part in MOOCs?
3   How can MOOCs be made accessible for learners with accessibility needs?

9.3 Researching accessibility in MOOCs

The research has taken a study-based approach; each study having its own research design, and methods of data collection and data analysis. The results from the studies are then related to each other and consolidated to address the research aims of the programme, and to draw out implications and directions for further work. The identification of appropriate methods for the research design was shaped by the ethical considerations of research that involved vulnerable groups involved with online learning (Farrow, 2016).

A pragmatic methodology was selected for this research which included qualitative, quantitative and HCI methods. That pragmatic approach suggested is demonstrated in the literature on MOOC research. Liyanagunawardena, Adams, and Williams (2013) pointed out that in the initial stage of MOOCs, the period from 2008 to 2012, the majority of research used multiple methods for data collection: primarily online surveys; and via interviews, focus groups and collecting platform analytics. Gasevic, Kovanovic, Joksimovic and Siemens (2014) proposed the use of mixed methods for research in MOOCs, by recognising the complexity of massiveness and openness of MOOCs. In a review that focused on 2013–2015 literature, Veletsianos and Shepherdson (2016) indicated that researchers favoured quantitative approaches with survey data and secondary data collected via automated methods, and qualitative methods informed few studies. Joksimović et al. (2018) in their systematic literature review pointed out the lack of generalisability of current results in MOOC research. As the literature review shows and Evans, Baker, and Dee (2016) suggest, research on MOOCs needs to focus on research approaches across different domains and multiple methods.

In this research design, research methods that require collecting perspectives from stakeholders were included: qualitative studies with MOOC providers and learners with accessibility needs facilitated understanding of their views (RQ1 and RQ2) and the way accessibility of MOOCs can be improved (RQ3). Quantitative studies were used to understand the demographics and motivations of learners (RQ2) and to draw out initial ideas on barriers (RQ3). A systematic tool called the MOOC accessibility audit based on the heuristic evaluation method of expert usability evaluation in the HCI literature was developed in this project. The audit tool involved expert-based evaluation (conducted by usability/accessibility experts) to detect accessibility barriers (RQ3). The mapping between research questions and methods in the three studies are shown in Figure 9.1.

In Study A, semi-structured interviews involved 26 MOOC providers and researchers, such as accessibility managers, course editors, inclusion designers, instructional designers, learning media developers and software developers (Iniesto, McAndrew, Minocha, and Coughlan, 2016). The aim was to explore the perspectives of platform and course providers on the importance of accessibility of the MOOC environment. The data from this study was useful to understand on how to approach the next components of the research programme. Interviewing individuals involved in MOOC development (MOOC providers) helped to understand how they catered for learners with accessibility needs (RQ1), and the
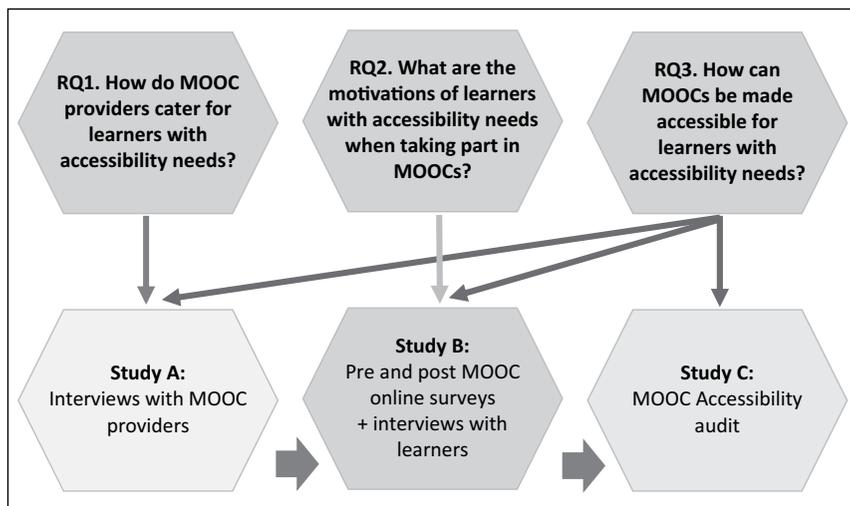
Figure 9.1 Research questions, studies and methods.

approaches they used to design accessible MOOCs (RQ3). Thematic analysis (Lapadat, 2009) was chosen for (qualitative) analysis of the data from these exploratory interviews.

Study B employed pre- and post-online survey data from past 14 Open University's MOOCs in FutureLearn (with 29,000 and 5,000 respondents) (Iniesto, McAndrew, Minocha, and Coughlan, 2017). The survey data was provided to the research team by FutureLearn who run pre- (at the start of the MOOC) and post-surveys (on completion of the MOOC) with their learners. The analysis of survey data provided preliminary insights related to research questions, RQ2 and RQ3, and was a source of secondary data as a precursor to interviews in Study B. Study B involved interviews with 15 learners with accessibility needs who had participated in MOOCs and filled up the course-surveys. The data from the semi-structured interviews helped to understand their motivations (for RQ2), the accessibility barriers they found, whether/how they worked around the barriers, and their suggestions for desired solutions (RQ3). It was essential to understand the individual situations learners had when working with MOOCs and to consider their varied contexts. Like in study A, thematic analysis was used for the analysis of the interviews, and survey data provided triangulation.

Study C was developed to understand how to improve the accessibility in MOOCs (RQ3) from an expert evaluation perspective (Iniesto, McAndrew, Minocha, and Coughlan, 2019). The study employed an accessibility audit which was conducted on four MOOCs from FutureLearn, Coursera, edX and Canvas. The audit-instrument was developed as a part of the research programme. The audit-instrument was comprised of four main evaluation areas and, therefore, four different checklists to apply heuristic evaluations (Petrie & Bevan, 2009):

- Technical accessibility evaluation. Checking of conformance to guidelines through WCAG (2018) and the text-based files.
- User experience (UX) evaluation. The evaluation of usability and user experience characteristics of the user interface design and pedagogical design.
- Quality evaluation. Evaluation of MOOC's properties, the quality of the design, platform and support for learners.
- Learning design evaluation. Evaluation of the learning design characteristics within MOOCs using Universal Design for Learning (UDL).

(See Chapter 15, Iniesto & Hillaire, 2022)

RQ3 was answered through three complementary studies. The findings from user-based studies were reinforced by the results from the audit which revealed further barriers. As a consequence of having different samples when merging research methods, the combination of methods allowed triangulation, to bring together complementary data interpretation and for checking validity (Creswell & Clark, 2017).

9.4 Main findings across the three studies

The combination of qualitative studies through interviews with MOOC providers and learners, and the quantitative information provided by the MOOC survey data provided an in-depth and multi-faceted insight into the accessibility needs of MOOC learners. The MOOC accessibility audit helped to identify accessibility barriers and the audit-instrument provides a tool that can be used and iteratively developed further to support the design and evaluation of MOOCs for accessibility.

9.4.1 MOOC providers cater for learners with accessibility needs (RQ1)

There is an awareness amongst the MOOC providers of learners with accessibility needs participating in MOOCs. However, in the investigations in this research programme, the providers have acknowledged limitations. For example, MOOC providers often do not know who is participating in their MOOCs which leads to a lack of understanding of their learners, and in particular learners with accessibility needs. MOOC providers do not gather accessibility information or requirements from their learners as is typical of other educational environments (Porter, 2014). Providers are, therefore, missing an opportunity to get more comprehensive feedback from learners to help them better support accessibility over time.

MOOC providers agreed that the technology of the platforms is creating barriers. MOOCs use social media, third-party software and technologies that may not be accessible for all learners. Therefore, MOOC providers prioritise legislation over learners' preferences and needs for MOOC accessibility. These factors have a direct influence in limiting the availability of accessible educational resources as

MOOC providers are not designing the educational resources for different target user-groups and are not allowing personalisation of the learner experience as a strategy to overcome accessibility barriers.

9.4.2 The motivations of learners when taking part in MOOCs (RQ2)

The motivations of learners with accessibility need to participate in MOOCs are broad and depend on factors already identified for MOOC learners (Ilgaz & Gulbahar, 2017; Serdyukov & Serdyukova, 2015). Learners with accessibility needs reported that they find MOOCs useful for personal development and continuing professional development, and as a route for access to higher education. As MOOC providers, they consider the low cost of MOOCs to be an important factor. But learners reported that some of these motivations are at risk since, low cost and openness are not a priority in the recent business models being adopted by MOOC providers (Ruipérez-Valiente, Martin, Reich, & Castro, 2020). Finally, MOOCs allow social interaction, which is facilitated by their massiveness and that learners can work from their preferred environment (for example at home with a laptop that includes assistive technologies). This flexibility helps learners in their self-regulated learning experience (Conde Gafaro, 2022).

9.4.3 Making MOOCs more accessible (RQ3)

The three studies of the research programme being reported have provided rich data, much of which aligns with other findings on accessibility and UX barriers in reported research on other (non- MOOC) online learning environments (Acosta & Luján-Mora, 2016). Those findings linked to technical aspects have also been highlighted by MOOC researchers (Akgul, 2018; Bong & Chen, 2016; Królak et al., 2017). In line with Straumsheim (2017), repeated identification of barriers indicates the slow speed in improving accessibility of educational technology and, hence, MOOCs; the same barriers are repeatedly identified, but solutions have not been provided as yet.

The studies within this research have been innovative in terms of identifying quality and pedagogical accessibility barriers, which have not been comprehensively explored in previous research (Park, Jung, & Reeves, 2015). These barriers can be caused by the way MOOCs are limited to a specific time frame generating barriers for many learners who cannot follow the workload included each week in the courses. As reported, the term open is also creating friction within the stakeholders: often in current MOOCs, the entire educational content is not available from the beginning, or access to it is lost when the course is finished.

Accessibility barriers in MOOCs can be found in several touchpoints of the learner journey, including the registration processes, search pages, information provided before enrolling, in carrying out assignments or the use of discussions. Previous research has developed legislation, frameworks and services to address accessibility in MOOCs (Sanchez-Gordon & Luján-Mora, 2017). However,

MOOC providers reported a limited ability to address barriers when MOOCs are being run. Learners indicated different ways they had responded to find ways to cope with accessibility barriers; these workarounds though were far from the desired solutions. The massiveness intended of MOOCs further implies a greater predisposition to be available, improvements in the help reporting services need to be in place in advance.

9.5 Discussion and implications for the future

Chapter 9 aimed to develop an understanding of stakeholders' perspectives from both the producer and learner communities. Those aspects are aligned with the open world learning approach of this book by providing accessible educational resources and platforms to reduce the digital divide. This research reveals openness as an enabler against the new MOOC business models and "technical disruption" such as accessibility are restricting opening up education to a large/massive scale.

Ferguson et al. (2018) describe a set of eight priority areas for MOOC development one of which is "wide access" built on accessibility and including those learners who are excluded from education. This research has reinforced the argument that to achieve wide access other priority areas need to be achieved, such as: "develop appropriate pedagogies", "develop effective learning designs", "clarify learner expectations", "develop educator teams" (in accessibility), and "develop new approaches to assessment and accreditation". A holistic approach to increasing accessibility in those areas will help widen access to all learners. In line with the need for having a holistic approach of embracing accessibility in MOOCs discussed in Rodrigo and Iniesto (2015), contributions from this research can lead to future research areas. MOOC accessibility research needs to consider technical and pedagogical aspects, and participatory approaches of including both MOOC providers and learners in accessible MOOC design.

Future research with learners may involve focussing on case studies with particular accessibility needs in order to understand those needs in-depth. Such an approach would avoid medical models of clustering learners with accessibility needs and allow a "putting people and processes first" perspective (Cooper, Sloan, Kelly, & Lewthwaite, 2012). Possible other sources of data may also be considered such as surveys included in accessibility-related MOOCs and analysis of the activity data of learners participating in MOOCs (Cooper, Ferguson, & Wolff, 2016). Another possible research area could be development of guidelines to support audit evaluations during the MOOC design and development processes (for platforms and educational resources) rather than post-implementation of MOOCs. These guidelines could be integrated in the process model for MOOC design. To help achieve such guidelines which are (and should be) iteratively developed to meet learner needs, participatory research methods of involving learners in the design processes should be considered (Toetenel & Bryan, 2015).

As Ferguson, Sharples, and Beale (2015) suggest, MOOCs need to evolve to meet societal needs building on advances in technology, and so future research should continue developing accessibility profiling standards and their practical

applications in open education (Navarrete & Luján-Mora, 2018). As well as continuously gathering feedback from learners, the requirements of learners evolve and, also, with the technological changes, there will be accessibility barriers which the learners may not have encountered before. Obtaining feedback from learners enables MOOC providers to adapt the platform designs and educational resources to meet the accessibility requirements of learners. Further research could also consider the role of learning analytics in addressing accessibility of MOOCs (Cooper, Ferguson, & Wolff, 2016) and aspects such as how learner-emotions affect learning (Hillaire, Iniesto, & Rienties, 2019).

While universal design encourages active consideration of learners with accessibility needs (Iniesto & Hillaire, 2022), an extended approach should focus on designing for diversity. Learners have diverse needs, and, in practice, an approach that addresses diversity leads to a model of alternative solutions around a core learning design. This preferred design approach for diversity is also referred to as inclusive design; it seeks to augment a central design by adding in a consideration of particular learner groups so that they are included, potentially through alternative design solutions rather than one design solution (Clarkson et al., 2013). Inclusive learning design aims to avoid the trap of looking at the technology that is needed for implementation but instead considers learning design in terms of learning goals, a model of pedagogy, and pattern of interactions of those involved (Toetenel & Bryan, 2015). This approach is aligned to that implemented at The Open University in its aims to "strike the right balance between digital augmentation and the human element in providing accessible services" (McAndrew, Farrow, & Cooper, 2012, p. 16).

9.5.1 Implications for practice

While Chapter 9 has shown that there are inherent challenges in accessible MOOC production, they are integral to any online learning course production in an agile development methodology. As a general approach, online course providers should seek a better understanding of their learners and their needs. The interests of learners with accessibility needs are varied and findings from previous research have not focused on accessibility. Any online course development processes need to be reviewed from the early design stages to produce accessible content, and the focus should change from meeting legislative requirements to actually meeting learners' needs. Therefore, to make online courses more accessible, it is necessary to put in place processes to identify accessibility barriers, to strengthen mechanisms that involve the participation of learners in course design, and to facilitate agile response in addressing barriers.

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Chapter 10

Internet kiosks in Uganda

A window of opportunities?

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10.1 Introduction

Despite the massive expansion of education in Africa through the various global
development frameworks in the last three decades, including the current Sustainable
Development Goals (UN, 2015), several challenges remain which the international
community has described as a "learning crisis" (World Bank, 2018). The evidence
shows that African countries exhibit the highest population of out-of-school chil-
dren for all school-age groups (UIS, 2019). Besides, data on the quality of schooling
indicate that approximately 202 million children are not attaining minimum pro-
ficiency in literacy and numeracy even after several years of attending school (Bold
et al., 2017). The reasons for these low learning outcomes are multifaceted; how-
ever, a fundamental determining factor is the lack of essential instructional resources
(Figa et al., 2020). Looking at Uganda, the focus of this research, the government
proposed a new education curriculum in 2018, formulated in 2019 to address the
low learning outcomes (World Bank, 2019). However, this policy reform was not
aligned with the development and distribution of instructional resources. Many
schools lack basic infrastructure and teaching resources to support this new cur-
riculum (Tromp and Datzberger, 2019).

In addition to technical skills such as literacy and numeracy at the heart of the
learning crisis narrative, the inclusion of a broad array of soft skills competencies,
also known as 21st-century skills such as computer literacy, collaboration, confi-
dence, communication skills, critical thinking, decision-making and problem-
solving have been emphasised as an essential component of education in the
rapidly changing labour market (Joynes et al., 2019). It has been outlined that
these skills extend beyond the work environment as individuals translate the
acquired knowledge into beneficial, practical action that impacts all areas of their
lives (Reece and Reece, 2016), leading to an improvement in their quality of life
(Joynes et al., 2019). Although many countries in Africa acknowledge the impor-
tance of soft skills in their public policy (Care et al., 2016), limited evidence exists
of how these skills have been integrated into the education curriculum in practice
(Kim et al., 2019).

Due to formal education deficiencies, non-formal learning opportunities have
become a core component of knowledge acquisition and livelihood improvement

in Africa (Yasunaga, 2014). Information Communication Technology for Development has been associated with bridging these gaps (Jordan, 2020). However, many low-income communities in Africa cannot afford to access ICT on their own and therefore experience a digital divide, described as disparities in the access and use of ICT (Van Dijk, 2017).

To bridge this digital divide, Community Technology Centres (CTCs), which are public-shared access to ICT resources with computers, Wi-Fi and, in some cases, mobile devices have been deployed in low-income contexts (Nemer, 2018b). Studies assessing CTCs in Brazil and Kenya indicated these facilities provide positive benefits that enable users to access information on education, health, current affairs (Wamuyu, 2017) and provide a social space to address individual and community needs (Nemer, 2018a).

Additionally, similar studies have focused on how CTCs could support educational outcomes in the Global South (e.g., Dangwal et al., 2014; Mitra, 2014; Mohamud, 2016). However, the evidence showed most studies focused on the wider Global South with limited focus on Africa. Furthermore, although many young people are not attending school, as the data suggest, they may be involved in non-formal learning contributing to lifelong learning (Yasunaga, 2014). Chapter 10 explores the impact of Internet Kiosks, a CTC intervention in Uganda on users' learning outcomes and influence on the quality of life.

Moreover, studies on CTCs have often focused on reporting tangible positive contributions limiting the intangible contributions (Osman and Tanner, 2017; Tabassum et al., 2019), and scarce evidence exists on associated threats, particularly in the African context (Livingstone et al., 2017). This chapter presents a holistic assessment of impacts comprising three perceived influences identified by young people (in-school and out-of-school) and adults who were users of the Internet Kiosks in Uganda.

10.2 Theoretical framework and methodology

The theoretical framing in Chapter 10 is based on the view that individuals are embedded within their context and are influenced by the cultural and social practices of the society they live in, drawing on (Vygotsky, 1978) sociocultural perspective. It draws on knowledge construction as an enculturation process that incorporates tools as organising resources integrated into participants' meaning-making processes. Tools include symbols and other devices (Lave, 1988) including ICT. Meanings are constructed through interpretation of situations and objects based on previous knowledge and experience (Zittoun and Brinkmann, 2012). This proposition provided a foundation for understanding how the research context influenced the Kiosks' communities' perception and determined how they engaged with them.

This chapter's findings were part of a larger research project conducted in 2018 at two urban low-income suburbs in Uganda. Skills to Survive [pseudonym], a UK-based organisation, partnered with a local organisation and built two outdoor solar-powered Internet Kiosks in October 2015, each equipped with wireless

Internet and two computers with educational software. One Kiosk [Kiosk A] was located in a local primary school [Hillside school] and the other [Kiosk B] in a busy market area approximately six kilometres from the school. Each Kiosk had two sides: one side with a lowered computer screen intended for children and a higher screen on the opposite side intended for all other users. Chapter 10 focuses on the following research question: What are the perceived impacts of the Kiosks on users (young people and adults) at the two sites in Uganda?

10.2.1 Methodology and analysis

Chapter 10 adopted a qualitative case-study research methodology. A purposive sampling through gatekeepers and a snowballing technique were used to select participants who could provide information on this study's research objectives. A total of 50 participants (26 young people; eight adult users of the Kiosks, including four teachers; 13 young people's carers; and three young people's teachers) participated in this research. The data generated were drawn from twelve focus group discussions (FGDs) with young people (45–60 minutes per FGD), semi-structured interviews with all 50 participants (30–60 minutes per interview) and field notes. The focus groups and interviews were conducted in a quiet location familiar to participants and done in the language participants preferred (either English or Luganda, which the first author speaks). All the data were transcribed and analysed following Braun and Clarke's (2006) thematic analysis approach on NVivo 12. Based on the analysis, quotes that are most representative of each theme were selected for presentation in this chapter.

10.3 Findings

Three main themes emerged from the thematic analysis encompassing perceived opportunities, perceived influence on users' quality of life and threats. This section explores these sequentially.

10.3.1 Perceived opportunities

The data on perceived opportunities demonstrate how the Kiosks created a potential for users according to their interests and abilities, thereby providing them with relevant skills and knowledge that supported their activities. Users valued the Kiosks outlining, "It has helped us to nurture our talents…." (Jason, adult, Kiosk A) and described the changes that came in their life through their engagement. One out-of-school participant framed it as "… For me the [Kiosk] opened up a world that I would have never seen" (Suleiman,16, out-of-school boy, Kiosk A). The purposes of use that were key to facilitating opportunities were different for young people and adults and depended on whether users were enrolled in school/college or not. Users' descriptions of the Kiosks' perceived opportunities were grouped into three sub-themes: learning; instructional resource support; and computer literacy.

10.3.2 Learning

The findings highlight that the Kiosks opened up new learning opportunities for all participants and is presented as follows: In-School Young people; Out of School Young People; and Adults.

10.3.2.1 In-School Young People

Young people who were enrolled in school felt the Kiosks supported them in learning a range of topics related to their school subjects.

> I have been able to expand my knowledge on various subjects. Instead of having to wait for the teacher to tell me everything in my school subjects… […] the [Kiosk] has helped me to be ahead… and even when we have not been taught something but it is part of the syllabus for the term, I used to do research on it. In History… 'Ngoni migration'; 'Nyamwezi'; 'the history of Maasai'. … chemistry, I learnt how to balance chemical equations through watching YouTube videos on balancing equations. …Statistics, I watched videos that helped me learn how to find the class boundary, cumulative distribution function, probability density function, linear regression, multiple regression… …its simplified things for me.
>
> (Garry, 16, in-school boy Kiosk A)

Most young people enrolled in school outlined the media resources facilitated better understanding of new concepts compared to what they were taught in class.

> Because on that computer we see them, but in the books, in the teacher's notes, they don't show them to us. They show us only their functions and words but don't show us their pictures. So, on that computer we see their pictures, functions and get more functions than in the books [teacher's notes].
>
> (Shaheen, 16, in-school girl, Kiosk A)

The evidence particularly indicated that the Kiosks supported young people's understanding of concepts in science and mathematics disciplines, explicitly outlining how the digital resources stimulated their comprehension of topics in these disciplines.

> I wanted to learn and understand paper chromatography… I read on the topic separating mixtures on BBC bitesize and watched some videos on Khan Academy on this topic, the videos simplified things for me because I understood things better than in class.
>
> (Gift, 15, in-school girl, Kiosk A)

Many participants reported that the research they conducted at the Kiosks' computers had a positive influence on their overall school performance.

> Actually it [the Kiosk] has helped me much because I was not performing well in Biology… But now the last two terms I got a D1 [Distinction 1 ranges from 85 to 100 percent] in Biology after searching on that computer. But before I used to get F9, C5 [lower grades as per the Ugandan education grading system].
>
> (Shaheen, 16, in-school girl, Kiosk A)

Participants' teachers also acknowledged that the Kiosks had a positive influence on students' overall performance. For example, in the case of Shaheen above, her Biology teacher commented "…whatever she is doing has improved her performance…" (Mr. Williams, Shaheen's teacher).

10.3.2.2 Out of school young people

Young people who were not enrolled in school noted the Kiosks supported them to learn concepts they felt were important to their daily activities. They also indicated using the Kiosks to engage with specific aspects of the school curriculum they felt were essential to supporting them with their tasks.

> I learnt farming methods that prevent soil erosion like contour farming and planting trees to break the wind. As you can see our land here is very hilly, in the rainy season I used to lose a lot of crops but now that has reduced. […] I also learnt about some farming tools that I did not know about like dibber… Because I am a farmer, I needed to know maths so I can count when I am planting and harvesting and even when selling my fruits and vegetables. So, I went and started learning on that [Kiosk] addition and subtraction on Khan Academy. … As I told you I stopped school some years ago, so I had forgotten what I learnt then.
>
> (Salim, 14, out–of–school boy, Kiosk B)

Out of school participants also indicated the Kiosks supported them in attaining skills for specific interests they had.

> It has been helping me to learn about photography and photo editing. Now there is a photography shop near here that I volunteer at…
>
> (Suleiman, 16, out–of–school boy, Kiosk A)

10.3.2.3 Adults

The findings illustrate that adult users utilised the Kiosks to learn about entrepreneurial concepts that facilitated enhancement of an existing business or stimulated innovative ways of income generation. For instance, Eddie noted the Kiosk provided him with access to entrepreneurial information enabling him to establish a small-scale business.

> For me I didn't have the courage to open up a business and I thought you need a lot of capital to open up a business. But one day… read a bit about small scale business, how to open up a small-scale business, what do I need? what do I have to know about it? and what should I focus on? … I didn't think I was able to start up something… After I realised that, then I… got determined to open up this business.
>
> (Eddie, adult, Kiosk B)

10.3.3 Instructional resource support

As established in the context section, Kiosk A was located at Hillside school. Teachers felt the Kiosk supported instruction at the school by bridging its educational resource constraint.

> I use it [Kiosk] when… we are learning about the skeleton because we don't have these physical parts of a skeleton. …we usually go to the [Kiosk] computer, we type in and different structures appear, then a child is able to identify how a skeleton is…
>
> (Ms. Elaine, teacher, Kiosk A)

Ms. Jane, another teacher stated:

> …I take my kids to see what I teach physically at the [Kiosk], so it helps me to simplify my work as a teacher…
>
> (Ms. Jane, teacher, Kiosk A)

Ms Jenna, another teacher explained the significance of the Kiosk in her lesson planning:

> Some books we use are not up to date, there are missing some things. So, when I need to teach kids something and I fail to get from the book they [the school] have given me, I go to the [Kiosk] I search for that thing.
>
> (Ms. Jenna, teacher, Kiosk A)

By complementing teaching at Hillside school, the findings show Kiosk A positively impacted the school's reputation.

> …many people have picked interest of bringing their children to us. …they know we have free internet; we can easily search and get to know what we don't know, that means the academic standard is now improving than before. …previously if you come across a question I didn't know, I just left it out and skipped it… I wouldn't give to the pupils because even as a teacher I don't know the answer. But now I can come across a question I do research on the [Kiosk] and once I get its explanation and understand, I teach it to my students.
>
> (Ms. Elaine, teacher, Kiosk A)

10.3.4 Computer Literacy

Most young people underlined the Kiosks were their first interaction with computers and indicated learning basic operating systems functions, Microsoft Office, and Internet functioning. As a result, participants felt confident that they could now use the computer and Internet independently.

> …it has taught me so many things, I didn't know how to use a computer but now I know, I have learnt how to use Microsoft word, PowerPoint and searching on the internet.
>
> (Ross, 15, out-of-school boy, Kiosk A)

Some teachers also pointed out that Kiosk A was their first engagement with computers, providing them with the chance to develop computer literacy with the assistance of colleagues.

> I am one of the teachers who at first didn't know how to use a computer totally. But since we had that computer, [Elaine, another teacher] has been helping me a lot in learning the computer because she learnt computer studies.
>
> (Ms. Jessica, teacher, Kiosk A)

10.3.5 Perceived influence on users' quality of life

The second theme that emerged under opportunities was the influence on the quality of life, which explores both tangible impacts encompassing the Kiosks' economic impact and intangible impacts that contributed to users' overall well-being. These intangible impacts comprised of social impact, collaboration skills, leadership skills, problem-solving skills, increased motivation and self-belief and community learning beyond Kiosks' users. The majority of stories and testimonials show that the access to ICT at the Kiosks provided users with the possibility to improve their quality of life through continuous knowledge access and connectivity. Many participants felt they had evolved as a result of the knowledge they acquired. In the words of one participant:

> This would never have happened if the [Kiosk] was never there. So, the [Kiosk] was the main source of knowledge for me with everything I learnt because I started with the [Kiosk]. At that time, I didn't have even 1000 Uganda Shillings [$ 0.27] to buy data bundle to put on my phone. […] I have been able to get jobs through social media… […] It's because the main source of knowledge was the [Kiosk]. If they repair the [Kiosk], I think you can get ten [Jasons] from the [Kiosk] because it has promoted me.
>
> (Jason, adult, Kiosk A)

The findings indicate the Kiosks provided adult users with access to resources that enabled them to elevate their economic livelihood, leading to an improved quality

of life. For Eddie, the Kiosk built his capacity to have the confidence to start a small-scale business that grew to become a photography studio and electronic accessories shop. Jason, another adult user, noted that Kiosk A provided him with the opportunity to generate income from YouTube vlogging.

> …the [Kiosk] has helped us… I used my YouTube channel I post there my videos and get views and then they pay me… Last year they [YouTube] gave me 47,000 Uganda Shillings [$12].
>
> (Jason, adult, Kiosk A)

Some users identified that the Kiosks provided them with an opportunity to earn an income. In the case of Ms Jane, she described the changes that occurred in her life due to the financial assistance she obtained from the online connections she made at the Kiosk.

> …When I went, I opened Facebook and Gmail and I got friends who help me because they send me help from abroad even my kids have got sponsors which I think there are others who have benefited like me from the [Kiosk]. Before the [Kiosk] came I was so badly off girl what I am telling you, that's the fact I was in a small house, I couldn't afford to pay for my kids' school fees, but when those people came [Kiosk developers] and they opened for us Facebook so we got many successful friends abroad.
>
> (Ms. Jane, teacher, Kiosk A)

Some users also noted gaining employment opportunities on social media via the Kiosk.

> It [the Kiosk] has helped me to get a job on Facebook, the other time when I was looking for a job everywhere, I found the job at the construction place up there on Facebook. They advertised it in a Facebook group.
>
> (Fuad, 17, out-of-school boy, Kiosk A)

The findings show that the Kiosks became important spaces where users strengthened social ties with their community through their interactions at the Kiosks. Many young people indicated they made new friends as a result of their engagement with the Kiosks.

> I had just moved here when the [Kiosk] was built. So, I was still new and through the [Kiosk] I made new friends. So, the [Kiosk] helped me to make new friends and to fit in, in this community.
>
> (Garry, 16, in-school boy, Kiosk A)

In addition to the in-person interaction, most participants talked about the Kiosks offering them new opportunities to nurture relationships with people in other

geographical locations, nationally and internationally, creating a sense of connection to a broader world.

> I found a way of communicating with my dad [in Abu Dhabi] at this [Kiosk], before I used to wait for him to call us once per week, but now I communicate with him directly through Facebook.
>
> (Gift, 15, in-school girl, Kiosk A)

Adult users particularly emphasised speed and ease to which they were able to communicate improved their relationships with others.

> I've been connected to friends than before, so it has made my communication easy because sometimes mostly on WhatsApp… I could take a long time without loading airtime. But now with the WiFi of the [Kiosk] communication has become fast and easy; I just communicate on WhatsApp with our supervisors… So, it has made communication easy for me.
>
> (Ms. Elaine, teacher, Kiosk A)

Many young people appreciated the Kiosks' collaborative nature, indicating that it encouraged them to develop collaborative skills.

> It makes me work together with other people and you show them the question or a problem… It promotes unity when you are working together because other children come and then you work together the question and then you get the answer, that's the opportunity I get from the [Kiosk].
>
> (Patricia, 13, in-school Kiosk A)

Furthermore, many young people identified a heightened feeling of accomplishment after achieving their goals and indicated that their motivation increased as a result.

> …like in my group at school they can say that you have the answer okay you give us, and it makes me feel good because I am becoming a leader. Because I know my group depends on me for answers, my interest in my studies increased and I do a lot of research.
>
> (Jacob, 14, in-school Kiosk B)

Several participants also expressed becoming competent in what they had learned at the Kiosks, which suggested an improvement in their self-belief and confidence.

> I had a problem I didn't know anything, like I told you I dropped out in primary three, but ever since they brought that computer, then I started using it for reading and all, now I can read, I can speak English. Now I know something, there is a change on my life because of that computer.
>
> (Ross, 15, out-of-school boy, Kiosk A)

10.3.6 Perceived threats

Despite the numerous opportunities, the Kiosks provided for all participants, a significant threat that emerged from the data analysis was the threat of children being exposed to pornographic content on the computers at the Kiosks.

> …those elder men watch blue movies [pornography] during the day when us children are there, and many children end up seeing things they should not be seeing.
>
> (Jacob, in-school boy, Kiosk B)

Although the threat of pornography was present at both Kiosks, the data shows that this threat's frequency was lower at Kiosk A than B, where a committee to oversee the Kiosk and the school established measures to mitigate it.

> So how we did to control that [pornography], we make sure for example for my case since I live here within the school, I make sure every morning… I could come here earlier than the pupils then I put it [the computer] on and I check what is there and remove anything that is inappropriate that a kid can come across. If it's not there, I would just leave. So, this is how we are trying to control this.
>
> (Ms. Elaine, teacher, Kiosk A)

10.4 Discussion and moving forwards

Chapter 10 presents a holistic assessment of impacts comprising three perceived influences encompassing opportunities, the effect on the quality of life, and threats identified by users of the Kiosks in Uganda through the sociocultural lens. The findings reported in this chapter shows the Kiosks had numerous positive impacts on users. The evidence on learning demonstrates how the Kiosks supported young people enrolled in school to learn a range of school topics and illustrates how the media resources facilitated understanding of new concepts, particularly in science and mathematics disciplines. Many of them reported that the Kiosks positively influenced their overall performance, with some explicitly indicating improvement in their grades. These findings align with similar previous studies (such as Dangwal et al., 2014; Mohamud, 2016). These results contribute to this literature by presenting evidence from an African context demonstrating explicit areas to which the Kiosks supported young people's school learning. Teachers who participated in this research also outlined that Kiosk A helped bridge the educational resource gap at Hillside school, indicating they utilised the computers to demonstrate the concepts they taught and provided them with relevant teaching content. Overall, this evidence suggests that the Kiosks helped bridge some of the educational resource gaps outlined in this chapter's introduction encountered in this research context.

The findings further demonstrate how the Kiosks supported out-of-school young people to engage with school curriculum aspects that supported their daily

activities. This finding adds depth to the literature focusing on how ICT could be used in non-formal contexts (such as Yasunaga, 2014) to support out-of-school children. The quotes from the out-of-school participants demonstrate how a more nuanced approach can help them acquire relevant knowledge to navigate their everyday experiences. Additionally, the Kiosks provided adult users with entrepreneurial knowledge that facilitated improvement in their livelihood. Most participants also expressed that they had developed basic computer literacy through self-directed learning and assistance from peers, a finding that echoes similar CTC studies (such as Wamuyu, 2017). The data also shows that some users, particularly young people, shared the knowledge acquired with peers, teachers, and their families, suggesting that the Kiosks' positive influence benefitted a wider community.

Furthermore, adult users and out-of-school young people noted that the Kiosks provided them with access to resources that helped improve their economic livelihood. Some stated that the entrepreneurial concepts learnt at the Kiosks enhanced their existing business, and others highlighted accessing employment opportunities and resources that stimulated innovative ways of income generation, suggesting the Kiosks promoted improvement in users' life quality. Many participants also reported that the Kiosks provided them with an opportunity to emerge as leaders as they assisted other users. Some participants also pointed out that the knowledge they acquired at the Kiosks provided them with the competence to implement what they had learned, suggesting that the Kiosks increased their confidence and self-belief. This evidence addresses the identified gap in the literature on soft skills development discussed in the introduction of this chapter by demonstrating how non-formal learning contexts such as the Kiosks examined here begins to bridge this gap for low-income communities in Uganda. It also contributes to the anecdotal research on the intangible influences of CTCs (such as Osman and Tanner, 2017; Tabassum et al., 2019).

The findings on social impact demonstrate that the Kiosks became vital social spaces where many users fostered social ties with their community through interactions at the Kiosks. Many young people linked this to the Kiosks' collaborative nature, where they shared a computer and developed a peer learning process to address questions and assisted each other in using the computer. These findings contribute to the anecdotal data on social practices afforded by CTCs (such as Nemer, 2018a) by presenting evidence from an African context. It also shows how the Kiosks provided many users with an opportunity to build online connections and relationships that afforded them new learning opportunities, better communication, and some of them obtained new income possibilities. This evidence suggests that the Kiosks contributed to the improvement of users' quality of life.

While the Kiosks provided numerous opportunities to the users in the low-income communities where they were built, the findings show that the threat of children encountering pornographic content on the computers due to some adults accessing them had a negative implication. This finding contributes to the literature on children's online risks (such as Livingstone et al., 2017) by providing evidence from a Global South perspective where data has been identified to be scarce. Although this threat was present at both Kiosks, the data shows a difference in impact at the two Kiosks as the school and committee overseeing the Kiosk

established a measure to mitigate this threat. This finding proposes a need for consideration on how this threat is mitigated when CTCs are being designed. Despite this threat that needs to be addressed, the findings demonstrate the Kiosks created opportunities for users in this low-income context. Although this research was limited to the specific low-income communities in Uganda, its findings have implication for stakeholders to inform implementation of CTCs in similar contexts.

10.4.1 Implications for practice

Chapter 10 provides insights into how CTCs could support education in low resource contexts and demonstrate how out-of-school young people can be supported through non-formal learning to acquire relevant skills to help them navigate their everyday experiences. The Kiosks' tangible and intangible impacts demonstrate how CTCs can support low-income communities in this context to achieve their desired goals and facilitated soft skills development. This evidence provides an insight into how underserved communities in Uganda and similar contexts can be supported through CTCs to create changes in quality of life.

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Chapter 11

Eliciting students' preferences for the use of their data for learning analytics

A crowdsourcing approach

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11.1 Introduction

Higher education institutions (HEIs) collect and use student data to improve operations and course delivery (Siemens, 2013), for research purposes (Griffiths, 2017), and to improve teaching and learning in a process referred to as learning analytics (Long & Siemens, 2011). Examples of such uses are illustrated in Chapter 8 (Rizvi, Rienties, Kizilcec, & Rogaten, 2022) and Chapter 14 (Nguyen, 2022). With the growing shift to blended and online learning in higher education, virtual learning environments (VLEs) facilitate the collection of data about whether and how students interact with learning resources. VLEs are designed to record a vast amount of information about students' behaviour, including number of clicks, time spent on the VLE, number of videos viewed, and number of forum posts (Rizvi, Rienties, Kizilcec, & Rogaten, 2022). This information may be used as a proxy for student engagement with a course, and to predict student success. Furthermore, the insights allow HEIs to improve educational practice in teaching and learning (Nguyen, 2022). Student support teams can identify students thought likely to drop out or fail the course (Foster & Siddle, 2020; Herodotou et al., 2017). These predictions can be made sufficiently early to allow tutors to intervene and support students to improve their performance and outcomes.

The institutional use of student data to facilitate various forms of student success has given rise to ethical and privacy concerns (Ferguson, 2012; Siemens, 2013; Slade & Prinsloo, 2013). Ethics in learning analytics may be understood as "the systematization of correct and incorrect behaviour in virtual spaces" (Pardo & Siemens, 2014, p. 439). Ethical considerations focus on issues such as morality, student identity, and the institutions' obligation to use student data (Slade & Prinsloo, 2013). Privacy in learning analytics may be understood as "the regulation of how personal digital information is being observed by the self or distributed to other observers" (Pardo & Siemens, 2014, p. 438). The value of privacy lies in its ability to promote relationships and autonomy, allowing people to limit what is known about them and to make decisions based on their values, without outside interference (Rubel & Jones, 2016).

Empirical research has consistently demonstrated that students are often unaware of the use of their data for learning analytics (Jones et al., 2020; Roberts, Howell,

Seaman, & Gibson, 2016), and the student data their institution collects (Sun, Mhaidli, Watel, Brooks, & Schaub, 2019). When informed about potential uses of their data, students express varied responses: such as indicating a lack of concern about the use of their data in cases where the recipient and data uses are made clear (Vu, Adkins, & Henderson, 2019), and accepting institutional use of their data to benefit their learning (Slade, Prinsloo, & Khalil, 2019). At the same time, students also express concern, for instance, about being surveilled or tracked (Slade & Prinsloo, 2014). Consequently, there seem to be inconsistent perceptions of students and privacy concern in learning analytics.

An area for further research, within the context of student privacy and learning analytics, is that of students' perceptions of the transactional nature of learning analytics (Ferguson, 2019; Wintrup, 2017). Students are asked (or are presumed) to consent to the use of their data for learning analytics so that data can be used for potentially beneficial purposes such as the provision of learning recommendations, or recommendations for remedial action and to improve student performance (Ho, 2017; Siemens, 2013). Use of student data in these ways has potential for privacy harms, that is, possible injury to students through the collection and use of their data (MacCarthy, 2014). This includes loss of autonomy (Rubel & Jones, 2016), profiling, and identification of the individual whose data is used (Solove, 2009). While there is insightful research on students' perspectives of the ethics and privacy of learning analytics, little is known about students' perceptions of this risk/benefit trade-off and their preferences for the use of their data. Chapter 11 offers additional insights in this context.

11.1.1 Empirical research on students and privacy in learning analytics

Findings from a number of studies converge on a common theme that students lack an awareness of learning analytics and about how their data is used for this purpose (Jones et al., 2020; Sun, Mhaidli, Watel, Brooks, & Schaub, 2019). In general, where they are informed about learning analytics, what data is used, and for what purpose, it might be argued that students appear positive about institutional use of their data to enhance their own and other students' learning. This is based on data collected using semi-structured interviews with 112 undergraduate students across eight universities in the USA (Jones et al., 2020). Other work, with a sample of students at a UK university, involving a survey (with 674 students) and focus group discussions (with 26 students) (Tsai, Whitelock-Wainwright, & Gašević, 2020) supports this perspective, as students in the focus groups indicated their support for institutional use of their data, but only for what they considered as legitimate purposes, namely, to comply with legal requirements, to improve educational services, and to improve the university's overall performance. It is noted that this positive perspective is conditional, thus, it is not clear whether negative perceptions of data use might arise in cases where there is insufficient institutional transparency surrounding use of student data.

One possible benefit of transparency about institutional use of student data is a reduction in privacy concerns as suggested by the work of Vu, Adkins, and Henderson (2019) who distributed a survey to 1,647 students at various HEIs in the USA. However, as previously stated, there are mixed results within the context of students' privacy concerns about data use for learning analytics. In contrast to the findings of Vu, Adkins, and Henderson (2019), students in the study by Ifenthaler and Schumacher (2016) were willing to share data related to their studies, but were less willing to share personal data or data trails collected from their use of a VLE. More specifically, of the 333 students who filled out the survey, 84% were willing to share course enrolment data, compared to 8% who agreed to share their medical data, and 9% who agreed to share their online user path for learning analytics purposes.

The role of students' acceptance of data use in exchange for learning-related benefits has been examined qualitatively in work by Tsai, Whitelock-Wainwright, and Gašević (2020) and quantitatively in work by Slade, Prinsloo, and Khalil (2019). In the latter case, the authors indicate that 74% of the 215 study participants stated that they were comfortable with the collection of their personal data in exchange for benefits such as personalised support. However, to the best of our knowledge, there is currently limited to no empirical research that has explored students' perspectives of the privacy risks inherent in the use of their data for learning analytics.

The privacy calculus theory and findings from related research (Dinev & Hart, 2006; Laufer & Wolfe, 1977), suggest that there is a relationship between both perception of privacy risks and benefits of data use, and willingness to share personal information. Specifically, where there is a high perception of privacy risk, users are less willing to transact with their personal information (Dinev & Hart, 2006), whereas users expecting to receive benefits are observed to share more data (Li, Rathindra, & Xu, 2010). Therefore, the following research questions were identified for Chapter 11:

1   To what extent does an awareness of the possible privacy risks and/or the benefits of data use for learning analytics influence students' data use preferences?
2   What do students indicate as the motivation for their data use preferences?

11.1.2 Methods

11.1.2.1 Setting and participants

Using the crowdsourcing platform Prolific, a sample was drawn from UK-based students. We sought to recruit an equal number of male and female participants. With respect to participants' ages, research findings have demonstrated that older adults express higher levels of privacy concern than younger adults (Black, Setterfield, & Warren, 2018). Therefore, we recruited participants aged between 18 and 25 years to enhance our evaluation of the influence of the interventions. A

total of 447 participants took part in the study. There were 216 male (48.3%) and 231 female (51.7%) participants. The mean age was 20.6 (SD = 1.86). Most of the participants (409–91.5%) were studying at university and the remainder were in further education (38–8.5%).

11.1.3 Study materials

All participants were shown a sample learning analytics dashboard (Figure 11.1), a data use preference prototype (Figure 11.2), and the privacy risks and/or benefits interventions (Figure 11.3). The latter was not provided to participants in the control group. The design of the sample learning analytics dashboard was based on the OU Analyse interface (Kuzilek, Hlosta, Herrmannova, Zdrahal, & Wolff, 2015) and was simplified to maintain participants' focus on the study aims.

The data use preference prototype showed participants two types of data that can be used for learning analytics, specifically data about the student and data about the students' activities on the online learning platform (Sclater, Peasgood, & Mullan, 2016).

The privacy risks intervention was developed using Solove's (2009) taxonomy of privacy harms. The first risk (1) is referred to at the beginning and end of the description. It relates to the information collection category of the taxonomy and the risk of surveillance. The second risk (2) falls under the information processing category of the taxonomy, and the risk of aggregation. The third risk (3) is also in the information processing category of the taxonomy, under the risk of identification. Additionally, the benefits intervention presented nudging, prediction, and recommendation of learning resources as benefits for students based on the use of their data.
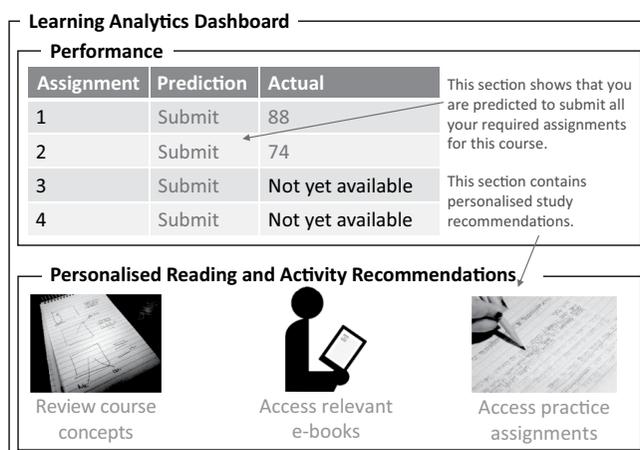
Figure 11.1 The sample learning analytics dashboard.

> **Data about myself, for example:**
>
> • Age
> • Gender
> • Previous education
> • Number of course attempts
>
> **Data about my activity in the virtual learning environment, for example:**
>
> • Activity on the student forum e.g. forum posts
> • Activity interacting with the course content e.g. downloads
> • Interaction with course material e.g. reading text
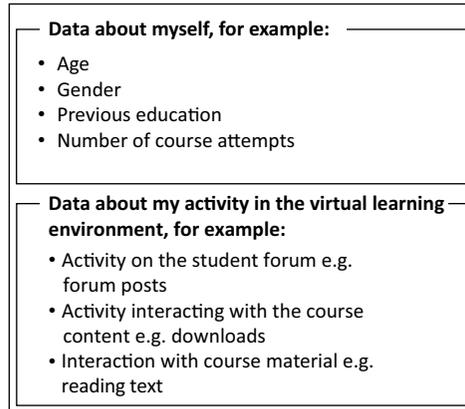
Figure 11.2 Examples of student data used for learning analytics.

Possible privacy risks of data use

We will monitor what you and other students are doing on the online learning platform [1]. Data that you and other students have provided to separate information systems at your learning institution (for example during registration) will be combined to form a digital profile [2]. The digital profile can be linked to the individual student [3], and this information will be used to make decisions about you and other students, such as predicting your performance and giving you study recommendations [1].

Possible benefits of data use

We can offer you personalised support to help you complete the course, including nudging to submit assignments or follow up from the student support team. We can also provide you with personalised recommendations of learning materials that can improve your understanding of the course material.

Figure 11.3 Descriptions of the privacy risks and benefits.

11.1.4 Study measures

Three measures of data use preferences, concern over data use, and concern over privacy risks were created. It was necessary to create these three measures as there was limited research on students' data use preferences in the learning analytics context, and therefore there were few opportunities to identify questions from related research as recommended in best practice for questionnaire design (Bryman, 2016; Groves et al., 2009).

Four other study measures were obtained from published research. The scale perceived usefulness of learning analytics was adapted from Arbaugh (2000) who developed it with 114 students in a study on student satisfaction with MBA courses. The sharing data scale was developed with over 300 students in Germany (Ifenthaler & Schumacher, 2016). The scale perception of benefit from data use for learning analytics was adapted from Naeini et al. (2017) who used it with 1,014 participants in a study on privacy preferences in the Internet of Things. Finally, the Internet

Users Information Privacy Concern (IUIPC) scale (Malhotra, Kim, & Agarwal, 2004) was developed in two studies with over 700 participants and has been used extensively to measure users' privacy concerns. The scales used in the study were modified to include a "not applicable" option following recommendations by Aldridge and Levine (2001) and Krosnick (2018) to allow participants to respond even if a question did not apply to them. Additionally, attention check questions were used to ensure that spurious data could be detected in the data cleaning phase (Egelman, Chi, & Dow, 2014).

11.1.5 Study design and procedures

A between-subjects design was used where each participant was randomly assigned to one of four groups: the risks group, the benefits group, the risks and benefits groups, and the control group. After providing consent to take part in the study, participants indicated their data use preference (pre-test), choosing between preferring to share no data, only data about themselves, only data about their activities on the learning platform, or both data about themselves and their activities on the learning platform. They were given brief background information on learning analytics and then viewed the sample learning analytics dashboard. In the experimental condition participants were shown the intervention, and afterwards they indicated their level of concern for the stated privacy risks and their perception of the benefits. Participants were then asked to assess the usefulness of the learning analytics dashboard features and indicate whether they were concerned about the use of their data. They again provided their data use preferences (post-test) and indicated their general privacy concern, before providing demographic information at the end of the study.

11.2 Results

11.2.1 The influence of risks and benefits awareness on participants' data use preferences

In terms of RQ1, the descriptive statistics for participants' data use preferences in terms of the mean and standard deviation are shown in Table 11.1. There was a decrease in the mean values (post-test) for the control group and the risks group, and an increase in the mean values for the benefits group. At the same time, the mean values for the risks and benefits group remained unchanged. In other words, the results suggest that the awareness intervention might have had an influence on participants' data use preferences in the risks, and in the benefits group, but made no difference in the risks and benefits group. It might be that any increase in participants' data use preferences (thereby indicating a willingness to share more data) resulting from the benefits intervention was tempered by the risks intervention.

There was a slight decrease comparing the overall post-test and pre-test mean scores (pre-test mean = 3.03, SD = 0.90; post-test mean = 3.00, SD = 0.94). A paired samples t-test revealed that these differences were not statistically significant

Table 11.1 Descriptive statistics of students' pre-test and post-test data use preferences by experimental group

Condition	Data use preference pre-test		Data use preference post-test		
	Mean	Std. Deviation	Mean	Std. Deviation	N
Control	3.09	0.976	2.97	0.98	128
Risks	2.93	0.906	2.89	0.934	104
Benefits	3.04	0.858	3.07	0.906	104
Risks and benefits	3.05	0.824	3.05	0.923	111

($p > .340$). A one-way ANOVA revealed no significant differences among the means of the four groups on pre-test data use preferences ($F(3, 443) = 0.637, p > .590$), and post-test data use preferences ($F(3, 443) = 0.786, p > .501$). Finally, using McNemar's test, as the variables were at the nominal measurement level, we determined that there was no statistically significant difference in participants' data use preferences pre- and post-intervention ($p > -.140$).

11.2.2 Motivation for participants' data use preferences

11.2.2.1 Theme 1: Support for institutional use of student data

Two main themes were identified from participants' open responses in order to address RQ2. The first theme indicated participants' support for institutional use of student data (49% of codes, $n = 238$), and participants gave several reasons for their data use preferences (80% of codes, $n = 190$ (out of 238 codes)), for example, that the data shared was sufficient or appropriate for the stated purposes (19% of codes, $n = 37$ (out of 190 codes)). Their perception of the data being sufficient took on several forms, for example, they shared what was most relevant (38% of codes, $n = 14$ (out of 190 codes)), was less invasive (19% of codes, $n = 7$ (out of 190 codes)), felt comfortable or safe for them to share (19% of codes, $n = 7$ (out of 190 codes)), or what they thought showed their engagement (11% of codes, $n = 4$ (out of 190 codes)). As participant 161 stated:

> Because that is directly related to my learning and doesn't take into consideration other factors which may not assess academic performance.
>
> (P161, risks group, Female, willing to share data about
> activities, no change in data use preference)

This code suggests that the way student data will be used is a useful information point in transparency initiatives as students might relate to one or more of the stated purposes, thereby agreeing to the use of their data, as seen in (Slade & Prinsloo, 2014).

Participants additionally expressed several expectations of what the learning institution should do with their data (9% of codes, $n = 21$ (out of 238 codes)). For example, they expressed an expectation for purpose limitation (33% of codes, $n = 7$ (out of 21 codes), that is, that only academic data would be used for academic purposes:

> I do not think it is appropriate to use data about a student's private life and background to make a judgement on their academic performance. It is not fair to do so, as it could lead to discrimination and unfair bias. A student's academic performance and private life should be separate and it is not the place of the university to be able to access that data or use it to judge a person's abilities. Their abilities should be judged solely on their present engagement with the course and their previous academic record.
>
> > (P269, control group, Female, willing to share data about activities, no change in data use preference)

Here we see the role that context plays in students' expectations of institutional data use. In contextual integrity (Nissenbaum, 2004), there are generally expectations around what information about a person can and cannot be revealed in a given context.

Finally, participants were observed to make trade-offs in data use for benefits even while supporting the use of student data (4% of codes, $n = 9$ (out of 238 codes)). For instance, participants indicated that they had shared just enough to protect privacy (44% of codes, $n = 4$ (out of 9 codes)), that they sought the best balance between privacy and services for students (22% of codes, $n = 2$ (out of 9 codes)), they were getting something back for their information (11% of codes, $n = 1$ (out of 9 codes)), and that the benefits outweighed the privacy risks (11% of codes, $n = 1$ (out of 9 codes)).

11.2.2.2 Theme 2: Hesitation about institutional use of student data

The second theme highlighted participants' hesitation about institutional use of student data (51% of codes, $n = 247$). Participants provided various reasons why they hesitated to share (all) their data. These reasons clarified why they chose to share some data, that is data about themselves or data about their activities (43% of codes, $n = 104$ (out of 247 codes)). One reason that participants agreed on was that personal details were either not needed or should not be shared (42% of codes, $n = 44$ (out of 104 codes)). A preference for privacy (23% of codes, $n = 24$ (out of 104 codes)) was another reason why participants hesitated to share their data, as participant 64 stated:

> I tend to avoid giving away personal information as I like to be private. Information about what I do on my university's learning platform is ok though.
>
> > (P64, risks group, Male, willing to share data about activities, no change in data use preference)

As explained previously, the context influenced the participant's data use prefer‐
ence, helping him make an exception because it was the university's learning
platform.

Furthermore, participants raised ethical and privacy considerations (35% of
codes, n = 87 (out of 247 codes)). Their responses captured their concern about
(potential) bias, discrimination, or prejudice (21% of codes, n = 18 (out of 87
codes)).

> I feel the knowledge of certain things such as my gender may be used to
> discriminate.
>
> (P412, risks group, Female, not willing to share data,
> change to prefer to share no data)

The example above demonstrates that transparency initiatives may cause stu‐
dents, where they can control whether their data is used, to prefer not to share
any data. As this participant was in the risks group, the change in their data use
preference was unsurprising. Transparency initiatives in learning institutions
should seek to balance information about privacy risks alongside information
about benefits, thereby enabling students to make informed decisions about the
use of their data.

Additionally, participants raised concerns that institutional use of student data as
described in the study could negatively impact students (18% of codes, n = 16 (out
of 87 codes)), for instance, that students would be pressured to behave in a certain
way:

> With more information, I could determine that the personal information used
> would be almost a breach of my privacy, and even giving away data about my
> use of the learning platform is somewhat private to me, as I would like to
> privately access learning materials without feeling pressure (for example if
> I downloaded some materials a little late in the course, or past a deadline).
>
> (P425, control group, Male, willing to share data about
> activities, change to prefer to share no data)

Finally, other concerns were raised including that the data use was privacy invasive
(8% of codes, n = 7 (out of 87 codes)), and that the data could only give a partial
picture of the student (8% of codes, n = 7 (out of 87 codes)).

There was some tension observed between understanding the need for data use
and discomfort with data use (12% of codes, n = 29 (out of 247 codes)) where
participants appeared in two minds about the use of data. Participants were seen to
express an understanding, for instance, that institutional data use was needed,
alongside seemingly contradictory views, such as expressing corresponding con‐
cerns about discrimination, or a sense that the data use was privacy invasive:

> I don't mind giving basic information about myself since that would be fairly
> easy to get anyway, but I do not like to have everything about me being

tracked even it could have some minor benefits to helping me improve my performance.

> (P424, Risks and benefits group, Female, willing to share
> data about self, no change in data use preference)

Finally, participants expressed a desire for boundaries or separation in data use across their personal lives and their lives as students (8% of codes, $n = 19$ (out of 247 codes)). They were keen to keep academic and private life separate or their online activity separate from student life:

> At first I thought it might be a good idea to share some data, but I believe that the suggested options of the data shared/what will be done with it oversteps its boundaries and could have negative effects on performance and mental health. I believe that if the only outcome of the data collection was to improve learning by providing support, then I'd be alright with sharing some of the suggested data.
>
> (P326, control group, Female, willing to share data about
> self and activities, change to prefer to share no data)

11.3 Discussion and moving forwards

In Chapter 11 participants were presented with privacy risks and/or benefits interventions to examine whether and how these would influence their data use preferences. While we observed slight changes to participants' data use preferences, these changes were not statistically significant (RQ1). Therefore, we analysed participants' open responses to better understand motivations for their data use preferences (RQ2).

We identified nuances in participants' responses as they expressed support for institutional use of student data for learning analytics alongside hesitation to support institutional use of student data. While one would expect either full support for use of student data or complete refusal to support the same, participants' responses suggested a middle ground where this apparent tension between support and hesitation co-existed.

Participants' responses indicated that they made trade-offs to arrive at what was an acceptable use of student data for them. This suggests a hidden negotiation process that students go through. Learning institutions can provide supporting structures such as inviting and publicly responding to students' questions on institutional data use to make these tensions and negotiations visible. There are also different student preferences to consider and support. While some students might want to choose what data is used, others may find this effort a step too far. However, this apparent apathy should not be construed as students lacking an interest in or having no concerns over the privacy of their data (Hargittai & Marwick, 2016).

Throughout Chapter 11 we noted that participants had contrasting views on what data was appropriate to share and why. For example, one student shared data about themselves saying that was less invasive, while another student shared data

about their activities on the online learning platform for the same reason. This suggests a need to enhance students' data literacy. For instance, they may not know that their personal data has less prominence in the statistical models over time and data about their activities on the learning platform becomes more important (Kuzilek, Hlosta, Herrmannova, Zdrahal, & Wolff, 2015). Additionally, it may be unclear whether sharing different data modifies the digital profiles created about students, how the resulting digital profile influences the benefits available to students, and the corresponding privacy harms. In this way, students can make more informed decisions about the use of their data which should be an aim of learning institutions' transparency initiatives.

11.3.1 Implications for practice

We recommend greater transparency from learning institutions about institutional uses of student data. This would require that the relevant content is made accessible and understandable for students, identifying what and how specific data is used for learning analytics purposes. This level of detail in learning institutions' transparency initiatives will be received positively by some students. Teachers can also support institutional efforts for transparency around data use by making students aware of when and how their course data is used for learning analytics. Furthermore, institutions should examine ways to empower students with respect to the use of their data by allowing them to indicate whether they want to participate in learning analytics, and which data items they would be willing to have used for the same. Whatever students choose, ethical practice places a burden on the learning institution to ensure that the benefits truly outweigh any harms.

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Chapter 12

Measuring player creativity in digital entertainment games using the Creativity in Gaming Scale

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12.1 Introduction

In 2020, the global population of gamers stood at 2.7 billion with an increase of over 6% globally from the previous year. Breaking this down further, those who play games have increased in all regions of the world, with the largest increase of gamers being in the Middle East and Africa, with a 14% increase from the previous year. This growth is even more prominent with the rise of smartphone usage and which is now the largest gaming platform in global terms (Newzoo, 2020). The increasing ubiquity of digital games, now widely available on a variety of different mediums including mobile, PC, console and streaming services, has meant that the benefits of gaming are reaching an even wider, more diverse demographic.

Digital games have been argued to be an effective medium to foster creativity as they encourage players to overcome challenging problems and actively experiment with different ideas and solutions free from external constraints (Leng et al., 2010). Games often comprise ill-structured challenges (e.g., problems with more than one solution) which have been argued to facilitate intrinsically motivating flow experiences leading to creativity (Kiili, 2005). The relationship between creativity and gameplay has been investigated by studies such as Moffat et al. (2017) who found that playing games contributes to a creative state of mind, and Blanco-Herrera et al. (2019) who identified a positive correlation between gameplay and trait creativity scores.

While general conceptualisations of creativity attempt to account for the many facets of, what has been argued to be, a multidimensional construct (Shute & Wang, 2016), they do not provide information on how creativity may manifest specifically within digital games. By understanding these unique manifestations of creativity, digital games may be used as an alternative, widely available tools for open-world learning. In this way, not only educators may select different games to develop creativity in students, but learners will have the autonomy to identify areas of creativity they wish to develop and select games according to their preferences.

12.1.1 Creativity in digital games

Hall et al. (2020a) attempted to classify the different ways creativity is expressed in games by identifying three main categories: *creativity as problem-solving, creativity as appropriation* and *creativity as affective change. Creativity as problem-solving* relates to the unique solutions and approaches to gaming problems that players create, and is likened to "Little C" (Kaufman & Beghetto, 2009) or "Everyday creativity" (Richards, 2007) in that the creative solutions/ideas are unique to the individual who creates them. Work such as Kiili's (2005) Experiential Gaming Model extrapolated how games facilitate creative problem-solving through an experiential process where players constantly testing, reflecting on, and refining solutions. Similarly, Iacovides et al. (2014) illustrated the unique approaches players create to navigating gameplay breakdowns, such as taking a break or using a trial and error approach.

Creativity as appropriation relates to the ways players go above and beyond what developers expect, personalising the gameplay experience (Herodotou et al., 2012). Appropriation includes emergent (Jarrett, 2014) and transgressive play (Aarseth, 2007) where players can combine game variables and mechanics in unintended ways, use glitches and create additional challenges such as speedrunning (i.e., completing the game in as short a time as possible). Furthermore, appropriation also includes transformative play (Sotamaa, 2007) including the creation and use of modifications, and user-created content (Burri, 2011) within the game such as object creation, and around the game such as fanfiction and fanart.

Creativity as affective change is most synonymous with Kaufman and Beghetto's (2009) "Mini C" whereby creativity is conceptualised as a player's unique interpretation of gameplay and game narrative which can lead to "reflection on the game's narrative, and as a result, the alteration of thought patterns, beliefs and perspectives" (Hall et al., 2020a, p. 9). Work such as Bopp et al. (2018) has investigated how games can instigate affective change, including reflection (Mekler et al., 2018), through emotional challenges which are presented through choice-based dialogues and ambiguous narratives, and perspective-challenging moments where players' prior concepts, attitudes and expectations are challenged (Whitby et al., 2019).

12.1.2 Measures of creativity

Creativity has been argued to be a hard-to-measure construct due to a variety of factors, such as a lack of clear definition and operationalisation, theoretical multidimensionality, and difficulty separating trait from state (e.g., some people may only be creative in certain situations, while others may be generally creative) (Shute & Wang, 2016). As such, there exist a number of metrics that aim to assess creativity from a variety of perspectives.

For example, some psychometric assessments rely on divergent thinking which has been "conceptualised as one component of creative thinking [and] remains an important concept among creativity researchers" (Baer, 2016, p. 9). The most well-known divergent thinking test is the Torrance Tests of Creative Thinking (TTCT) (Torrance, 1966) which measures creative attributes such as fluency (total number

of ideas), flexibility (number of different categories or kinds of ideas), originality (distinctiveness of an idea), and elaboration (richness of detail and broadness of scope of ideas) (Baer, 2016). However, while widely used, TTCT tests have been criticised for measuring only one aspect of a multi-faceted construct, and being too closely linked to intelligence (Lubart, 1994). Other psychometric approaches such as the Remote Association Test (RAT) (Mednick, 1968) assess an individual's ability to form associations and combinations between diverse knowledge elements, and involves a series of three words indirectly related to each other which the participant must connect with a fourth word (Lubart, 1994). The RAT has been criticised for having poor content validity by measuring verbal ability and academic performance instead of creativity (Lubart, 1994).

Other metrics aim to measure creativity based on personality factors such as the Creative Personality Scale (CPS) (Gough, 1979) and the Creativity Style Questionnaire (Kumar et al., 1997). Biographical inventories assess creative talent via observational measures by instructors, supervisors, or classmates to assess behaviour and compare it to creative outputs and sensitivity such as the Creative Behavior Inventory (CBI) (Kirschenbaum, 1989). Measurements of creative products include metrics such as the Creative Product Assessment Matrix (Besemer & O'Quin, 1987) which attempts to analyse how creative a product/idea is.

While far less common, there are some examples of measurements of creativity for digital games. For example, Chuang et al. (2015) documented the creation of an objective metric for measuring creativity in the game *Arctic Quest 2*. Using a computerised fuzzy logic system that extended evaluations beyond true/false and good/bad, player's trophies and points were recorded and used to calculate scores on fluency, flexibility, elaboration and sensibility. While Chuang et al.'s (2015) computerised method eliminated some of the subjectivity in creativity assessment, it does not measure originality (e.g., novelty and relevance of ideas) which has been argued to be a key component of creativity (Runco & Jaeger, 2012). Furthermore, it is based on only one game, and does not account for the specific manifestations of creativity in digital games, instead of using the psychometric properties of general creativity metrics.

Huang and Chuang (2012) devised the Creativity Assessment Scale of Digital Game Story Design (CAS-DGSD) to measure the creativity involved in creating game narrative. The CAS-DGSD includes the creativity dimensions of novelty, complexity, imagination, variation and application, and the digital game story constructs of content, narrative device, organisation, word choice and game feature. While the CAS-DGSD provides a valuable assessment tool for evaluating game narrative, it is geared more towards the creativity involved in designing a game, rather than the creativity involved in playing one.

In essence, a range of metrics exist to measure creativity from a variety of theoretical standpoints; however, the majority of these do not pertain to the unique expressions of creativity in digital games. The scope of creative practices which games facilitate may be difficult to quantify with traditional measures of creativity such as the TTCT (Torrance, 1993) and the CPS (Gough, 1979), and work which has attempted to create metrics for the assessment of creativity in digital games

such as Chuang et al.'s (2015) fuzzy logic system focused on one game genre using existing psychometric constructs to measure creativity. As such, this chapter details the development of a scale to measure creativity unique to digital games and is not based on existing psychometric or traditional measures. The scale operationalises creativity specific to digital games and provides a measure of the unique expressions of creativity and associated constructs from the ground up.

12.2 Method

12.2.1 Research instrument

The instrument for data collection was an online survey, which consisted of three parts with the first comprising the consent questionnaire. The second part asked respondents about their current gaming habits, including how many hours a week they spent playing online and offline games, genre of games played, format of gaming (e.g., PC, console, handheld) and what type of gamer they identified as, if any (e.g., casual, moderate, hardcore). The third part of the survey comprised a total of 71 attitude statements across seven sections. The statements related to themes developed from a previous qualitative study (discussed in Hall et al., 2020a, 2020b) which identified three unique expressions of creativity in digital games using a thematic approach; problem-solving, appropriation and affective change, in addition to further related themes including player conceptualisations of creativity, design affordances for creativity, learning from creativity and transferability of creativity. As such, three sections related to the different forms of creative expression, one related to how players conceptualised creativity, one related to learning outcomes from creativity, one related to the transferability of game-based creativity and one related to creative design affordances in games. Scale items were on a standard 5-point Likert scale, with 1 being strongly disagree and 5 being strongly agree. At least one negatively worded item was included in every Likert section.

12.2.2 Recruitment

The study advert was posted on a variety of online forums, social media and Reddit. A wide selection of gaming forums was chosen to capture multiple different game genres and, when available, the advert was placed in sub-forums such as off-topic (non-game related) and community creation areas. Forums included the popular platform Steam, in addition to game-specific forums such as Kerbal Space Program and Bioware. Adverts were also placed on speedrunning and game modification forums such as Nexus Mods. Reddit was used to target specific games from a variety of genres (e.g., r/ggoverwatch, r/witcher3) and groups (e.g., r/gamedev, r/gamingpc) and the survey specific sub-reddit r/samplesize was also used. The advert was posted on the principal researcher's Facebook and was shared on Twitter using hashtags such as #videogamers and #gamedevs. Due to the high proportion of males in the sample, Twitter was also used to target female gaming and tech groups such as #womenintech and #girlgamers.

12.2.3 Participants and data analysis

A total of 251 respondents completed the survey, comprising 160 males, 82 females, 6 nonbinary, and 3 undisclosed. The most common age bracket was 25–34 (n = 108), followed by 18–24 (n = 89). The sample consisted of predominantly American and European nationalities and was fairly even across education levels, with the most common being undergraduate and college (high school = 39, college = 60, undergraduate = 81, postgraduate = 40, doctorate = 18, and other = 10).

The stage of analysis comprised dimension reduction using exploratory Principal Component Analysis (PCA) with Varimax rotation in order to "summarize data so that relationships and patterns can be easily understood [and] to regroup variables into a limited set of clusters based on shared variance" (Gie Yong & Pearce, 2013, p. 79). The higher cut-off point of .45 which is described as fair to good was adopted (Tabachnick & Fidell, 2007). All of cross-loading items were also removed.

12.3 Results

12.3.1 Descriptive statistics

Respondents played a wide variety of games with the most common online genres being massively multiplayer online role-playing games (MMORPG) (n = 127) and massively multiplayer online first-person shooters (MMOFPS) (n = 106), and the most common offline game genres being role playing (n = 214), action/adventure (n = 187), strategy/tactics (n = 146) and first-person shooter (n = 124). The mean hours spent playing online games a week was 12.2 (SD = 14.4) and the mean hours spent per week playing offline games was 14.0 (SD = 12.3). The mean gaming session lasted 3.4 (SD = 2.3) hours. The most common gaming medium was PC/Mac/Linux (n = 222) followed by Console (n = 133).

12.3.2 Factor analysis

Items were subjected to PCA using an iterative process whereby all items which loaded under .45 and cross-loaded were removed before PCA was rerun until no items cross-loaded or loaded under .45. The resulting initial analysis of the 71 scale items produced a twenty-factor model accounting for 68% of variance, with a Kaiser–Meyer–Olkin value of .814 and a significant result for Bartlett's test of Sphericity (X^2 = 7555.407, DF = 2485, p < 0.001) indicating that a reasonable factor solution could be computed. Upon analysis of the scree plot, it was evident that five- and six-factor solutions could be supported (Figure 12.1).

Both five- and six-factor solutions were attempted, with the difference of variance between them being 1% (55% and 56%, respectively). Due to the minimal variance difference and due to the five-factor solution providing ease of identification of the constructs within the data, it was selected as the model of choice.

The five-factor model was subjected to the same iterative process as the original factor model whereby all items with loadings under .45 and cross-loadings were removed and PCA was rerun until no items cross-loaded or loaded under .45. The
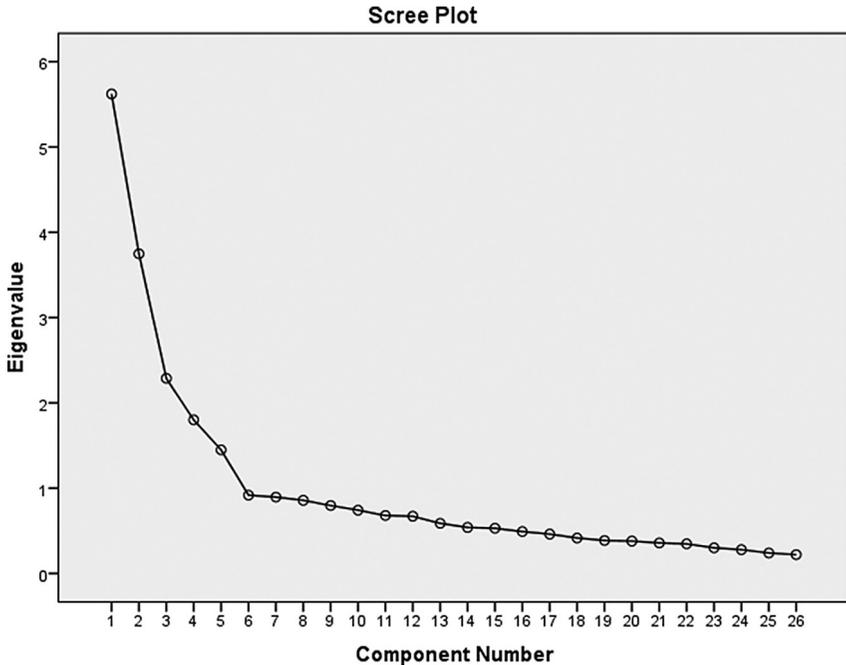
Figure 12.1 Scree plot of initial twenty-factor mode.

resulting model accounted for 57.4% of variance. The Kaiser-Meyer-Olkin measure of sampling adequacy was good at.835 and Barlett's Test of Sphericity was significant (X^2 = 2303.942, DF = 325, p = .000). Determinant was above the acceptable 0.0001. The instrument was named the Creativity in Gaming Scale (CGS) (see Table 12.1 for factor item loadings and Table 12.2 for variances, means, standard deviations and alpha).

The first factor accounted for the largest variance in the model at 16.3% and comprised eight items. Two items were aligned with from the creativity as affective change subscale, two items from the learning subscale and four items from the transferability subscale. All items related to the general use of creativity or creative skills such as problem-solving in other areas of life, except for one item (*27.7 I have used what I have learnt from games in my job/workplace*) which related to the use of these skills within the domain-specific context of the workplace. As such, the factor was named *transferability*. The second factor accounted for 13.7% of variance and included five items from the creativity as appropriation subscale. As such, the factor was named *appropriation* as all items related to how players could go above and beyond what developers expect. The third factor accounted for 11.3% of variance and comprised five items with the majority coming from the creativity as problem-solving subscale. The remaining two items came from the design affordances and appropriation subscales. As all items suggested an overall alignment

Table 12.1 Creativity in Gaming Scale

Item	Transferability	Appropriation	Problem-Solving	Affective change	Design Affordances
27.7 I have used what I have learnt from games in my job/workplace	.757				
27.6 Games have influenced my attitudes or behaviours in other areas of life	.745				
25.1 Playing games has made me come to view things in everyday life differently	.729				
27.4 Being creative in games gives me a new perspective on problems and challenges in my everyday life	.722				
26.6 Being creative in games has developed my problem-solving and thinking skills	.708				
25.3 Playing games has made me realise things about myself	.680				
27.10 I have used the skills and knowledge developed in games elsewhere in my life	.657				
26.2 I have developed IT/technical skills through being creative in games	.581				
24.2 I actively seek out glitches		.781			
24.5 I enjoy using the game mechanics in new, unintended ways		.779			
24.3 I try and find shortcuts in games		.747			
24.4 I use glitches to enable me to progress in the game		.743			

(*Continued*)

Table 12.1   (Continued)

Item	Transferability	Appropriation	Problem-Solving	Affective change	Design Affordances
24.1 I like to test the boundaries of what the game allows		.703			
24.10 I try and find ways to adapt and bend the rules of the game		.693			
23.1 I enjoy coming up with new strategies when I play games			.802		
24.8 I enjoy creating additional challenges for myself in games such as upping the difficulty			.722		
23.5 I highly value the sense of achievement I get when overcoming difficult challenges in games			.646		
23.6 I enjoy experimenting with what I can do using different game variables			.641		
22.1 I enjoy games that allow me to try out different play styles			.640		
25.5 The narrative of a game is important to me				.692	
25.10 I enjoy games which make me question things				.631	
25.6 I enjoy games that give me a new perspective of other cultures and societies				.627	
22.7 I prefer games that let me choose the personality of my character through dialogue choices				.565	
22.6 Games that allow more freedom for the player are more likely to involve creativity					.789
20.8 Games that allow the freedom to build and make things are the most creative					.779
22.10 Games that allow opportunities to interact with the environment help me be more creative in how I play					.461

Table 12.2 Factor variances, means, and standard deviations

Factor	No. Items	Variance %	M	SD	Cronbach's Alpha
1: Transferability	8	16.3	3.8	.83	.86
2: Appropriation	6	13.7	3.3	.75	.86
3: Problem-solving	5	11.3	4.2	.69	.76
4: Affective change	4	8.9	4.3	.60	.62
5: Design affordances	3	7.2	4.0	.77	.60
Whole Scale	**26**	**57.4**	**3.8**	**.35**	**.82**

with problem-solving the factor was named *problem-solving*. The fifth factor comprised four items accounting for 8.9% of total variance. Three of the four items came from the creativity as affective change subscale, and one from the design affordances subscale relating to dialogue choices (*22.7: I prefer games that let me choose the personality of my character through dialogue choices*).

Overall, the items aligned with how game narrative can cause players to question or reflect on aspects of life, and as such the factor was named *affective change*. The final factor accounted for 7.2% of variance with three items, two of which came from the design affordances subscale. The remaining item came from the player conceptualisations subscale which was aligned with the view that creativity was facilitated by opportunities for object construction (*20.8: Games which allow the freedom to build and make things are the most creative*). Taken together the items pointed to an alignment with games that facilitated creativity through environmental interaction and object construction, and as such, the factor was named *design affordances*.

12.3.3 Reliability analysis

Cronbach's alpha was computed for each subscale individually and the scale as a whole. *Transferability, appropriation* and *problem-solving* produced values of .86, .86 and .76 which are deemed good (Tavakol & Dennick, 2011). *Affective change* and *design affordances* had lower values of .62 and .60, respectively; however, these values may be attributed to the fact that these two factors had lower numbers of items which can reduce the alpha value. Alpha for the scale as a whole was good at .82, indicating a high level of internal consistency.

12.4 Discussion and moving forwards

The CGS comprised five subscales, three of which aligned to the different expressions of creativity; *problem-solving, appropriation* and *affective change*, and two relating to *transferability* and *design affordances*, respectively. *Affective change* (*M* = 4.3, SD = .60) and *problem-solving* (*M* = 4.2, SD = .69) had the highest mean scores, suggesting participants had a positive attitude towards games which supported these forms of creative expression. Previous work by Cole et al. (2015) found that narrative was a core component of the gaming experience which may explain the high mean score for *affective change*. The majority of games include problem-solving elements in the form of ill-structured challenges (Kiili, 2005) which players can

solve in multiple ways, and due to the ubiquitous nature of these challenges, respondents may have been more likely to recognise the statements in the *problem-solving* subscale and hence, score higher on this subscale. *Appropriation* ($M = 3.3$, SD = .75) on the other hand had a lower mean score, suggesting a more neutral valence towards activities associated with creativity as appropriation. As previous work found that some players felt glitches detracted them from the gaming experience, or were worried about corrupting their saved data (Hall et al., 2020a), two statements regarding glitches (*24.2, I actively seek out glitches, 24.4: I use glitches to enable me to progress in the game*) both with lower mean scores ($M < 2.5$) may have impacted on the overall mean score for this subscale.

Respondents scored fairly high on the *design affordances* subscale ($M = 4$, SD = .77), suggesting that games which provided greater player freedom, opportunities for constructing objects, and supporting interaction with the environment were important for cultivating player creativity. The importance of affordances for environmental interactivity and object construction is reflected in previous studies such as Ward (2015) who argues that options for personalisation of objects and environment provide opportunities for Mini C creativity as players can reflect their personal creativity in designing and customising the environment and objects. Furthermore, games that provide more freedom for the player such as open-world game designs provide a larger "possibility space" (Järvinen, 2008) which supports alternative routes of play, a greater array of strategies and opportunities for exploration.

Transferability ($M = 3.8$, SD = .83) explained the greatest variance in the model (16.3%), however, had a less positive mean score. The diversity of items included in the subscale could point to the complexity of transferability as a construct, with aspects of learning and creativity likely to transfer outside of games. The majority of items related to aspects of affective change, lending weight to previous work which has suggested games can lead to reflection on experiences (Mekler et al., 2018), new perspectives (Oliver & Carr, 2009) and empathy (Bopp et al., 2018; Cole et al., 2015). A further two items related to specific skill development – namely problem-solving and IT/technical skills, which support previous work on the propensity of games to develop transferable skills such as problem-solving and IT literacy (e.g., Qian & Clark, 2016; Sourmelis et al., 2017; Voulgari et al., 2014). Only one item (*27.7 I have used what I have learnt from games in my job/workplace*) included in the scale indicated where creativity and associated skills may be used outside of games; however, there is the possibility that respondents could have been using domain unspecific skills such as problem-solving within a vocational setting.

Despite adverts being targeted at female technology and gaming groups, the sample consisted disproportionately of men (160 males to 82 females). Western demographics between male and female gamers is roughly even with 46% of gamers in the US being female compared with 54% being male (ESA, 2019), with the numbers being similar in Europe (ISFE, 2019). As such, future studies may wish to try and address this issue by recruiting a more equal sample of both genders and gamers from non-Western countries, thus providing a more accurate representation of a wider demographic. This would allow the CGS to be further customised to accommodate learners throughout the globe.

Secondly, the sample was not stratified, and respondents were able to self-select. Despite the survey being advertised broadly, there is the possibility that those who completed it already self-identified as creative and as a result were more likely to take part. As has been argued elsewhere, engaging in gameplay may increase creativity and in turn, those who play games may be more creative as a result (Jackson, 2012; Jackson & Games, 2015; Jackson et al., 2012). As such, future studies may wish to compare differences in attitudes between those who self-identify as creative and those who do not. Further confirmatory factor analysis (CFA) was not performed, and as such, future studies may wish to confirm the factor structure using a larger sample.

Chapter 12 detailed the development of a scale to measure game-specific creativity and related constructs. 71 statements on a 5-point Likert scale were subjected to PCA analysis, producing a five-factor 26-item solution with sub-scales relating to *transferability, appropriation, problem-solving, affective change*, and *design affordances*, which supported findings from a previous qualitative study. The CGS would not only benefit game developers in providing guidance on the most important aspects of player experience but could also provide benefit for educators and learners. Use of the CGS is not simply be confined to classroom-based contexts but could be used in other settings such as distance education as an alternative format of learning. Moreover, due to their ubiquitous nature, digital games could be used as an alternative method of open-world learning where learners have the autonomy to decide which games suit their preferences, and educators can use digital games as widely available educational tools. In this way, the CGS would allow educators and learners to select games that enhance the creative forms of *problem-solving, appropriation* and *affective change* and assess the development of these over time.

12.4.1 Implications for practice

Digital games are enjoyed by millions of people worldwide and offer an alternative means for developing creativity – from problem-solving abilities to affective elements such as reflection and empathy. For game developers, the CGS provides a means of measuring the effectiveness of a given game, in particular the degree to which it is facilitating player creativity. A developer could use the scale as a guide on what aspects of creativity are most important to players of a given game genre or with different previous gaming experiences and demographic characteristics. The scale could help learners and teachers capture and reflect on how creativity is developing over time and which are those experiences that are more likely to support this development.

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Chapter 13

Incorporating student opinion into opinion mining

A student-sourced sentiment analysis classifier

Garron Hillaire, Bart Rienties, Mark Fenton-O'Creevy, Zdenek Zdrahal and Dirk Tempelaar

13.1 Introduction

> Yeah, well, you know, that's just, like, your opinion, man.
> Jeffrey "the Dude"
>
> Lebowski talking to Jesus Quintana in *The Big Lebowski*

In Open World Learning we focus on free online learning resources and explore how to support more students to benefit from these resources. To better understand the student experience there is a need to focus on emotional measures as emotions are considered integral to the learning process (Immordino–Yang & Damasio, 2007). As one of the ubiquitous modes of communication in online learning is text, we focus on sentiment analysis (SA), which is an affective computing measure that can interpret emotions in text by classifying if text is positive, negative, neutral, or mixed (both positive and negative). In Chapter 13, we focus on how student perceptions relate to and are affected by predictions about their emotional expression in text. By exploring how student opinions relate to and are potentially influenced by SA we explore the validity and utility of SA.

When SA classifiers are built the process starts with establishing the correct labels for text, referred to as ground truth. Establishing ground truth relies on human judgements. We ironically reference the quote from *The Big Lebowski* "that's just, like, your opinion, man." to light-heartedly call into question how truth is established. In our opinion, there is justifiable reason to anchor truth for SA to the opinions of students. While there is inherent subjectivity when anchoring truth to student opinions, SA commonly purports to measure how the opinion of the author of the text elicits a reaction from the intended reader of the text (Balahur & Steinberger, 2009).

Early SA work used text from product reviews and as well as star ratings (e.g., 1-star reviews considered negative; 5-star reviews considered positive) (Liu, 2010). Effectively, the labels for text were inferred by a star rating that came from the author of the text. While it is commonly held that SA technologies work best when used on text for similar contexts as to the context where data used to train the classifier originated, it is not commonly held that the labels for the text should also come from people from the context. For example, a very common practice in

SA research is to have researchers rate text using trained raters on established cod-ing schemes (Thelwall, 2013), or use anonymous raters from crowd-sourcing plat-forms such as Amazon's Mechanical Turk (MTurk) (Mohammad & Turney, 2013) where the wisdom of the crowd typically replaces the training of raters.

The choice of who is best situated to rate the valence of text is directly related to the definition of emotion – which is still a highly debated concept. If emotion is universal, then there are attributes we can identify as characteristics of emotions. For example, when someone is happy they might say "I am going to Disneyland!". This phrase comes from an advertising campaign in the late 1980s where the most valuable player from the super bowl would shout this phrase after winning the game. While the Disney corporation likely wants this phrase to be universal there are people in the world who may have never heard the phrase or even know about Disneyland (a popular theme park). In contrast to the universal perspective, the Constructed Theory of Emotion (CTE) would suggest that only those with famil-iarity of the social context would understand the emotional expression (Feldman Barrett, 2018). In Chapter 13, we test CTE by considering the perspectives of the social group of students from the classroom and contrast this with a social group of anonymous raters.

In conjunction with the debate on the definition of emotion there is a further multi-level debate on how emotion is best measured. The first emotional measure-ment debate is between discrete measurement of emotions such as happiness and anger in contrast with the perspective that emotion is best measured in dimen-sional terms such as the dimension of valence from positive to negative (Feldman Barrett & Russell, 1998). In Chapter 13, we focus on the dimensional measure-ment of valence. We adopt four possible categories of valence: positive, negative, neutral, and mixed. Specifically, we explore if the social consensus used rate text should be from a contextual group (the students) or an anonymous out-of-context group (Mechanical Turk). Finally, we examine the accuracy of our proposed classi-fier by showing the predictions of the classifier to the students during interviews. We shared predictions with students to see if students viewed the predictions as accurate and useful. To situate this work in the broader context of SA research, we first review related work.

13.2 Related work

It is important to note that not all emotional measures share a common aim and not all measurement adoption explicitly states the assumptions of the measures (Weidman, Steckler, & Tracy, 2016). This makes comparison between work difficult as SA studies consider accuracy of those measures based on completely different definitions of truth (e.g., universal vs. social). Two key assumptions of measurement adoption are related to debates both on what emotion is and how it should be measured. To illustrate these debates, we review three theories on emotion, three approaches to measure emotion in text, and finally classify 15 existing studies in the context of learning within this taxonomy of emotional theory and measurement based on how they evaluate accuracy of the measures.

13.2.1 Three perspectives on emotion

Basic Emotion Theory (BET) considers some emotional experiences to be so fundamental that they are described as universal. For example, people may have a common experience of emotion when it comes to some specific emotional responses, such as anger and happiness. Typically, researchers who adopt the BET position on emotion focus on five to thirteen emotions that are considered fundamental to the human experience: Happiness, Enjoyment, Sadness, Fear, Anger, Disgust, Interest, Contempt, Rage, Love, Lust, Care, and Surprise (Tracy & Randles, 2011). One limitation for BET is that there is minimal relevance for basic emotions in learning activities that span 30 minutes to 2 hours (Calvo & D'Mello, 2010).

CTE is a perspective that suggests that the manner by which emotion is interpreted is through the influence of social factors. An example of how social theorists interpret emotion is illustrated in the book *How Emotions Are Made* by Lisa Feldman Barrett when she used a picture of Serena Williams. The photo was taken immediately after Serena beat her sister, Venus Williams, in the 2008 U.S. Open. The picture Barrett presents is a cropped image of Serena's facial expression and Barrett suggests that looking at the facial expression in isolation of context might be categorised as an expression of terror when using a basic perspective on emotion. However, by taking context into consideration we should instead interpret the image to mean something closer to exultation (Feldman Barrett, 2018, p. 42). Barrett argued that emotion consists of making meaning, prescribing action, regulating the body, emotion communication, and social influence. Two of the components, emotion communication and social influence, are considered social as they are aspects of emotion that cannot be done in isolation.

Situated Affectivity Theory (SAT) considers the goal as the focal point for interpreting all of the components of emotion (Wilutzky, 2015). With this goal orientation, a manipulation between an individual and their environment is the basis for stimulation for emotion. The physiological response represents a physical experience that resonates with the interaction with the environment. Emotional communication is thought to be used by people to achieve goals.

13.2.2 Three perspectives on valence

Valence is a dimensional perspective on organising emotions commonly considering positive and negative. There are three competing perspectives on how valence should be organised. The bipolar model considers positive and negative to be the opposite ends of the same spectrum (Russell & Carroll, 1999). For example, the emotion happy can be placed on the positive end of the spectrum and the emotion sad can be placed on the negative end of the spectrum. The bi-variate model suggests a co-activation where emotions can be categorised as simultaneously activating positive and negative (Watson, Wiese, Vaidya, & Tellegen, 1999). In the bi-variate model, there are two variables (one for positive and one for negative). The evaluative space model (ESM) suggests that emotions are both bipolar and bi-variate (Cacioppo, Gardner, & Berntson, 1999). Effectively, ESM argues that valence should

be thought of as a plane. We can consider the *Y*-axis of the plane to range from neutral to negative and the *X*-axis of the plane to range from neutral to positive. Points on the *X*- and *Y*-axes represent bipolar categories of emotion. Chapter 13 adopts ESM by considering the four valence categories of positive, negative, neutral, and mixed.

13.2.3 Reviewing sentiment analysis in education

SA research shows promise regarding investigations into the complex role of emotion in learning. Given the potential for SA in educational research, it is essential to consider the validity and reliability of SA. To begin considering validity and reliability it is essential to precisely clarify what SA purports to measure. As it is common for researchers to use emotional measures without explicitly stating their theoretical perspective on emotion (Weidman et al., 2016), first we reviewed the 15 identified SA in studies in the context of learning and classified how accuracy was evaluated in relation to the three emotion theories reviewed. The results are reported in Table 13.1.

We classified five studies that used methods that are best described as BET. In these studies, the researchers believed that they could identify what was accurate as this indicated that emotion expression was identifiable by someone other than students in the context of learning. For example, BET studies included an examination of teacher evaluations where researchers read the teacher evaluations, and coded the "actual" sentiments based on the perspective of the researcher reporting an overall accuracy of 86.28% (Rajput, Haider, & Ghani, 2016).

Table 13.1 Interpretation of emotion theory of sentiment analysis studies in education

Studies	#	BET	SAT	CTE	None
Ortigosa et al. (2014); Troussas, Virvou, Espinosa, Llaguno, & Caro (2013)	2	☑	–	–	–
Chaplot et al. (2015); Crossley, Paquette, et al. (2016); Wen et al. (2014); Wyner, Shaw, Kim, Li, & Kim (2008)	4	–	☑	–	–
Calvo & Kim (2010)	1	–	–	☑	–
Munezero et al. (2013); Jagtap & Dhotre (2014); Shapiro et al. (2017); Chang, Maheswaran, Kim, & Zhu (2013); Kagklis, Karatrantou, Tantoula, Panagiotakopoulos, & Verykios (2015)	5	–	–	–	☑
Rajput et al. (2016); Santos et al. (2013)	2	☑	–	☑	–
Hillaire, Rienties, et al. (2018)	1	☑	☑	–	–
Total	15	5/15	5/15	3/15	5/15

Note: BET = Basic Emotion Theory; SAT = Situated Affect Theory; CTE = Constructed Theory of Emotion; None = No Evaluation of Accuracy.

Three studies used evaluation of accuracy methods best aligned with CTE. For example, one study compared course ratings on a Likert scale to determine which ratings were positive and inferred comments in the review were positive (Calvo & Kim, 2010). None of these studies directly asked participants their opinion about the text analysed by SA (sometimes referred to as opinion mining) which is a clear gap in educational research.

We classified five studies all using discussion forums as reflecting SAT when the focus was on correlations between SA and outcomes (e.g., student retention), because this placed an emphasis on the relationship between emotion expression and goal orientation. For example, when predicting student attrition in an online course SA was used in conjunction with other measures to generate two predictive algorithms which reported a Kappa statistic of 0.403 and 0.432 when predicting attrition (Chaplot, Rhim, & Kim, 2015). Next, we evaluated the same 15 studies to examine which valence categories were measured considering the four valence categories identified in our review on valence theory (see Table 13.2).

When considering valence categories measured when applying SA to the context of learning, there appears to be an emphasis in the existing literature on measuring positive and negative valence. Of the 15 studies reviewed, all of the studies measured both positive and negative valence as indicated in Table 13.2. About half of the studies, seven out of 15, measured the category of neutral, and only two out

Table 13.2 Valence categories of sentiment analysis studies in education

Studies	#	Positive	Negative	Neutral	Mixed
Munezero, Mozgovoy, Montero, & Sutinen (2013); Jagtap & Dhotre (2014); Troussas, Virvou, Espinosa, Llaguno, & Caro (2013); Crossley, Paquette, Dascalu, McNamara, & Baker (2016); Wen, Yang, & Rosé (2014); Wyner, Shaw, Kim, Li, & Kim (2008); Chang, Maheswaran, Kim, & Zhu (2013)	7	☑	☑	–	–
Calvo & Kim (2010); Ortigosa et al. (2014); Chaplot et al. (2015); Hillaire, Rienties, et al. (2018); Shapiro et al. (2017); Kagklis, Karatrantou, Tantoula, Panagiotakopoulos, & Verykios (2015)	6	☑	☑	☑	–
Rajput et al. (2016)	1	☑	☑	–	☑
Santos et al. (2013)	1	☑	☑	☑	☑
Total	15	15/15	15/15	7/15	2/15

of 15 studies measured a category of mixed emotion. One study (Santos et al., 2013) measured all four categories of positive, negative, neutral, and mixed. However, they referred to mixed as ambivalence – which they defined as both positive and negative. In the second study considered mixed expression (Rajput et al., 2016), the authors used neutral and mixed interchangeably when describing the results but reported statistics for the category of mixed expression.

13.3 Student-sourcing, crowd-sourcing ground truth for a classifier with students

We explore centring students with *student sourcing*, using crowd-sourcing methods with students evaluating their own group discussions. In doing so we flip the assumption from the perspective that crowd ratings are by default noise to the default assumption they are accurate. When establishing ground truth more single labels are better in the condition where raters are considered reliable. Based on the shifting the assumption that student ratings are by default accurate single ratings is considered useful. A common approach is using the Expectation Maximisation (EM) algorithm (Dempster, Laird, & Rubin, 1977), which selects the best label using crowd-sourcing label data by considering both the prevalence of each valence category and the categorical accuracy of each rater. Effectively the uniqueness of student opinions is favoured by this approach because the EM algorithm adopts single ratings as ground truth. Where multiple ratings occur, the EM algorithm selects a best fit as a proxy for what social consensus might evolve between students. As the approach is novel we evaluate the work using both standard approaches to reliability, and benchmark this specialised classifier with general crowd-sourcing approaches.

Typically, with crowd sourcing a large number of people are recruited to categorise text by providing labels frequently generating five labels for each item being categorised. Providing both Fleiss' Kappa and Krippendorff's alpha are suggested for crowd-sourced labels in social computing (Salminen, Al-Merekhi, Dey, & Jansen, 2018) because the expectation is that agreement is usually low with crowd-sourcing methods. For example, Krippendorf's alpha scores around 0.10 were frequently found when evaluating crowd-sourcing methods (Alonso, Marshall, & Najork, 2013). We use crowd sourcing as one of the benchmarks for student's sourcing where students provide labels instead of anonymous MTurk raters disconnected from the classroom context and then validated the outcome of training on MTurk ratings by predicting student labels that close the loop by validating with student labels. This approach is contrasted with centring students where using artificial intelligence approaches we instead train a classifier based on student labels and then use the student-sourced classifier to predict student labels (see Figure 13.1)

Finally, we conducted interviews with respective students involved in the experiments to further lean into student perspectives. Therefore, to investigate the assumption that we can accept student opinions as correct for opinion mining two research questions need to be assessed:
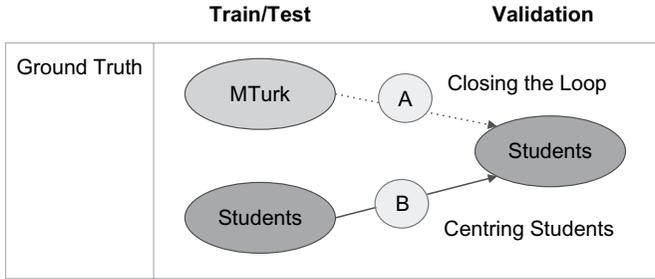
Figure 13.1 Comparing closing the loop with centring students with ground truth.

1   To what extent are student-sourced examples reliable?
2   To what extent can we use student-sourced examples to train an SA classifier?

13.4 Methods

Chapter 13 is based on two extensive studies undertaken with two separate cohorts of students at a university in the Netherlands as part of the thesis of the first author (Hillaire, 2021). While the university recruits international students, courses are taught in English. Cohort 1 included 767 freshmen in a statistics course in Fall 2016 who (1) worked on an online group assignment where students chat with one another and (2) reviewed their discussions and provided examples of messages for valence categories. There were 304 females and 463 males. The population was international, including 191 domestic (Dutch), 529 European Students, and 47 non-European students. Mechanical Turk was used to generate five labels for messages selected by Cohort 1 Students. Cohort 2 included 484 freshmen in the same statistics course in Fall 2017 who (1) completed an online group assignment, (2) provided examples of messages for valence categories (see Figure 13.2).

We generated Data Set 1 with the EM algorithm which selected the ground truth label for each text message based on the example text and labels provided by Cohort 1 Students. We generated Data Set 2 with the EM algorithm which selected the ground truth label for text message from text examples provided by Cohort 1 Students and labels for the text provided by Mechanical Turk workers. We generated Data Set 3 with the EM algorithm which selected the ground truth label for each text messages based on the example text and labels provided by Cohort 2 Students (see Figure 13.2).

Finally, we used Data Set 1 to train Classifier 1 (a logistic regression classifier). We used Data Set 2 to train Classifier 2 (a logistic regression classifier). Both Classifier 1 and Classifier 2 categorised text messages as positive, negative, neutral, or mixed. Finally, we used Classifier 1 and Classifier 2 to predict labels for Data Set 3. To ground the comparison between Classifier 1 and Classifier 2 we compared them to general SA classifiers used on Data Set 3 (see Figure 13.2).
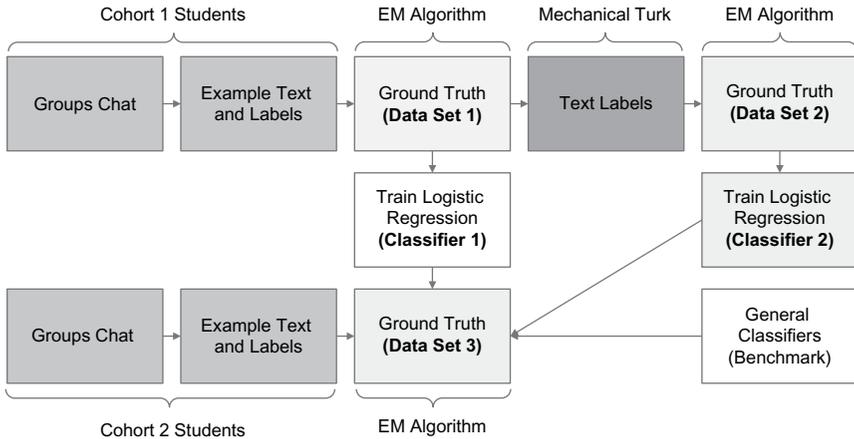
Figure 13.2 Research design generating three data sets and two classifiers.

Finally, we interviewed six students from Cohort 2 to evaluate the accuracy of Classifier 1 as well as the utility of having access to SA predictions on their own text messages.

13.5 Procedure

In Cohort 1, students (n = 767) were assigned randomly to groups of five (M = 4.73 SD = 0.84) in a laboratory setting, whereby each student had a desktop computer, and all written communication was online as part of a regularly occurring lab session for their course. Previous research on this task reported that overall students enjoyed working together in groups (Mittelmeier, Rienties, Tempelaar, Hillaire, & Whitelock, 2018). The group work activity for Cohort 2 was the same as for Cohort 1 with a small change to the warmup exercise. The post-activity was changed in that participants no longer provided examples of ambiguous messages and the final modification was a series of interviews conducted with six students to examine the trustworthiness of the algorithm's predictions.

In the post-activity Cohort 1 participants were first given a set of instructions to provide 1–3 examples of positive, negative, neutral, mixed, and ambiguous messages (for Cohort 2 removed the Ambiguous valence category). For Cohort 2, the interview consisted of three parts. Part 1 asked students to review a subset of messages from their group chat and identify if the message was positive, negative, neutral, or mixed. Part 2 asked participants to compare their rating with the prediction from the student-sourced classifier in conjunction with the text features the algorithm used to predict the valence. If the prediction was different than the student label provided in Part 1 the student was asked if the algorithm prediction changed their mind. Finally, at the end of the interview participants were asked if the predictions were useful.

13.5.1 Analysis

To answer RQ1 we computed inter-rater agreement for Data Sets 1, 2, and 3 and compared the results to benchmarks of agreement for crowd sourcing in social science. Low agreement in crowd ratings does not mean the opinions of labels are incorrect; it may simply indicate they have different opinions (Salminen et al., 2018).

To answer RQ2 we generated Classifiers 1 and 2 (logistic regression classifiers) based on Data Sets 1 and 2, respectively, and compared the accuracy of Classifiers 1 and 2, with General Benchmarks when predicting valence labels for Data Set 3. We also benchmarked the accuracy of Classifiers 1 and 2 with general measures. Finally, we interviewed students from Cohort 2 to evaluate the accuracy and utility of predictions from Classifier 1 used to interpret their text data.

13.5.2 Results

To answer RQ1, we first established three datasets and then computed agreement statistics. Data Set 1 was generated by 767 students providing examples for positive, negative, neutral, mixed and ambiguous, resulting in 2512 records with 1979 distinct messages. Data Set 2 was generated by using the EM algorithm to select the ground truth label for Data Set 1 which resulted in 1778 messages categorised as positive, negative, neutral, and mixed (we excluded the 201 messages categorised as ambiguous). We next used Mechanical Turk where five raters classified the 1778 messages as positive, negative, neutral, and mixed. Data Set 3 was generated by 484 students providing examples for positive, negative, neutral, mixed. This resulted in 986 records with 755 distinct messages. After generating the three datasets we computed agreement statistics resulting in Krippendorff's alpha scores of 0.44, 0.25, and 0.42 for Data Sets 1, 2, and 3, respectively. Datasets 1 and 2 generated a range of between one and five ratings per unique message so we further computed and report Fleiss' Kappa scores for agreement statistics based on the number of ratings. For Data set 2 we had five raters for every unique message and report Fleiss' Kappa for completeness (see Table 13.3).

In Table 13.3, we observe that both Data Set 1 (alpha=0.44) and Data Set 3 (alpha=0.42) had similar Krippendorff's alpha scores indicating (1) students had moderate agreement with one another on the valence labels from their own chat data; and (2) student agreement was above Mechanical Turk raters (alpha=0.25) as well as below the average Krippendorff's alpha score of 0.60 found in crowdsourcing studies in social science. These results show promise that crowd sourcing with students has the potential to do better than using services such as Mechanical Turk, but also indicates that agreement is below the average indicating room for improvement.

To answer RQ2, we first established a series of benchmarks using general SA technologies making predictions about Data Set 3 with labels from Cohort 2 students. The f-measures for the best benchmarks was VADER with an f-score of 0.43. Next, we trained Classifier 1 using Data Set 1 with labels from Cohort 1

Table 13.3 Agreement statistics for three data sets

	Raters	1 rater	2 raters	3 raters	4 raters	5 raters	Krippendorff's alpha
Data Set 1 (Fleiss' Kappa)	Cohort 1 Students	1586 (–)	330 (0.42)	56 (0.52)	6 (0.30)	1 (–)	0.44
Data Set 2 (Fleiss' Kappa)	Mechanical Turk					1778 (0.25)	0.25
Data Set 3 (Fleiss' Kappa)	Cohort 2 Students	577 (–)	139 (0.41)	30 (0.50)	4 (0.36)	5 (−0.15)	0.42

students and trained Classifier 2 using Data Set 2. The best cross–validation f-scores for Classifier 1 was 0.475 and the subsequent validation F-score was 0.462. The best cross–validation f-scores for Classifier 2 was 0.550 and the subsequent validation F-score is 0.456. When comparing these results Classifier 2 had a higher cross-validation score and Classifier 1 had a higher validation score (see Table 13.4). This means that when we tested the two classifiers on Data Set 3 (with labels from Cohort 2 students) that Classifier 1 trained on Cohort 1 student labels was more accurate than Classifier 2 trained on Mechanical Turk labels.

Finally, we interviewed six students from Cohort 2 about the predictions from classifier 1. Across the six students interviewed they reviewed 113 messages of which they agreed with the algorithm 36 times, and disagreed 77 times. For the 77 disagreements, they changed their mind to agree 21 times (27% or 21/77) after seeing the algorithm's predictions (see Table 13.5). When considering the initial agreement (36 times) and when they changed their mind (21 times) the students considered the prediction accurate 50% of the time (57/113).

Participants changed their mind to agree with the algorithm one to three times with the exception of one student who changed their mind eleven times. Students who found the algorithm to be useful had final agreement that ranged from 42% to 67% (initial agreements 5-9 messages; final agreements 8–20 messages) with a). The one student who did not find the algorithm to be useful, Student-6, only initially agreed with the algorithm once and changed their mind to agree with it two times for a total of three agreements out of 12 messages (25%). While sample

Table 13.4 Agreement statistics for three data sets

	Train/test data	Validation data	Cross validation	Validation
Classifier 1	Data Set 1 (Cohort 1 Students)	Data Set 3 (Cohort 2 Students)	0.475	0.462
Classifier 2	Data Set 2 (Mechanical Turk)	Data Set 3 (Cohort 2 Students)	0.550	0.456

Table 13.5 Agreement, disagreement, final agreement, and usefulness of SSAC

Participant	Agree	Disagree (change)	Final agreement %	Useful
Student 1	7	10 (1)	47%	Yes
Student 2	9	21 (11)	67%	Yes
Student 3	8	9 (2)	59%	Yes
Student 4	5	13 (3)	44%	Yes
Student 5	6	13 (2)	42%	Yes
Student 6	1	11 (2)	25%	No

size from interviews is small, it is noteworthy that Student-6 who did not find it useful had a final agreement of 25%, which was the same as the unweighted chance levels of accuracy for predicting four categories, while all of the students who found it useful had above chance levels of agreement. This result suggests above chance levels of accuracy is necessary for students to find the classifier useful. Five out of six students interviewed said that the algorithm was useful. When describing the usefulness of the algorithm, participants described benefits including: (1) better understanding their own communication (e.g., "I started thinking more about what I said"), (2) better understanding communication of other students (e.g. "I started analysing the way others said it"), and (3) seeing an alternate interpretation that changed their mind which they described as learning from the algorithm.

13.6 Discussion and moving forwards

Chapter 13 illustrated how a student-sourced SA could build a better understanding of the online student experience and emotions in particular. What is novel about our findings is that we demonstrated that (1) student labels had a higher level of inter-rater agreement than Mechanical Turk labels, (2) Mechanical Turk labels generated a higher cross-validation score than student labels, and (3) student labels trained a classifier with higher accuracy than the classifier trained using Mechanical Turk labels. A potential explanation for this result is that the consensus established by Mechanical Turk workers was simply divergent from the consensus of students. We could reframe this to say what Mechanical Turk workers consider to be the true labels for text has higher consistency, but their idea of truth is different from students. From the perspective of the CTE the consensus established by members of the social context is the very definition of emotion. Interpreting these results from a CTE perspective suggests there is potential benefit in having raters that come from the context where the text was originally generated. This finding builds on the existing belief that SA classifiers are context sensitive and perform best when used in contexts similar to the context where training data for the classifier was collected by contributing evidence that context sensitivity may also include the relationship between the raters of text and the context where the text was collected.

13.6.1 Implications for practice

Practitioners that use educational technology should be cautious when they incorporate SA classifiers trained on data dissimilar to classroom data as general technologies had low performance. Practitioners should consider how to centre the lived experience of students when integrating classifiers that seek to model highly subjective topics such as SA. Not only is there reason to share SA predictions with students to anchor accuracy with student opinion, but students reflecting on SA predictions demonstrated the benefit of thinking about both what they say to their peers and what their peers say to them in terms of emotional expression. Future

work should explore supporting and evaluating student awareness of emotion expression in text.

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Educators and inclusive practice in an Open World

Chapter 14

Informing learning design in online education using learning analytics of student engagement

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14.1 Introduction

Since the early 2000s, two strands of research in education have emerged that can help educators gain better insights into the teaching and learning process. These are learning design (LD) and learning analytics (LA). Learning design, in this context, is defined as "a descriptive framework for teaching and learning activities ("educational notation"), and to explore how this framework can assist educators to share and adopt great teaching ideas." (Dalziel et al., 2016, p. 4). Research in LD has developed a wide range of tools and frameworks to document and visualise sequences of learning activities designed by teachers and to guide them through the LD process (Cross et al., 2012; Laurillard et al., 2018). Through the transition from implicit to explicit representations of LD, teachers can reflect on their practices, while re-using and adapting good instructional approaches from others (Agostinho et al., 2011).

In parallel to LD, LA has emerged as a field in the decade since the first Learning Analytics Knowledge (LAK) conference in 2011. Learning analytics is defined as "the measurement, collection, analysis and reporting of data about students and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs" (Ferguson, 2012, p. 305). LA research typically collects a large amount of data about students such as demographics, course performance, activity logs of students (Rienties et al., 2019; Tempelaar et al., 2018), discussion forums interactions (Wise et al., 2017), and open texts from essays or course evaluations (Ullmann, 2019). By taking advantage of advanced analytical techniques such as machine learning (Ullmann, 2019), text-mining (Hillaire et al., 2022), and social network analysis (Wise et al., 2017), LA has created practical applications to support the learning process.

There exists a strong synergy between the two fields (Lockyer & Dawson, 2011). On the one hand, LA provides data and tools to test pedagogical assumptions in LD against actual student interactions. On the other hand, LD provides the necessary contextual overlay to better understand observed student behaviour and translate LA findings into actionable insights (Lockyer & Dawson, 2011). Prior empirical works have shown the benefits of embedding LD in LA such as improving predictive accuracy of academic performance (Gašević et al., 2016), understanding the

impact of LD on student engagement, satisfaction, and performance (Rienties & Toetenel, 2016), exploring the variety of designing approaches (Nguyen et al., 2017a, 2017b, 2017), uncovering the (in)consistency between students' engagement and instructors' learning design (Nguyen et al., 2018a, 2018b, 2018), and highlighting in Chapter 8 that geocultural background characteristics of learners influence engagement with LD (Rizvi et al., 2022). The next sections will outline some applications of learning analytics to inform learning design in online education, using large-scale empirical findings from over three years of extensive research at the Open University UK (OU).

14.2 Background

14.2.1 Study context

All the studies reported in this chapter took place at the OU. The OU is the largest academic institution in the UK and in Europe with over 170,000 enrolled students. As a pioneer in distance learning model since 1969, the OU offers more than 200 qualifications and 400 modules via a distance learning model, which involves the use of a Virtual Learning Environment (VLE) in conjunction with online and/or face-to-face tutorials with designated tutors. The OU is a leading research institution in learning analytics (Clow, 2013; Ferguson, 2012; Herodotou et al., 2019). For example, OU Analyse produces an early prediction of "at-risk" students based on their demographic data and their interaction with the VLE (Kuzilek et al., 2015). In addition, the OU has a rich database of its students including demographics, academic performance, course registration, and trace data of activities on VLE across hundreds of thousands of students since 1970s. Therefore, the OU provides a unique opportunity for LA researchers to address educational research questions at a large-scale, improving the external validity and generalisability of the findings.

14.2.2 Learning design at the Open University

Compared to other universities, the OU module production process is longer and more complex. This process typically takes two to four years, involving multiple stakeholders with specialised skills in academic content writing, teaching, project management, media production and technical development (Cross et al., 2012). Capturing and quantifying pedagogical practices is challenging, to say the least. At the OU, each new module goes through a mapping process, which maps out all learning activities and their estimated time to complete the activities. Learning activities are categorised based on the learning activity taxonomy originally developed by Conole et al. (2008), which has subsequently been further fine-tuned and adjusted over time based upon both practical experiences as well as LD research (Toetenel & Rienties, 2016a, 2016b) (Table 14.1).

Assimilative activities refer to tasks which require student's attention to information. These include watching lecture video, reading the text, listening to an audio

Table 14.1 Learning activity taxonomy

Taxonomy	Type of activity	Example
Assimilative	Attending to information	Read, Watch, Listen, Think about, Access.
Finding and handling information	Searching for and processing information	List, Analyse, Collate, Plot, Find, Discover, Access, Use, Gather.
Communication	Discussing module related content with at least one other person (student or tutor)	Communicate, Debate, Discuss, Argue, Share, Report, Collaborate, Present, Describe.
Productive	Actively constructing an artefact	Create, Build, Make, Design, Construct, Contribute, Complete.
Experiential	Applying learning in a real-world setting	Practice, Apply, Mimic, Experience, Explore, Investigate.
Interactive/adaptive	Applying learning in a simulated setting	Explore, Experiment, Trial, Improve, Model, Simulate.
Assessment	All forms of assessment (summarive, formative and self assessment)	Write, Present, Report, Demonstrate, Critique.

Source: Retrieved from Conole et al. (2008).

file, etc. *Finding and handling information* activities implies, for example, searching and filtering for relevant literature in a particular topic on the internet. *Communication* activities refer to a range of practices to communicate such as posting in a discussion forum and replying to peer comments. *Productive* activities represent the construction of an artefact, such as writing a summary or resolving a problem. *Experiential* activities provide students with opportunities to apply theories in a real-world setting such as case study, or field trip. *Interactive/adaptive* activities encourage students to apply what they learned in an experiential environment or interacting with a simulation. Finally, *assessment* activities evaluate the student's understanding such as writing through the construction of an essay, exam or making a presentation (Conole, 2012; Conole et al., 2008).

For each learning activity, an estimation is made for how long it would take an average student to complete that activity. This estimation is usually determined by the module team and being embedded in the module guide on the VLE as a guidance for students' study time allocation (Figure 14.1). If the time estimation is not explicitly stated in the module guide, it will be determined using agreed conventions for study speed and amount of time allocated to studying figures, tables, images, audio and video within module materials. The time estimation of each learning activity was aggregated at a weekly level (i.e., estimated workload per week). The workload of each module was restricted by its number of credits, with each credit equates one hour of studying. For example, a 30-credit module requires

> ### Activity 3.3
>
> 🕐 *Spend approximately 35 minutes on this activity.*
>
> The Open University provides guidance on a number of study skills on the StudentHome website. You are encouraged to refer to these guidance notes and excercies as and when it seems useful to you. However, from time to time you will be explicitly directed to one of these OU study skills sessions as part of one of the activities on B100. This is because much of the generic guidance available in the sessions is very relevant to studying B100 and it would be an unnecesary doubling of effort to recreate very similar guidance here, specificlly for B100. Also, by linking to the generic study skills pages you will get an idea of what else is available there that may be useful to you at some point. This activity on note taking is one of those where you are encouraged to work through a generic study skills session before you return to the B100 website to complete the activity with some B100 specific material.

Figure 14.1 Time estimation of learning activity in a module guide.

Figure 14.2 Activity planner tool.

300 hours of learning or 8–9 hours per week, and a 60-credit module requires 600 hours of learning or 16–18 hours per week.

When using data to compare module design across disciplines and modules, according to previous work (Rienties & Toetenel, 2016; Toetenel & Rienties, 2016a) it is important to classify learning activities in an objective and consistent manner. In particular, each module goes through a mapping process by a module team which consists of an LD specialist, an LD manager, and faculty members. This process typically takes between one to three days for a single module, depending on the number of credits, structure, and quantity of learning resources. First, the learning outcomes specified by the module team were captured by an LD special-ist. Each learning activity within the module's weeks, topics, or blocks was catego-rised under the LD taxonomy and stored in an "activity planner" – a planning and design tool supporting the development, analysis, and sharing of LD (Figure 14.2). Next, the LD team manager reviews the resulting module map before the findings are forwarded to the faculty. This provides academics with an opportunity to com-ment on the data before the status of the LD is finalised. To sum up, the mapping process is reviewed by at least three people to ensure the reliability and robustness of the data relating to LD.

14.3 How instructors design online courses

To understand how instructors designed online courses at the OU, a subset of 37 modules were extracted from the OU Activity Profile tool, which was mapped on a weekly basis. These modules were selected based on the data availability in conjunction with discussion with the LD team, in order to determine a representative sample of the OU courses. Table 14.2 provides descriptive information about the selected modules.

In line with previous findings (Rienties & Toetenel, 2016; Toetenel & Rienties, 2016a), assimilative, assessment, and productive activities were the predominant types of learning activity (Table 14.3). Assimilative activities accounted for half of the workload on average (M = 50.00%, SD = 13.03%), followed by assessment (M = 24.4%, SD = 8.38%) and productive (M = 17.60%, SD = 12.39%). There was a large variation in terms of the total workload across modules. All modules have some proportions of assimilative, productive, and assessment but some modules did not have any communication, finding information, interactive, or experiential activities (Table 14.3).

A visual comparison of LDs across the four disciplines suggested that STEM modules were more likely to use experiential and interactive activities than other disciplines (Figure 14.3). Modules in Education, Health, and Languages had the highest proportion of workload for productive activities. A Kruskal-Wallis test indicated that the differences between disciplines in productive (X^2 = 14.37, p < .01) and experiential activities (X^2 = 8.64, p < .05) were statistically significant. These results based on aggregated figures of LD confirmed findings from previous studies (Rienties & Toetenel, 2016; Toetenel & Rienties, 2016a). It also added new insights

Table 14.2 Descriptive statistics of 37 modules

	Frequency	Percent
Credits		
30	17	45.9%
60	20	54.1%
Level		
0	3	8.1%
1	26	70.3%
2	5	13.5%
3	3	8.1%
Faculty		
Arts & Social Sciences	9	24.3%
Business & Law	6	16.2%
Education, Health, Languages	9	24.3%
STEM	13	35.1%

Note: Level 1, 2, 3 at the OU are equivalent to introductory, intermediate, and advanced courses. Level 0 represents access modules.

Table 14.3 Descriptive statistics of seven types of learning activity in 37 modules

	N	Minimum	Maximum	Mean	Std. deviation
Assimilative	37	23%	75%	50.0%	13.03%
Information	37	0%	8%	2.2%	1.98%
Communication	37	0%	9%	2.5%	2.96%
Productive	37	2%	59%	17.6%	12.39%
Experiential	37	0%	12%	1.1%	2.25%
Interactive	37	0%	19%	2.2%	4.56%
Assessment	37	13%	57%	24.4%	8.38%

Metric = % of total workload.
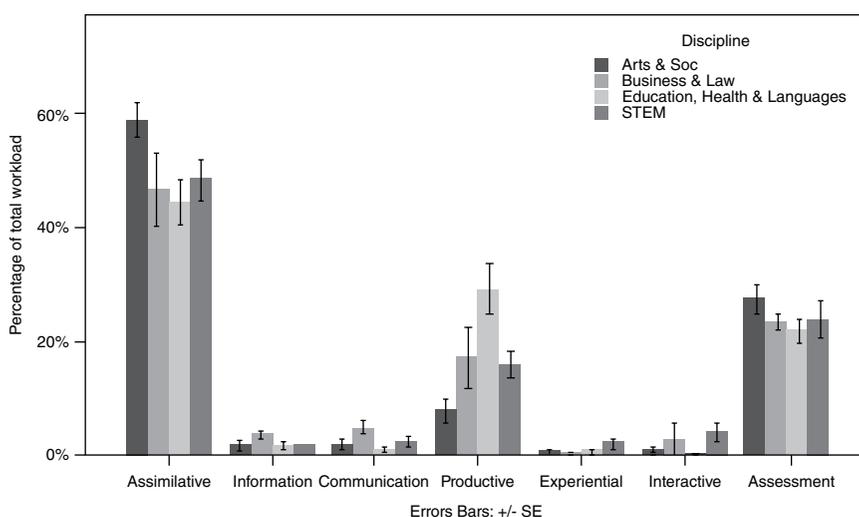
Figure 14.3 A comparison of seven learning activity types across four disciplines.

into the disciplinary differences in LDs. The next section will unpack the changes in LDs over time.

Figure 14.4 visualised the changes in total workload of 37 modules over 31 weeks grouped by the number of credits. By default, the total workload of 30 credit modules was lower than 60 credit modules. However, there were a lot of fluctuations in workload across modules over time ($M_{30\ credit} = 6.5$, $SD_{30\ credit} = 3.11$; $M_{60\ credit} = 8.9$, $SD_{60\ credit} = 4.42$) with a slight decrease in the last 4 weeks toward the end of the module (Table 14.4).

Figure 14.5 illustrates the average time students were expected to spend per module (in hours) on different learning activities over 34 weeks. Each colour
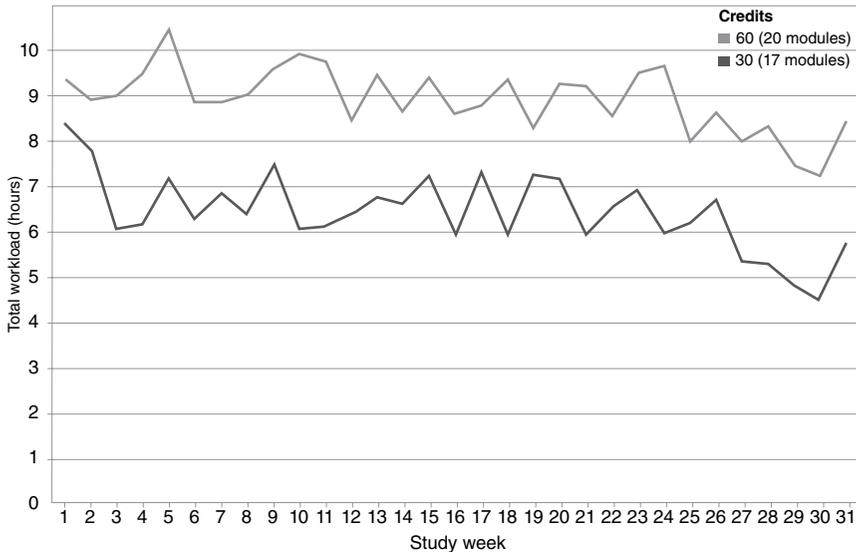
Figure 14.4 Visualisation of total workload over time of 37 modules over 31 weeks.

Table 14.4 Descriptive statistics of seven learning activity types of 37 modules over 31 weeks

	N	Min	Max	Mean	Std. deviation
30 credits modules					
Assimilative	475	0.0	12.4	3.1	2.36
Information	475	0.0	2.3	0.1	0.31
Communication	475	0.0	2.5	0.2	0.38
Productive	475	0.0	9.5	1.3	1.39
Experiential	475	0.0	9.0	0.1	0.71
Interactive	475	0.0	4.4	0.2	0.78
Assessment	475	0.0	10.5	1.3	2.23
Total	475	0.0	23.6	6.4	3.11
60 credits modules					
Assimilative	613	0.0	15.0	4.5	3.88
Information	613	0.0	13.0	0.3	0.92
Communication	613	0.0	11.0	0.3	0.89
Productive	613	0.0	12.5	1.3	1.94
Experiential	613	0.0	1.8	0.0	0.17
Interactive	613	0.0	19.1	0.1	0.87
Assessment	613	0.0	20.0	2.4	4.06
Total	613	0.0	35.9	8.9	4.42

Metrics = Hours N = Number of data points per module per week. For example, a 30-week long module has 30 data points.
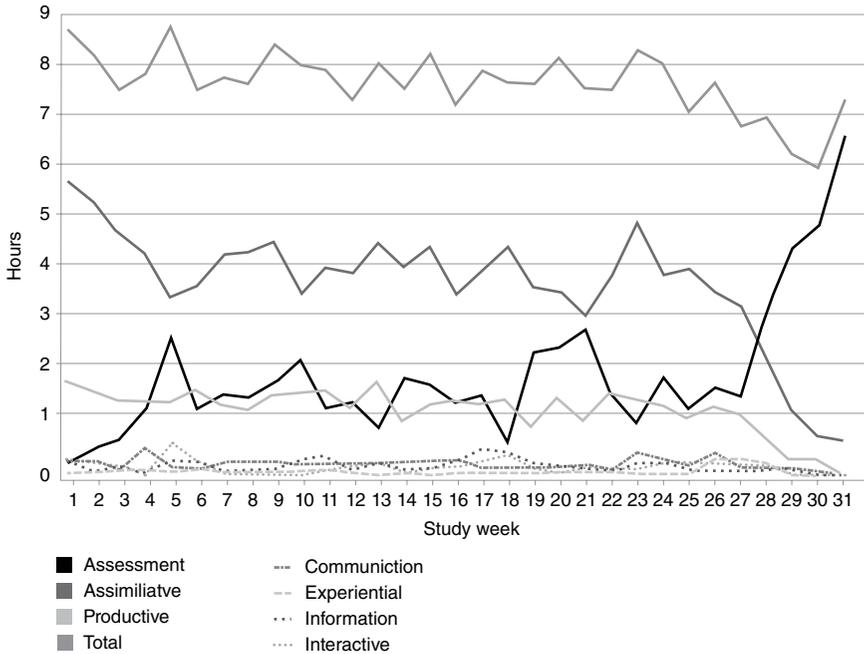
Figure 14.5 Visualisation of seven learning activity types over time of 37 modules over 31 weeks.

represents a type of learning activities. The visualisation also confirmed the dominance of assimilative (orange), assessment (blue), and productive (purple) learning activity types. Assimilative activities were present throughout most of the learning process except for the last four weeks and accounted for half of the total workload (M = 3.90, SD = 3.37).

Interestingly, there was an opposite trend between assimilative and assessment activities throughout the course (r = -0.462, *p* < .01). More assimilative activities were used at the beginning of a module, whereas more assessments were used toward the end. Assessment activities were also negatively correlated with other types of learning activity (Table 14.5). In other words, teachers deliberately reduced the workload of other learning activity types when an assessment was activated.

After capturing a dynamic picture of LD over time, we took a further step to investigate how LDs were configured across different modules. We reported four exemplary modules across four disciplines with a variety of configurations and patterns of learning activities (Figure 14.6). In line with the findings above, all four modules extensively made use of assimilative (orange), productive (purple), and assessment activities (blue). However, there are subtle differences in the way each module utilised these three activity types.

The first module in Arts followed a "traditional" design, with a lot of reading, watching, listening activities. Its assessment consisted of five continuous assessments, so-called Tutor Marked Assessments (TMAs) every 4–5 weeks and an end

Table 14.5 Correlation analysis of seven learning activity types over time of 37 modules

	1	2	3	4	5	6	7	8
1. Assimilative	1							
2. Information	.082**	1						
3. Communication	.166**	.167**	1					
4. Productive	.161**	.167**	.130**	1				
5. Experiential	.021	−.021	−.022	−.002	1			
6. Interactive	.016	.015	.050	.008	.012	1		
7. Assessment	−.462**	−.115**	−.124**	−.292**	−.062*	−.003	1	
8. Total	.555**	.248**	.300**	.362**	.078**	.230**	.283**	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
N = 1088 data points.
Note: Adapted from Nguyen et al. (2017).
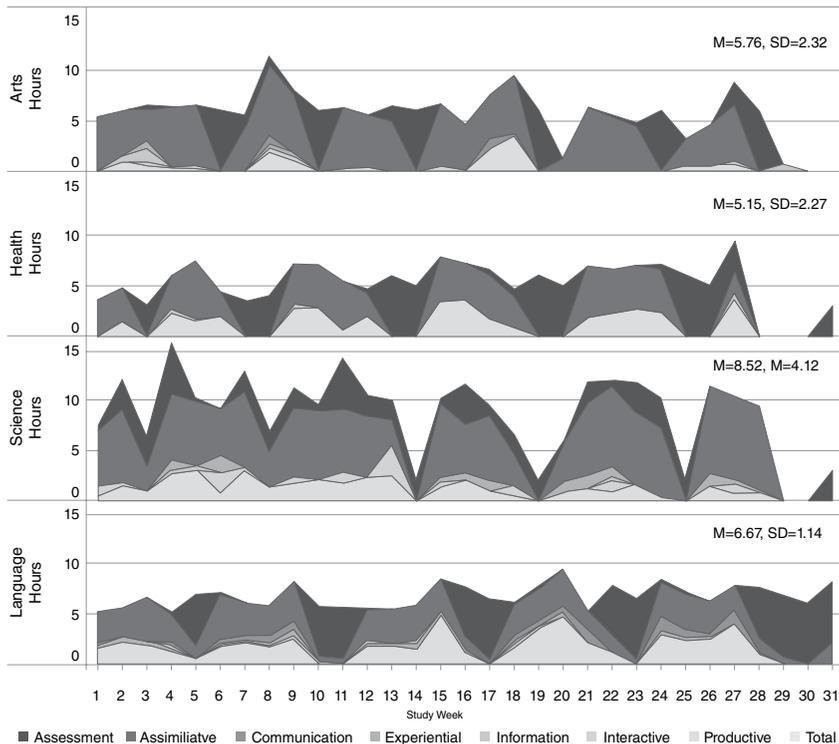
Figure 14.6 Four exemplary modules from Arts, Health, Science, and Languages.

of module assessment (EMA) in week 30. The workload of this module was relatively constant for most parts, except for the peak in week 8 which had a double amount of workload (i.e., 11.31 hours) compared to other weeks.

The second module in Health was similar to the first module in Arts. However, the former used more productive activities and had two-week long studying time for each TMA. The third module in Science adopted a continuous assessment strategy using a lot of quizzes throughout the learning process. This module also had a considerable amount of interactive (yellow) and experiential (light blue) activities compared to other modules. There were several dips in workload in week 14, 19, and 25 which represented TMA preparation weeks. The dip in week 29 represented an EMA preparation week. The fourth module in languages had a higher mix of assimilative and productive activities. There was also a higher presence of communication activities (red) in this module.

In summary, the findings have started to demonstrate through visualisations and statistical analysis the overall trends in LDs across 37 modules over 31 weeks. The three main types of learning activity namely assimilative, productive, and assessment were visible in all modules. There was a moderate negative correlation between

assimilative and assessment activities. A closer look into each module individually revealed subtle differences in how each teacher utilised each learning activity type.

14.4 How students engage in online learning activities

To capture student engagement, the time spent on the VLE (i.e., Moodle) was used as a proxy of student online behavioural engagement. Time spent on the VLE was calculated as the duration between two consecutive clicks, aggregated across all study sections. The data were captured from four weeks before the start of the module until four weeks after the end of the module. Learning activities were planned for over 30 weeks. In order to link LD data with engagement data, the measurements needed to be on the same level of analysis (e.g., weekly). Based on this, behavioural engagement were generated as the average time spent on the VLE per week (in minutes).

Fixed effect models were carried out with the average time spent on VLE per week (Table 14.6) as a dependent variable. For each predictor, four models were applied. First, we ran a normal OLS regression model. Second, a fixed–effect model was used to control for the unobserved heterogeneity of time. Third, we controlled for the fixed effect between modules. Finally, we controlled for the fixed effects of both time and modules. Since assimilative activities account for most of the

Table 14.6 Fixed effect model of VLE engagement per week predicted by learning design activities

DV = VLE per week	Unstandardised coefficients			
	(1)	(2)	(3)	(4)
MODELS	OLS	FE_week	FE_module	FE_module_week
Assessment	4.98**	5.09**	2.47**	2.80**
	(0.57)	(0.59)	(0.47)	(0.47)
Information	2.40	3.23	−0.72	0.15
	(2.64)	(2.60)	(1.98)	(1.94)
Communication	26.29**	26.29**	16.54**	17.44**
	(2.66)	(2.62)	(2.16)	(2.11)
Productive	1.75	1.73	−1.84	−1.83
	(1.14)	(1.12)	(1.04)	(1.03)
Experiential	3.57	4.49	−2.07	−0.99
	(3.83)	(3.78)	(2.98)	(2.91)
Interactive	11.57**	11.25**	−0.33	−0.46
	(2.23)	(2.20)	(1.81)	(1.78)
Constant	95.66**	95.30**	110.6**	172.1**
	(2.91)	(2.85)	(2.46)	(10.50)
Observations	1,088	1,088	1,088	1,088
Adjusted R-squared	0.15	0.19	0.55	0.58

Standard errors in parentheses. * $p < .05$, ** $p < .01$
Baseline: assimilative.
Source: Adapted from Nguyen et al. (2017).

workload, they were set as the baseline. Therefore, the following results should be interpreted relative to assimilative activities.

Table 14.6 shows that assessment activities were positively and significantly related to the average time spent in the VLE per week in all four models (Nguyen et al., 2017). In Models 1 and 2, the effect of assessment activities was almost the same ($B = 4.98$, SE $= 0.57$, $p < .01$ and $B = 5.09$, SE $= 0.59$, $p < .01$, respectively). The effect of assessment activities became smaller in Model 3 and Model 4 when differences between modules were taken into account. On average, an additional hour allocated for assessment activities was associated with 2.47 (SE $= 0.47$, $p < .01$) and 2.80 (SE $= 0.47$, $p < .01$) minutes increase in the average time spent on the VLE per week in Model 3 and Model 4, respectively.

Communication activities were also positively associated with the time spent on VLE per week in all four models. For every hour increase in communication activities, the time spent on VLE per week increased by 17.44 minutes (SE $= 2.11$, $p < .01$). The effect of communication activities was the strongest amongst all other learning activity types. Interactive activities were positively correlated with time spent on VLE in Model 1 and Model 2. However, the effect of interactive activities became non-significant when the differences between modules were taken into account (Model 3 & Model 4).

Overall, LD activities explained up to 58% of the variability in student engagement in the VLE per week when controlling for the heterogeneity between modules. To further explore the relationship between LD and student engagement. We visualised two exemplary modules in Arts and in Languages (Figure 14.7). These two modules had a relatively similar design but the level of VLE engagement seemed to be very different. In the Arts module, we can see a peak in VLE activity
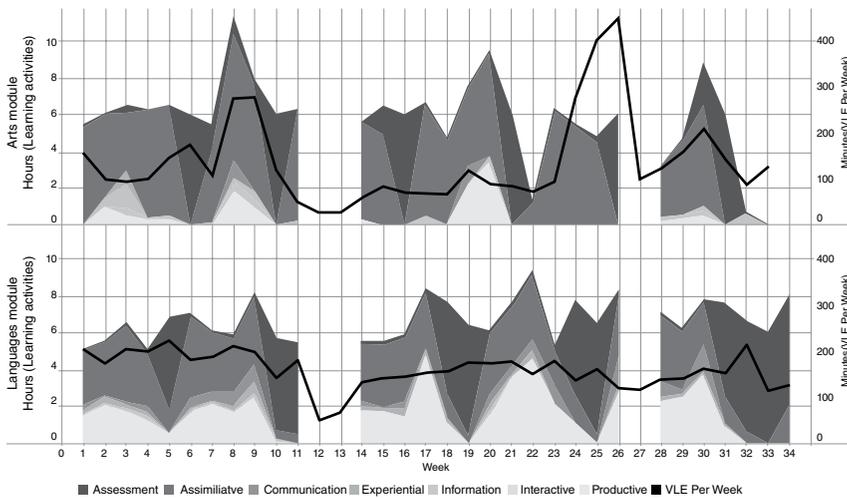
Figure 14.7 Learning design and VLE activity of two modules in Arts and Languages.

in week 8–9 due to the increase in workload. The level of engagement then decreased during the Christmas breaks and sharply increase just before the Easter break in week 26. In contrast, the level of engagement in the Language module was relatively constant throughout the module, with the exception during Christmas breaks. The level of engagement in both module slightly increased in assessment weeks, which confirmed the findings from the fixed-effect models.

14.5 Study patterns and academic performance

When teachers design for learning, they often estimate the workload of each activity and the corresponding time period for each activity (e.g., take 3 hours to read chapter 2 in week 2). LD is often embedded in the course syllabus and acts as a guideline for students to self-regulate their learning process (Biggs & Tang, 2007). However, students as agents consciously and perhaps opportunistically make decisions on what, how, and when to engage in a particular range of learning activities (Winne, 2017). While teachers might think that a student will read say chapter 2 in week 2, perhaps some students are already pre-reading materials from week 4, while other students may not have watched the introduction video of week 1. Therefore, by having a better understanding of how much time students spent on respective learning materials and when in time they studied these learning materials, this may enhance our intertemporal understanding of how students make complex study decisions.

Nguyen et al. (2018b) investigated how students study patterns compare to the initial study regime produced for the LD, together with how different groups of performance and LD were related to these study patterns. The analyses were conducted using trace data from the VLE longitudinally over 28 weeks, with 387 participating students, and replicated over two semesters in 2015 and 2016. Two types of study patterns were computed which capture how much time a student spent on studying a particular study material:

- in advance – material x assigned to week t was studied during or before week t
- catching up or revise – material x assigned to week t was studied after week t

Overall, given the same study materials, the passed and the excellent group of students spent more time on studying in advance and catch up than the students who failed in both semesters (Figures 14.8 & 14.9). In Fall 2015, passed and excellent students spent on average each week 1.81 hours (SD = 3.43), and 2.3 hours (SD = 3.52) on studying in advance, compared to students who failed with an average of 0.22 hours (SD = 1.05). Similar trends in the time studying in advance across the three groups were also presented in Fall 2016. In Fall 2015, passed and excellent students followed a similar pattern studying in advance. However, in Fall 2016 passed and students who failed portrayed a similar pattern for all study materials from week 1 to week 12. From week 13 onwards, passed students spent more time studying in advance than students who failed. A lot of time was spent on studying in advance in weeks 8, 18, and 27 (for Fall 2015) because of the respective assessments (TMAs) in these weeks (Figure 14.8).
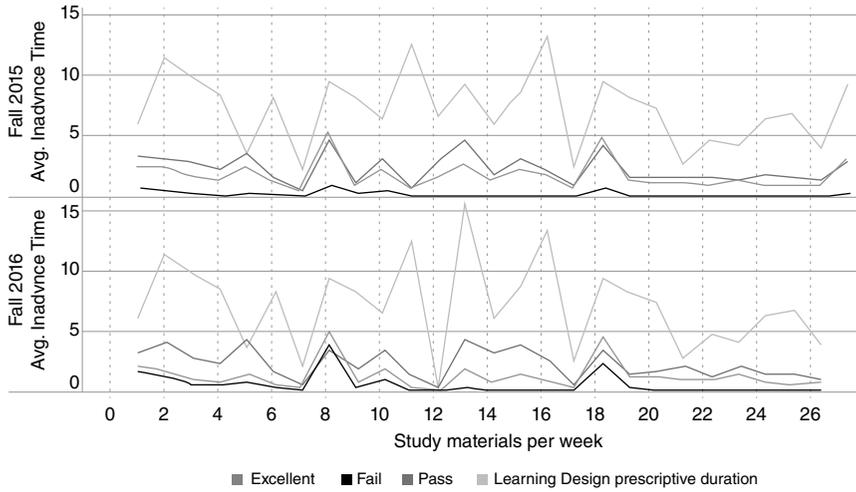
Figure 14.8 Number of hours spent on studying in advance.
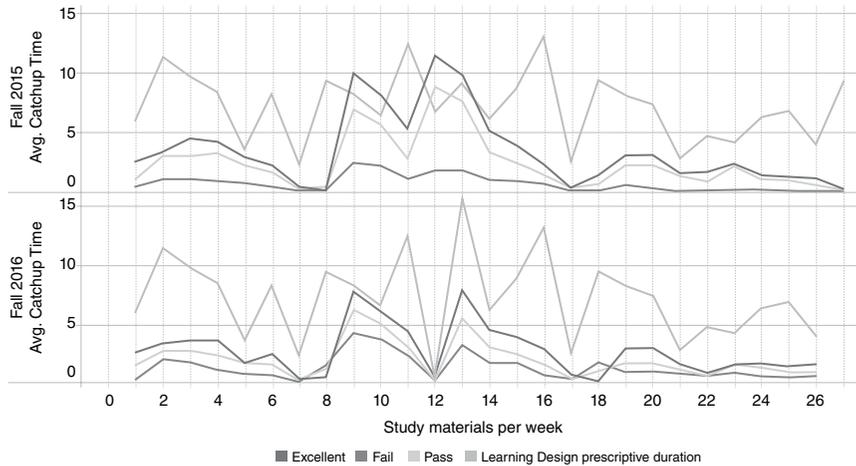
Figure 14.9 Number of hours spent on studying catching up and revising.

Two study materials in weeks 9–10 (block 2.1) and weeks 12–13 (block 2.3) represented red-flags of overwhelming workloads since they were associated with an increase in both studying in advance and catch up time (Figures 14.8 and 14.9). In Fall 2015, passed and excellent students spent much more time to catch up on both of the materials, while the gap was smaller in 2016.

While students who passed consistently spent more time studying both in advance and catch up than students who failed, the relative frequencies revealed a different picture. In both semesters, all three groups of students spent a similar
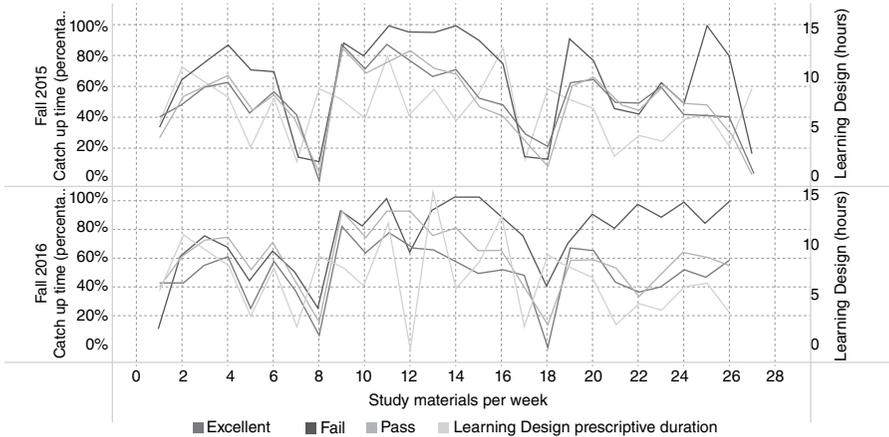
Figure 14.10 Percentage of time spent on studying catching up.

percentage of their time studying in advance in weeks which had a TMA (week 8, 18, 27). However, in Fall 2015 students who failed spent a higher proportion of their time on catching up activities (61% on average) than passed (56%) and excellent students (55%) in almost all weeks (Figure 14.10).

In Fall 2016, the three groups shared a similar percentage of study time on catching up from week 1 to week 12. After week 12, students who failed spent on average much higher proportion of their time on catching up activities compared to passed and excellent students. Towards the end of the course, the gap between failed and passed/excellent students increased considerably (Figure 14.10).

In other words, the initial visualisations indicated that student engagement on VLE was lower than the suggested time spent in LD. High-performing students, who achieved a pass or excellent grade shared similar patterns of engagement. However, low-performing students spent the least amount of time on VLE and the highest proportion of their studying time on catching up and revising activities.

By having a better understanding of how, when students study on which materials, and how these behavioural patterns connected to LD, teachers may be in a much better position to reflect and adjust their teaching practices. By explicitly pointing out which study materials were under or over-used, teachers can act on these materials. This information can be fed back into an LA dashboard, which would support teachers and learning designers to track how the students progressed through each individual study material (on-track or lagging behind). Teachers can use this information to adjust the study workload and re-arrange the structure of learning activities accordingly.

14.6 Discussion and moving forwards

The increasing development in online and distance education has provided researchers with an unprecedented amount of data generated by both students and

educators (Shum, 2012). By utilising digital traces of students' activities combined with information about the course design, Chapter 14 unpacked some of the temporal characteristics of how teachers design for learning and how LD influences student engagement in distance education. Findings from Chapter 14 showed that assimilative activities, such as reading, watching, and listening, were predominantly used at the beginning and throughout the module. Assimilative activities were often accompanied by productive activities which required students to reflect on the information they assimilated. Furthermore, the study workload varied from modules to modules and fluctuated considerably from weeks to weeks.

These findings highlighted a mismatch between educational literature, institutional policies, and the actual LDs. Previous research suggested that a balanced and consistent study workload is essential to student success (Bowyer, 2012; Whitelock et al., 2015). However, in practice the study workload is difficult to estimate due to the quantity and variety of learning activities used by teachers. The effect of inconsistent workload could be even more detrimental to OU students because the majority of them are engaged in either a full-time or part-time employment in parallel to studying. By visualising LD on a week by week basis, teachers can reflect on the (im)balance of workload in their module and improve their LDs.

Chapter 14 showed that LD plays an important role in LA research by not only improving its model accuracy by taking into account the contextual heterogeneity across modules but also offering concrete and actionable feedback to teachers. The level of engagement on VLE by students was lower than the expected workload by teachers in most weeks throughout the course timeline. What is more important was LA models informed by LD can help teachers to identify problematic learning activities in which students spent an excessive amount of time revisiting or when did students start to fall behind the course timeline. We need to go beyond this kind of simple prediction, although it is accurate, to ask real important questions, such as which concept or learning activity student X was struggling with, and since when student X started falling behind on these activities. Other specific questions about the LD could be asked, such as whether students engaged in material X, how long students spent on learning activity Y, and how often students revisited concept Z. The type of fine-grained analysis illustrated in this thesis allows researchers to ask and answer some of these meaningful questions.

However, there are a lot unknown about the changes in LD practices and student engagement over a longer period of time, such as semesters or years. Therefore, future research should consider extending the longitudinal design, such as examining the changes in LD of the same module over different semesters, the changes in engagement pattern of the same student as they progressed through different LDs, and the changes of LD in the same discipline/qualification.

Furthermore there is a lack of studies on how LD-informed LA could be beneficial to students learning progress. For example, recommendation systems could be built based on patterns of engagement of the previous cohort of students to support the subsequent cohorts. Students could use insights from the previous cohort to plan and self-regulate their own learning process such as how much time should they expect to spend on certain learning activities, which concept that

students from previous years struggled with, and how high-performing students engaged throughout the course.

14.6.1 Implications for practice

Chapter 14 has shown that while student engagement was largely driven by LD, there are many potential misalignments between what teachers think students do and what they actually do. By having a "reality check" based on actual student behaviour, teachers can identify potential problems in their LD and make appropriate adjustments. It is important to have frequent check-ins with students not only on the assignment deadline but throughout their learning process. It might be too late to intervene by the time a student appears as "at-risk" on the LA system. LA should go beyond simple click count with more fine-grained metrics such as the duration student spent on each learning activity and whether students are on-track or falling behind. This type of fine-grained analysis tightly linked to LD could provide important new insights to teachers and may help them to effectively intervene where necessary.

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UDL and its implications in MOOC accessibility evaluation

Francisco Iniesto and Garron Hillaire

15.1 Introduction

Assessing the accessibility of online educational environments is not easy. As we scale up educational technologies like with Massive Open Online Courses (MOOCs), we may amplify the impact of (in)accessible designs (Martin, Salvatierra, & González, 2016). With MOOCs, we reach more learners and need to consider the variability that comes with scale (Papathoma et al., 2020), as previously high-lighted in this book (Chua, 2022; Conde Gafaro, 2022; Iniesto, McAndrew, Minocha & Coughlan, 2022; Rizvi, Rienties, Kizilcec, & Rogaten, 2022). While the challenges and opportunities online learning at scale faces in terms of accessibility are great, the support from educators and technical experts of the platforms that host such courses has historically been minimal (Sanchez-Gordon & Luján-Mora, 2017).

As indicated in Chapter 9, Iniesto et al. (2022) implemented an accessibility audit to understand how to improve the accessibility in MOOCs for learners with accessibility needs from an expert evaluation perspective. The audit was conducted to help understand the current state of accessibility in MOOCs (Iniesto, 2020). The methodology in the audit combined accessibility evaluation methods across four main evaluation areas to compose four different checklists in a common heuristic evaluation approach: technical accessibility, user experience (UX), quality and learning design evaluations.

Universal Design for Learning (UDL) was selected for the learning design component because UDL offers benefits for both learners and educators in its imple-mentation in higher education. The greatest benefits of UDL implementations are often experienced by those learners with accessibility needs. While implementing UDL there is a reduction in the need for and time required to arrange individual accommodations, it is a proactive design that supports a diverse accessibility needs, and it offers a greater opportunity to develop more self-aware and knowledgeable learners (CAST, 2018). UDL has a thorough development and widespread use in primary, secondary and further educational contexts worldwide and it is already included in the curricula at university level (e.g., Gronseth et al., 2019). UDL is used in educational international initiatives such as INCLUDE (The International Collaboratory for Leadership in Universally Designed Education) (Bracken &

Novak, 2019) and UDLL (Universal Design for Learning – License to Learn) (Griful-Freixenet, Struyven, Verstichele, & Andries, 2017). The most recent *Inclusion and Education* report (UNESCO, 2020) assesses the progress towards Sustainable Development Goal 4 which ensures inclusive and equitable quality education and promote lifelong learning opportunities for all, drawing attention to all those excluded from education because of background or ability, naming UDL 16 times in the report.

Lifelong learning and opportunities to all provided thanks to the implementation of UDL in online learning embraces the open world learning theme as an enabler that empowers creating expert educators and learners who are critical of the learning resources and platforms. To support the long-term aim of developing learners as expert evaluators of their learning environments, we focus first on the development of a rubric to evaluate MOOCs based on the UDL guidelines. In Chapter 15, we detail the reflective process followed to update the UDL framework, designed for developing accessible educational resources, to an evaluation checklist for MOOCs and the implications this process has for extending the aim of UDL from creating expert learners to creating expert evaluators. While we do not believe UDL can be simplified solely to a checklist we view this as a tool that can help to close the loop between the intention of course designers with evaluations from learners. With that goal in mind, we report on adapting the UDL guidelines to an evaluation checklist, the authors of Chapter 15 computed inter-rater reliability using Cohen's Kappa to validate the checklist as an iterative process for improvement (Gwet, 2014).

15.2 UDL to evaluate MOOCs

UDL offers a framework that considers how to design learning environments to develop expert learners, defined in this framework as resourceful and knowledgeable, strategic and goal-directed, purposeful and motivated (CAST, 2017). UDL favours the elimination of physical, sensory, affective, and cognitive barriers to access, learning, and participation of learners (Meyer, Rose, & Gordon, 2014). It aims to use various teaching methods to remove barriers to learning (understood as anything that prevents learners from fully engaging in learning) and give all learners the same opportunity to achieve their learning goals. UDL is based on three principles, as further explained in Table 15.1:

1 *Provide multiple means of engagement.* Learners differ in how they may feel involved and motivated to learn. Therefore, it is necessary to offer options that reflect the interests of learners, strategies to face new tasks, choices for self-evaluation and reflection on their expectations.
2 *Provide multiple means of representation.* Learners vary in the way they perceive and understand the educational content. Therefore, it is necessary to offer different options to approach materials through various channels of perception, be it auditory, visual, or motor, so it is required to provide the information in a format that allows as much as possible to be adjusted by the learner.

Table 15.1 UDL Principles and guidelines

	Provide multiple means of engagement	*Provide multiple means of representation*	*Provide multiple means of action and expression*
Access	(7) Provide options for recruiting interest	(1) Provide options for perception	(4) Provide options for physical action
Build	(8) Provide options for sustaining effort and persistence	(2) Provide options for language & symbols	(5) Provide options for expression & communication
Internalise	(9) Provide options for self-regulation	(3) Provide options for comprehension	(6) Provide options for executive functions
Goal	**Purposeful and motivated**	**Resourceful and knowledgeable**	**Strategic and goal-directed**

Source: Adapted from CAST (2018).

3   *Provide multiple means for action and expression.* Learners differ in how they can work during learning and express what they know. It is necessary to offer varied options for action through materials with which all learners can interact, facilitate fluent opinions, and seek the stimulation of the effort and the motivation towards a goal.

Since the UDL Guidelines are meant to be informed by both new research and feedback from the field, they have been updated several times in the past. As indicated in Table 15.1, the guidelines start with the principle *Provide multiple means of Engagement* but originally it was *Provide Multiple Means of Representation.* While the principles were reordered the guidelines were not renumbered which is why guidelines 7–9 appear first in the framework. UDL has recently informed that guidelines are going to be updated again following a community-driven process (CAST, 2020).

   The three design principles contain nine guidelines and 31 checkpoints. Principles outline the overall goal while the checkpoints provide specific design advice that considers accessibility and learning. In the most recent version of the UDL Guidelines (CAST, 2018), the guidelines and checkpoints have been further organised into access, build, and internalise categories. The "access" category includes guidelines that suggest ways to increase access to the learning goal by recruiting interest and by offering options for perception and physical action. The "build" category comprises guidelines that suggest ways to develop effort and persistence, language and symbols, and expression and communication. Finally, the "internalise" category incorporates guidelines that suggest ways to empower

learners through self-regulation, comprehension, and executive function. Each one of them shows the maturing process to become an expert learner.

Therefore, the UDL approach is to present the information in ways that fit learners' needs, rather than requiring learners to adapt to the information (Rose & Meyer, 2006). This is useful for those users with learning and attention difficulties because it allows them to interact with the materials in several different ways (Cook & Rao, 2018). At the same time, UDL supports every learner to choose the best path for their learning. This approach is relevant to understand learners who may like the curriculum to adjust to their needs. As reported above, one of the objectives of UDL is not simply the mastery of content knowledge or new technologies, it is the mastery of the learning process where education should help turn novice learners into expert learners (CAST, 2017), which aligns itself with MOOCs pedagogical perspective where learners are expected to be self-directed in their learning (Conde Gafaro, 2022).

The framework proposed by UDL is intended to produce educational content following the principles of UDL rather than being evaluated once those resources are provided (Hall, Cohen, Vue, & Ganley, 2015). However, UDL has been proved as an appropriate framework to categorise and address barriers to learning for online environments (Rao, Ok, Smith, Evmenova, & Edyburn, 2020). Following the UDL objective to promote expert learners the process of using the UDL framework to evaluate MOOCs is an exercise to show the ability to evaluate the online environment for barriers to learning. Figure 15.1 shows that the process of the application of the framework as an evaluative framework for MOOCs is a support for those learning about technology accessibility and learning. Educators and learners can benefit from evaluating them in a process that facilities exploring their educational needs as expert evaluators (i.e., expert learners).

15.3 The design and validation of the framework

The design and validation of the framework fell into three phases. The first phase was the creation of the checklist by the first author. The second phase was reviewing the checklist with the UDL expert, in other words, the second author. Finally, the third phase involved an inter-rater reliability agreement protocol between both raters.

15.3.1 Creating the framework

The meta-framework proposed included four components (Iniesto, McAndrew, Minocha, & Coughlan, 2019). The MOOC accessibility audit components are as follows:

1   Technical accessibility evaluation. Checking of conformance to guidelines through WCAG (2018) and the text-based files.
2   User experience (UX) evaluation. The evaluation of usability and UX characteristics of the user interface design and pedagogical design.
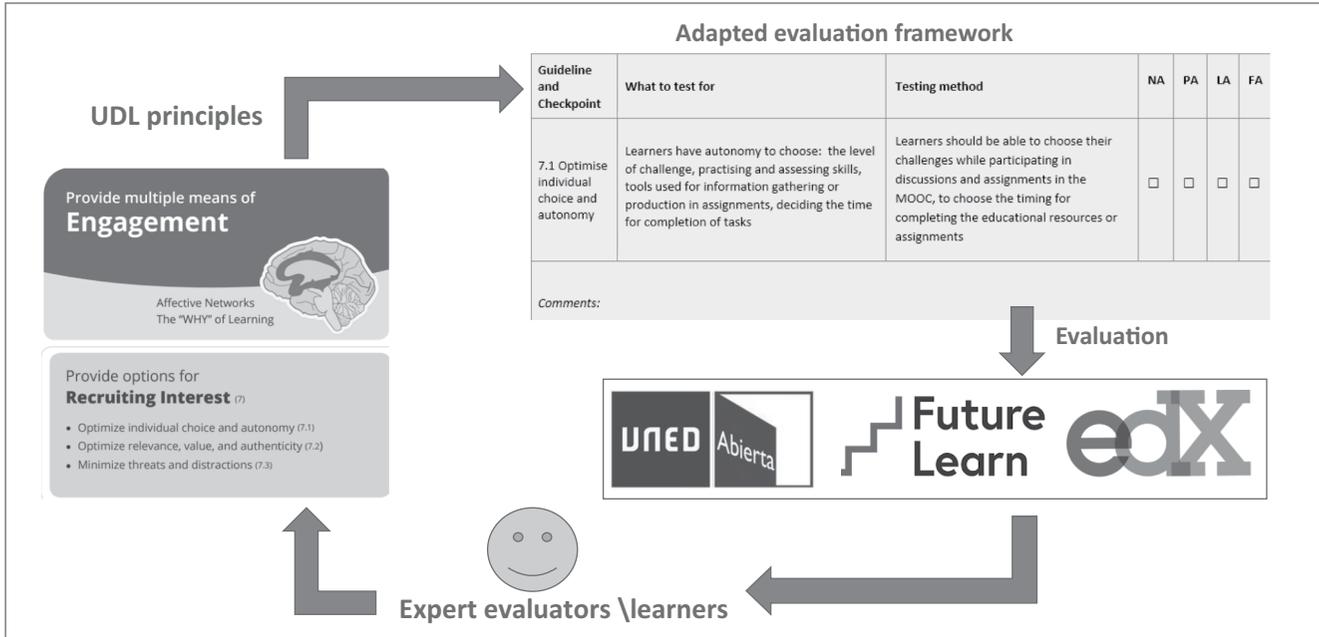
Figure 15.1 UDL evaluation process.

3   Quality evaluation. Evaluation of MOOCs properties, the quality of the design, platform, and support for learners.
4   Learning design evaluation. Evaluation of the learning design characteristics within MOOCs using UDL.

All of them share a standard set of characteristics: checklists were applied to evaluate the MOOC once it was run and had the same structure (principle, guideline, and criteria). Some further characteristics included:

• The checklist shares the same structure for every single criterion:
    • What to test for: information to help the reviewer to know what the criterion is evaluating.
    • Testing method: information to help the reviewer to proceed to test the criterion.
    • Comments: space for the reviewer to add free comments.
• The checklist shares the same rating method:
    • NA (Not achieved): The feature to test is missing.
    • PA (Partially achieved): The feature to test is available but not integrated.
    • LA (Largely achieved): The feature to test is available and partially integrated.
    • FA (Fully achieved): The feature to test is available and fully integrated.
    • If the criterion is not applicable, *Not Applicable* is added to the comments

The use of "What to test" for and "Testing method" was based on the accessibility heuristic evaluation template by the Inclusive Design Research Centre (Pererya, 2016). The four evaluation criteria were taken from the OpenUpEd quality label benchmark (Rosewell & Jansen, 2014). As Brajnik, Yesilada, and Harper (2010) claimed, heuristic evaluations can be complex and even produce wrong results (false positives). For that reason, a good definition of what should be evaluated and how the evaluation should be carried out has been developed to help the evaluator. In the "Testing method" the explanation provided aims to reinforce what a fully achieved item would be. Developing a rating system that has four different values seeks to avoid a system that considers that a criterion is only fulfilled or not fulfilled, by adding the nuance that a criterion can be partially or largely implemented, in addition the use of comments allows the opinion of the evaluator to be explained to enrich the feedback available.

In the case of the learning design component reported in Chapter 15 the first author produced a draft for each of the 31 UDL checklists, named criteria in the audit. The design of the criteria for this component required a completely new development in the sections "What to test for" and "Testing method". For that purpose, the first author used UDL examples proposed by CAST, which helped to prepare specific cases in MOOCs (CAST, 2016).

15.3.2 Designing the framework

The design and validation processes between the two authors included a total of five meetings (Figure 15.2). That had two aims: improving the component
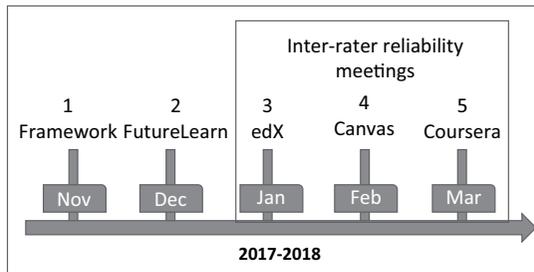
Figure 15.2 Design and validation meetings.

specifications iteratively and training to be critical using UDL (i.e., become an expert evaluator). Therefore, it was an iterative process between the two authors, whereby the second author acted as the rater for the validation of the design. The two initial meetings served different purposes: the first meeting had the objective of setting the evaluation framework reviewing the checklist proposal. The second meeting was used to carry out a process of testing the checklist on a MOOC of FutureLearn (Table 15.2). The sample for the validation process for the three remaining meetings included MOOCs from Coursera, edX and Canvas. The reason for the four differentiated platforms was to enrich the sample since different providers have different MOOC offering and pedagogical designs, as well all MOOCs cover differentiated subjects to allow finding varied barriers to learning.

15.3.3 Validating the application of the framework

In each of the validation meetings, the content of *"what to test for"* and *"testing method"* sections of the criteria were reviewed and improved to evolve from general testing to MOOCs structure. The updated version was used in the next evaluation. Figure 15.3 shows the evolution of criteria 9.1 and 2.2 as examples from meetings 4 to 5 (final version).

To allow validation of the framework, inter-rater reliability was computed. Inter-rater reliability, also known as inter-rater agreement, applies a score of how much consensus there is in the ratings given by various raters to test validity (Hallgren, 2012). Inter-rater reliability is useful in processes to determine if a scale is appropriate for measuring a variable. In the case of rater disagreement, it need not follow that the scale proposed is defective but that, for example, the raters need more training and better requirements (i.e., the process of becoming an expert evaluator through the improvement of the evaluation framework).

The inter-rater reliability protocol followed a systematised process that included two steps per inter-rater reliability meeting. The first step consisted of a brief talk before the individual evaluation to agree on the checklist version to be used and the course sample (i.e., webpages and educational resources from the platform and course) were understood by the raters. In the second step, the results of the

Table 15.2 Sample for the validation process

Order	Platform provider	MOOC	Course provider	Subject	Validated
1	FutureLearn	Smart Cities	The Open University	Engineering	No
2	edX	Introduction to Computational Thinking and Data Science	MIT	Mathematical Sciences	Yes
3	Canvas	Biometric Technologies: Identification for the Future	Canberra Institute of Technology	Biological sciences	Yes
4	Coursera	Learning How to Learn: Powerful mental tools to help you master tough subjects	University of California	Education	Yes

Source: Adapted from Iniesto (2020).
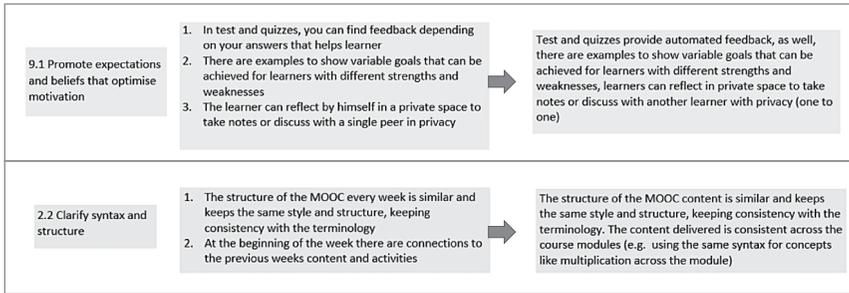
Figure 15.3 UDL checklists / Learning design criteria *testing method* evolution.

evaluation and possible improvements were discussed. In case of discrepancy, an agreement was then reached between the evaluators on how that particular criterion should be qualified (Cook et al., 2009).

The terminology that describes the agreement process includes:

- Success and failure. Success criteria are considered fully achieved (FA) and largely achieved (LA), failure criteria are considered partially achieved (PA) and not achieved (NA).
- Agreement. Evaluators can agree that is either perfect agreement or moderate agreement.
  - Perfect agreement. A perfect agreement is considered when the evaluators gave the same rating to a criterion (e.g., FA vs FA, NA vs NA).
  - Moderate agreement. Moderated agreement is when the rating given by the evaluators differs within the same group (success or failure).
- Disagreement. The rating between the evaluators differed between success or failure (e.g., PA vs FA or NA vs FA).
- Final agreement. The final rating as discussed and agreed.

We included statistical mathematical agreement using Cohen's Kappa (k) when examining the agreement between two raters (0.01–0.20 slight agreement, 0.21–0.40 fair agreement, 0.41–0.60 moderate agreement, 0.61–0.80 substantial agreement and 0.81–1.00 perfect agreement) (Gwet, 2014).

The edX agreement was of 24 out of 31, with 10 full agreements (k = 0.55). With Canvas there was a consensus of 24 out of 31, 11 of full agreement ($k = 0.55$). Finally, with Coursera, there was a concurrence of 26 out of 31, 12 of the criteria with full agreement ($k = 0.59$) (Table 15.3). Overall, the results indicated that the level of agreement increased during the third round of evaluation. In all cases, for the full evaluation process Cohen's Kappa showed a moderate agreement. When looking at the principles there were agreement fluctuations even when the specifications of the criteria included in the checklists were improved at each iteration. As well, there was variation at the criteria level in each iteration, which might be due

Table 15.3 Cohen's Kappa between evaluators

	Engagement	Representation	Action and expression	Full evaluation process
edX	0.28	0.83	0.57	0.55
Canvas	0.19	0.47	0.57	0.55
Coursera	0.8	0.42	0.39	0.59

to the nature of the sample, with different MOOCs and providers, and the richness of specifications in the UDL criteria.

To understand where the raters were improving their agreement and areas where it was more difficult, we further disaggregated the analysis at the principle level. Tables 15.4, 15.5 and 15.6 show the agreements and disagreements including both moderate agreements and final agreement. These tables are helpful to show visually the discrepancies during the process. Only one criterion of the 31 had not incurred any discrepancies ("Use multiple tools for construction and composition", 5.2), which exemplified the different interpretations that can be made while learning how to internalise UDL. Highlighted disagreements in the following explanations included those who have appeared in two or more evaluations.

For the principle "means of engagement" (Table 15.4), those criteria where there had been a substantial discrepancy were:

- "Optimise individual choice and autonomy" (7.1) and "Optimise relevance, value, and authenticity" (7.2). It was difficult to evaluate if learners can choose their challenges while participating in discussions and assignments and if those allow learners to connect with their learning goals.
- "Foster collaboration and community" (8.3). Difficulties when evaluating arose to determine if learners can find support to foster collaboration to encourage discussions.
- "Facilitate personal coping skills and strategies" (9.2). In a MOOC environment, it was not straightforward to identify places for learners to identify coping skills in discussions, either originated by facilitators or learners themselves.

Therefore, in MOOCs it is difficult to evaluate the engagement between learners and educators (and learners themselves) in discussions and assignments, an aspect reported both in the literature (Bote-Lorenzo & Gómez–Sánchez, 2017) and in this book (Chua, 2022; Conde Gafaro, 2022; Rizvi et al., 2022), losing part of the MOOC claimed support for social interaction (Sunar, White, Abdullah & Davis, 2016).

In the case of "means of representation" (Table 15.5), at criteria level key disagreements were:

- "Highlight patterns, critical features, big ideas, and relationships" (3.2) and "Maximise transfer and generalisation" (3.4). It was not easy to identify examples of essential features, places where having previous knowledge could help. As well, the existence of tools for the learners to personalise and generalise their learning.

Table 15.4 Agreement process for "provide multiple means of engagement"

Criteria \ checklists	edX			Canvas			Coursera		
	R1	R2	FA	R1	R2	FA	R1	R2	FA
7.1 Optimise individual choice and autonomy	PA	NA	NA	LA	PA	PA	PA	LA	LA
7.2 Optimise relevance, value, and authenticity	LA	PA	PA	LA	PA	PA	FA	LA	LA
7.3 Minimise threats and distractions	LA	LA	LA	LA	LA	LA	LA	LA	LA
8.1 Heighten salience of goals and objectives	PA	NA	NA	PA			PA		
8.2 Vary demands and resources to optimise challenge	NA	NA	NA	NA	NA	NA	LA	FA	LA
8.3 Foster collaboration and community	LA	NA	PA	LA	PA	LA	LA	FA	LA
8.4 Increase mastery-oriented feedback	NA	NA	NA	FA	LA	LA	FA	NA	NA
9.1 Promote expectations and beliefs that optimise motivation	PA	NA	PA	LA	PA	PA	PA		
9.2 Facilitate personal coping skills and strategies	LA	NA	PA	LA	PA	PA	PA		
9.3 Develop self-assessment and reflection	PA	NA	PA	PA			NA		

Note: R1 = Rater 1; R2 = Rater2; FA = Final Agreement; NA = Not Achieved; PA = Partially Achieved; LA = Largely Achieved; FA = Fully Achieved.

Source: Adapted from Iniesto (2020).

Table 15.5 Agreement process for "provide multiple means of representation"

Criteria \ checklists	edX			Canvas			Coursera		
	R1	R2	FA	R1	R2	FA	R1	R2	FA
1.1 Offer ways of customising the display of information	LA	FA	LA	PA			PA	LA	PA
1.2 Offer alternatives for auditory information	FA	LA	LA	PA			LA	FA	LA
1.3 Offer alternatives for visual information	PA	PA	PA	NA	PA	PA	LA	FA	LA
2.1 Clarify vocabulary and symbols	PA	NA	NA	NA			LA	FA	LA
2.2 Clarify syntax and structure	FA	LA	LA	PA			LA	FA	LA
2.3 Support decoding of text, mathematical notation, and symbols	PA	NA	NA	Not applicable			Not applicable		
2.4 Promote understanding across languages	PA	NA	PA	PA	NA	NA	FA	LA	LA
2.5 Illustrate through multiple media	NA	PA	PA	LA			PA	LA	PA
3.1 Activate or supply background knowledge	PA	PA	PA	LA	PA	PA	LA	FA	LA
3.2 Highlight patterns, critical features, big ideas, and relationships	FA	PA	PA	LA	PA	PA	FA	LA	LA
3.3 Guide information processing, visualisation, and manipulation	LA			FA			FA	LA	LA
3.4 Maximise transfer and generalisation	FA	PA	PA	LA	PA	PA	PA		

Source: Adapted from Iniesto (2020).

Table 15.6 Agreement process for "provide multiple means of action and expression"

Criteria \ checklists	edX			Canvas			Coursera		
	R1	R2	FA	R1	R2	FA	R1	R2	FA
4.1 Vary the methods for response and navigation	LA			FA	LA	LA	NA		
4.2 Optimise access to tools and assistive technologies	LA			FA	LA	LA	NA	LA	PA
5.1 Use multiple media for communication	LA	NA	PA	LA			PA	NA	PA
5.2 Use multiple tools for construction and composition	LA			PA			PA		
5.3 Build fluencies with graduated levels of support for practice and performance	PA	NA	NA	LA	PA	PA	PA		
6.1 Guide appropriate goal-setting	LA	NA	PA	PA			PA	NA	PA
6.2 Support planning and strategy development	NA			NA			NA	LA	LA
6.3 Facilitate managing information and resources	PA	NA	PA	NA	PA	PA	NA	PA	PA
6.4 Enhance capacity for monitoring progress	PA	NA	PA	LA			LA		

Source: Adapted from Iniesto (2020).

In MOOCs information about prior knowledge should be clear before enrolment and there should exist pointers to external resources during the course. As well, there is a lack of possibilities for personalisation, something that is problematic at the platform level since it affects courses even if they have been designed allowing space for personalising the learner experience (García-Peñalvo, Fidalgo-Blanco, & Sein-Echaluce, 2018). Finally, for "means of action and expression" principle (Table 15.6), criteria showed disagreements at some stage, but they were not repeated across the several evaluations.

The fact that the "means of engagement" principle accumulated more disagreements than "means of representation" but still more than "means of action and expression" pointed towards engagement complexities in MOOCs. Expert learners in MOOCs are often strategic and goal-directed, therefore, they are good at self-directed learning (Watted & Barak, 2018), but do worse in being purposeful and motivated, which is aligned with the drop-out rates and difficulties to keep the engagement in MOOCs (Petronzi & Hadi, 2016).

15.4 Discussion and moving forwards

In Chapter 15 we have reported on the adaptation of the UDL framework for evaluation purposes following an inter-rater reliability validation process. UDL evaluation processes by educators and learners facilitate the empowerment of creating expert learners who are critically evaluating the educational platforms and resources. Discussions during the validation process between the two raters included multiple conversations on what to evaluate in MOOCs using the UDL framework. In that sense, one of the principal difficulties was to distinguish whether the requirements should be addressed at platform or course level. This aspect is identified where the reliability agreements were lower which is underpinning differences between the platforms s and their individual features for hosting educational resources and underlying pedagogical models. That aspect is linked with the lack of specification of MOOC completion and inclusion of discussions in educational resources, the lack of options to optimise individual choice and ways of customising the display of information. Aspects already reported in the broader literature of learning at scale in MOOCs (Joksimović et al., 2018).

A key aspect of the UDL checklist after its validation was its complexity. Criteria in the UDL checklist were often rich, covering multiple aspects to be evaluated, which made it complicated for an evaluator to decide a final rating. That was linked with the fact of the complexity of acquiring expertise in UDL, and therefore an expert evaluator through the MOOC evaluation process. Future evaluations should consider including more MOOCs per platform provider, and more platforms, to understand the different evaluations between course providers using the same platform. In a broader context, further research in learning design and accessibility in MOOCs should also consider other aspects such as the role of learning analytics to understand the diversity of learners needs (Cooper, Ferguson, & Wolff, 2016), how learner-emotions affect learning (Hillaire, Iniesto, & Rienties, 2019) and how personalisation informs the learning process and engagement (FitzGerald et al., 2018).

The process in Chapter 15 has shown that UDL cannot be stored in a box and applied as a simple checklist. The design and validation of evaluation checklists indicate a complexity of learning, whereby different concepts derived from the UDL framework proposed and how practising in this iterative evaluation and validation process helps to internalise UDL principles and guidelines. But as well showcasing the appearance of complex concepts to evaluate or redundancies that might be creating difficulties in that mastering process.

15.4.1 Implications for practice

When producing educational resources all stakeholders should be considered in their design and evaluation processes including educators and learners. To all those educators interested in universal and inclusive design, reflecting on the UDL principles and guidelines may help when producing educational resources and critically evaluating them, which may facilitate and foster inclusion and widen access. To make online courses more accessible it is necessary to put in place processes to identify barriers to learning and strengthen mechanisms that facilitate agile responses in addressing those barriers. Regardless of whether to design MOOCs or any other online course, it is necessary to consider the different platforms that exist and how their pedagogical designs influence our decisions. In this sense, they can affect aspects of UDL such as the production of educational resources in alternative formats, the promotion of interaction and engagement between learners or the inclusion of space to allow reflection and personalisation of the learning experience.

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Chapter 16

Practitioner's perspective on young children's use of mobile technology

Pinsuda Srisontisuk

16.1 Introduction

The 21st century and its technological advancement, particularly mobile technology, have brought about a new outlook towards teaching and learning in the early years. Whether children are directly interacting with these new devices or merely exposed to it, it becomes evident that most "rapid changes in these technologies create a new landscape of knowledge, leaning and growing up for young children" (Arnott, 2017). Kabali et al. (2015) emphasised the universality of exposure to mobile devices. In their research, they found that the pervasiveness of technology towards young children was evident across different social levels, irrespective of income or race.

In Chapter 16, we focus specifically on mobile touch screen technology (MTST) as their unique features of being mobile and touchscreen has played a role in the fast adoption of these devices amongst young children. The growing trend of young users is visible, not only through data collected from national surveys (Ofcom, 2019), but it is also evident in the sheer growth of apps targeted towards pre-school children internationally, with apps for this age group dominating the education app category at 58% (Shuler, Levine, & Ree, 2012). A more recent study investigated how beneficial these "educational" apps specifically targeted at young children, the results of analysing over 100 apps, indicated that the apps were not as educational as expected (Meyer et al., 2021). As a result, the pervasiveness of MTST in young children's lives raises the question of how technology should be introduced and focused on early years practitioners' perspectives towards these new devices.

This main research question that drives the narrative of Chapter 16 is "What attitudes and opinions do practitioners have towards young children's use of mobile touch screen technology?". Chapter 16 will provide an overview of previous research that has looked at early years practitioners' beliefs and attitudes towards technology and young children, acknowledging the limited research in this field. It should be noted that the findings from Chapter 16 are based on empirical data from a larger design-based research project that aimed to investigate how children cooperate when using tablet computer in pairs. For the purpose of Chapter 16, when referring to young children the specific age group that we are discussing are

children aged 3-5 years old, as this is the age group in which practitioners were working with.

16.2 Research concerned with early years practitioners' beliefs and attitudes towards MTST

Multiple studies have explored how teacher beliefs and attitudes towards technology influence adoption and usage, especially in relation to primary school-age children (Ertmer, 1999; Ifenthaler & Schweinbenz, 2013). However, far less research has explored the perspective of pracitioners and teachers of young children, an important group given the debate on the place of technology in the lives of these young children (Blackwell, Lauricella, Wartella, Robb, & Schomburg, 2013). The studies that have explored early years practitioners' perspectives often employed a quantitative approach in the form of surveys (Gialamas & Nikolopoulou, 2010; Aldhafeeri, Palaiologou, & Folorunsho, 2016). The findings usually indicated a positive attitude towards MTST, although concerns were also expressed, such as delays in social development, inapproate material, and addiction (Marsh et al., 2015; O'Connor, 2017).

A limited number of more qualitative research and mixed-methods approach studies have also been conducted, involving focus groups that offered more perspectives in terms of the social expectations from their work colleagues (Hatzigianni & Kalaitzidis, 2018; Palaiologou, 2016). For example, Hatzigianni and Kalaitzidis (2018) found that early years teachers views were evolving, and acknowledged a changing trend where practitioners were open minded to these new technologies. Using a Bronfenbrenner's ecological framework Hatzigianni and Kalaitzidis (2018) focused on how personal digital skills, leadership styles, teacher training, and teaching philosophies were associated with a positive attitude towards incorporation of technology. Palaiologou's (2016) international survey conducted across five countries demonstrated that practitioners consistently demonstrated a positive attitude and aptitude towards digital devices. However, practitioners appeared hesitant about integrating technology in their practice. This reluctance was unpacked in subsequent focus groups and was attributed to the fact that "the dominant ideology is that play-based pedagogy leaves no space for digital devices to be included" (Palaiologou; 2016, p. 313). This conflicting perspective towards digital technology appeared to be consistent cross-culturally as the view towards digital devices were not seen as offering interactions or experiences that could be considered as playful, and thus part of a play-based pedagogy that is the core to most early years curriculum.

Given that this is a critical age for all aspects of development and that technology is an undeniable part of everyday life for these children and will be even more eminent as they grow up, educators are concerned about how to establish a "positive start" in using technology. Research has shown that "problematic media habits may predict a trajectory of increasingly excessive use through adolescence" (Radesky et al., 2014, p. 1176) and therefore the early years are fundamental.

As for the studies that focused on interviews with practitioners, these either looked at ICT in general (Mertala, 2017) or specifically at computers (Alkhawaldeh

et al., 2017). Therefore, further interview studies to provide more insights into practitioners' perspectives in settings that are users and non-users of MTST are needed to better understand the educational context of young children in pre-school settings. Understanding how practitioners view MTST technology and what promotes or hinders practitioners in the early years sector to adopt any type of technology is critical. It is often a precursor to how technology is introduced in the primary school level, but it also is a reflection of the gap between practice and pedagogy.

16.3 Research design

Chapter 16 aimed to gather data about practitioners' perspectives on MTST through the use of semi-structured interviews. The participants involved nine practitioners from two different early childhood educational settings, one setting was a nursery based in Reading (no access to MTST) while the other was a school situated in east London (access to iPads). Using purposeful samplings (Palinkas et al., 2015), each of the practitioners had varying degrees of experience in teaching in the early years, ranging from 1–17 years. These samples are not meant to be representative but are intended to provide a holistic view from multiple perspectives. Interviews lasted between 30 and 50 minutes, were audio-recorded, transcribed, and analysed through an inductive thematic analysis approach (Braun & Clarke, 2006) by the author. Five major themes emerged from asking practitioners about their views on young children's usage of MTST: (1) Ubiquity of Technology (2) Ability in using MTST (3) Use in Moderation (4) Values of technologies in Early Childhood and (5) Negative Aspects of MTST.

16.4 Research findings

16.4.1 Ubiquity of technology

The first theme of ubiquity of technology referred to comments that practitioners made regarding how prevalent MTST is in young children's environment as well as in our daily lives as adults. This was also evident in Chapter 4 (Vogiatzis et al., 2022), whereby a teacher mainly used WhatsApp as a language theme method as most people have ubiquitous access to MTST. This theme manifested itself in different ways. Either the teacher was explicit in saying that MTST is here to stay and therefore we must be prepared for it, or through anecdotal stories they explained the pervasive nature of it and how we all are becoming regular users of MTST. This was an important and major theme as it reflects the changing outlook amongst practitioners about the usage of technology.

It demonstrates a shift in the conversation from the binary question of whether (or not) practitioners should be using technology towards a more constructive dialogue about how to best to use technology and to what extent it will yield the most educational benefit for young learners. This finding supported previous findings regarding the increased uptake of MTST in the early years as well as an

acknowledgement that young children today are growing up in a distinctively dif-
ferent technological environment than their parents (Karagiannidou, 2017).

Practitioners in both the London and Reading settings agreed that technology
should be introduced. However, their tone and further explanation of why it should
be introduced to children varied across practitioners. A majority of practitioners
expressed that the need to introduce this type of technology was mainly due to how
prevalent technology is in our society nowadays. As one practitioner mentioned,

> I think it's a good idea, because the world is moving so fast, I mean new things
> are coming up. If they don't, if they're not, you know, expose to all of this, then
> they'll find it difficult later on. So it's best that they actually know how to use
> thing, it helps with their learning as well.
>
> (P8, London)

There appeared to be a general recognition that MTST are becoming widely used
and thus it becomes essential for early year practitioners to prepare children to use
these types of technology appropriately. Similar perspectives on technology pres-
ence were reflected in other practitioners as they agreed that technology should be
introduced:

> I suppose because this day and age, technology is more in use.
>
> (P7)

> they just grow up with technology so they always expect it.
>
> (P4, Reading)

The idea of technology presence as a rationale for introducing MTST in the early
years appeared to be an agreed-upon notion. However, the implication of technol-
ogy presence, including the perceived benefits and harms varied much more across
individual practitioners, and will be discussed further in the fifth theme.

In another example, practitioner 6 shed a light on "ubiquity of technology" by
making a comparison to her own childhood, and highlighting the differences in
how time is now spent:

> when I was little you go out and bike in the street and you went to play foot-
> ball, but now children want to sit on the iPad, even my niece she is two years
> old, she can pick up a phone and can open it, she can sit there for hours, which
> I guess as a parent is really useful sometimes, but not all the time, I mean like
> she's been taken to the park and what not but it is concerning that so much
> time is spent on there.
>
> (P6, London)

This reflective thinking and comparison to one's childhood can often be found in
research regarding uncertainty around new technology and parenting styles

(Plowman, McPake, & Stephen, 2008), and this is also true in teachers' teaching philosophy. It is not uncommon to make these comparisons, as we use our own experience as points of reference when working with young children. It becomes more challenging when practitioners are working with technologies that have not been part of their own childhood experiences. Although practitioner 6 was expressing her concerns about the potential harm that technology brings with it, she also highlighted another key component of technology presence and how it is re-shaping the culture of young children. As children share their day-to-day experience with their peers or teachers, stories about their weekend may include elements of watching a certain YouTube clip, or playing a new game on the iPad, in addition to or replacing more traditional stories of going to the park. This familiarity of technology has led to children sharing and developing different skill sets around technology use.

The first theme also presented itself in other ways, such as when one practitioner who was very optimistic about technology and commenting was questioned on how she thought the devices offered a lot of possibilities for learning. Reflecting on whether she was always receptive to new technology, she replied, "I think since I've been teaching, it's always been in the forefront. So I can't really compare it to before" (P5, London). This was another perspective on technology's presence and it illustrated how technology was advocated in the educational sector. It should be noted that she had experience teaching slightly older children, which might have shaped exposure and experience in using technology with children, as she also mentioned a project she did with her older students using stop-motion animation. This perspective might reflect some practitioners' experiences based on their training and school cultures that were more proactive in supporting and engaging practitioners in the use of MTST in their teaching practices. An unexpected point that emerged from the theme of technology presence was how for some children, the presence of all this technology changed the children's accent, given that children were watching more American YouTube clips at home.

16.4.2 Ability in using MTST

The second theme "Ability in using MTST" involved comments related to how easy, comfortable, and confident many of the children were in using MTST, because of how prevalent it is now in their home environment. Many practitioners noted that they could not be certain how much usage of MTST the children were getting outside of the school, as it was not something they tracked. However, there was certain behaviour that could be observed which indicated increased usage outside of the school environment. This related to how confident and knowledgeable children were when using the devices, prior to any instructions. This was a sub-theme as it was derived from the practitioners' comments that the children's confidence in using technology was the direct result of how much exposure or usage they were getting outside of school:

> Some of the children are, you can tell cos some of them are really confident to speak to you about the programs and all the stuff that they use on the iPads, like the YouTube videos. They'll say like 'Oh!, I saw this on the YouTube video'. They know a lot of games that they play on the iPad, so that's how you know that they often on it at home. The majority do have access to iPad.
>
> (P7, London)

Comments about children's confidence in using technology were echoed by other practitioners. Although practitioners did not address the more intuitive design of a touch-screen interface and the user-friendly nature of the devices that made it more accessible to young children, they did comment on a gap in expertise, and how children appeared to be more adept in using MTST than some adults. As practitioner 8 explained:

> These are guys (children) are too good, I think some of them are a bit too forward than the adults and they know a bit too much sometimes. I think with technology like that smart phones and iPhones they have it at home. So they are really equipped, especially the ones who have them readily available.
>
> (P8, London)

Practitioners viewed the children's confidence in using the devices from multiple angles: the tone varied from impressed at how adept the young children were at using it, to concerns that other essential skills such as holding a pencil were not being nurtured at home. An example of a more impressed tone could be seen when one of the practitioners listed all the things a child was capable of doing:

> some of them know how to like turn the volume down, how to switch off. Yeah some of them, yeah it's crazy, (they) know how to turn the volume, know how to turn it up, know how to brighten up the screen and I'm just like "Well, I don't even know this". And they know how to get on it as well.
>
> (P2, Reading)

As mentioned earlier, some practitioners took a more cautious view that although the young children were able to easily navigate through these devices, it might come at the cost of not developing other essential skills, such as mark-making and writing:

> It's so interesting that some of them can come in and open the tablet, go around you know the different apps, when they're barely, you know just turned 4, but they can't pick up a pen, they can't hold a pen to make a mark. And I think it's getting the balance between the two.
>
> (P6, London)

Practitioners appeared to be keenly aware of a different skillset that young children had developed, which included children using their fine-motor skills to use MTST

devices. Being able to swipe and navigate through these tools with confidence, although such a skill set might appear to be more intuitive than using a mouse or writing with a pencil, was still a different competency that developed as a result of more exposure to technology.

16.4.3 Use in moderation

The third term *use in moderation* indicated comments where practitioners talked about ensuring that children had exposure to technology but also sufficient time to engage in other types of activity. This idea of balanced choices often manifested itself in practitioners commenting on the necessity of setting up "limits", and ensuring that children were engaging in other learning activities as well. There was some mention around the potential difference in the home and school setting, where setting up this balance at school was easier. This might not be so easy in the home setting where children may be spending substantially more time on the devices than appropriate. Although the theme was frequently expressed from the viewpoint of needing to set limitations, the *term use in* moderation rather than limits was used in Chapter 16 as it was a more reflective of the idea that practitioners still felt there was a place and time for MTST.

Practitioner 1 explained how she structured it in her setting, and set up clear time frames of usage:

> I think that it could be introduced as long as there are some limits, not all day long. We are here for half an hour, we switch off the computer. Go to that room, so we can enjoy that space, if it's just something new and the game, maybe in the day half an hour morning and in the afternoon. For children to do some educational activities.
>
> (P1, Reading)

Practitioner 1 went on to explain how she also set limits within her own household, and how that was made clear to her own children, "You have to give limits, how long they can use it for? You have to give limits. This iPad, for me I've got two children, they only use on the weekend.". Other practitioners also expressed similar views on setting up limits, "I think that it would be good to introduce with limits and not having certain things on there." (P3, Reading). The idea of making a balanced choice often required the intervention of a practitioner to monitor their usage and ensure that certain children were not always on the devices:

> I think it's fantastic, a fantastic learning tool for them. And obviously we limit the amount of time they're on. There are some children that would obviously love to sit there, like all day long on the iPad, playing games and watching videos. So you do try and limit them.
>
> (P5, London)

Theme 3 was naturally linked with Theme 1, and the concern that because the devices were so prevalent, children were not engaging in other learning activities. Practitioner 6 explained this further:

> I think when they're (MTST) used in the right way for an activity that it's benefiting them. But I think it needs to limited so that they're getting other experiences, and I think especially we find with our children they do spend a lot of time on tablets and mobile phones at home. So we try to limit the time that they get on them in school.
>
> (P6, London)

16.4.3.1 Value of MTST in early childhood education

The fourth theme addressed practitioners' comments about the positive value that MTST had in early childhood education. Some comments referred exclusively to the three Rs (reading, writing, arithmetic), referencing specific apps that catered to these knowledge developments. Practitioners also talked about the positive attitudes that children had towards learning when using the devices as well as the ability for technology to extend their learning. This extension of learning was one of the unique features of mobile devices, involving instant access to information that these tools now enabled through the Internet.

The feature of being able to find information online, and research certain concepts in the present, allowed the option to extend a learning opportunity further. This also helped to provide visual stimuli to explore and explain certain new concepts. Practitioner 5 gave an example from her classroom:

> If someone comes up with a topic of discussion or something they're interested in, I can just get google up, "Oh lets", you know if you're interested in harp, like Jack and the Beanstalk. Everyone was like what's a harp?, they weren't sure. You know, it was easier to find pictures of harp and then to play some harp music them and give them that experience.
>
> (P5, London)

The interesting thing about theme 4 was how practitioners went into detail and were able to give concrete examples about an incident, where they were able to search something online to help show or explain something further to the young children. This illustrates that practitioners experienced the advantages and benefits of being able to access information at any given time.

> We had a little girl she got onto google maps, and like I showed her where are nursery was and then I showed her London and where we live, and that was an interesting one. Yeah, and then we showed her the world. The world was on there, "We live in England … there is other people that live here". She was like "Oh! We come and play here, we come to nursery here". So I was like "Yeah". I thought that was pretty clever.
>
> (P2, Reading)

The ubiquitous knowledge access was often viewed in a positive light, and practitioners expressed how accessibility allows for a more enriching experience for the children. Practitioners valued this access to the Internet:

> They do have the internet explorer that they can use if they want to find out about something. Usually I go on the iPad and I show them, then they're aware of it, so then they can try and type out the word that they research. I personally like to use it for research.
>
> (P9, London)

The findings demonstrated that many practitioners recognised the potential educational benefits of technology. One being the technology's connectivity to Internet, with the instant access to information being a tremendous asset to their teaching in extending the children's understanding of the world. According to the view that early childhood teachers helped to facilitate how children develop their culture and foster their ability to practically produce knowledge (Ihmeideh & Alkhawaldeh, 2017) this instant access to information has allowed children to extend their learning. However, such engagement was often teacher-led.

16.4.4 Negative aspects of MTST

The fifth and final theme demonstrated the different types of concerns that practitioners had. There was a concern that when children were too immersed in technology they became too passive, and they did not communicate with others, or developed those essential physical, social, emotional skills that are at the core of early years education. This subdued interaction with technology was viewed as almost an addictive behaviour, and that their engagement with technology was no longer productive once it took away time from other essential types of play.

A fear was expressed by one of the practitioners, "That the children will become so technology involved that they're not interested in anything else. They're not giving those practical experience of going out to run but now children want to sit on the iPad." *(P6, London).* Another practitioner explained further why excessive passive interaction might hinder their cognitive development, "Fear, is that they may become a bit passive, it's already there they don't have to think much it's just click, click, click. That's what I feel some time, more of that and less of thinking." (P7, London). Practitioner 2 explained her fear when a balanced choice is not made, and how technology limits their interactions with others:

> Bad things are I think some of them can just sit and sit and not interact with anybody else and there is no talking there. And their communication is just with colours, screen, a box. I don't like them sitting on their for too long.
>
> (P2, Reading)

The fifth theme was expected given a general concern that the media presents and current observational behaviour in which children appeared to be overly immersed

with technology. Practitioners were expressing genuine concern over how the devices did not encourage active learning, but instead it was just a passive consumption of information.

16.5 Discussion and moving forwards

Chapter 16 provided an overview of how early child practitioners from two UK schools perceived the use of mobile touch screen technology (MTST) by young children. As practitioners acknowledged the growing presence of these devices, they shared differing perspectives on the educational potential of the MTST and the perceived harm, adding to the ongoing debate. The interviews with nine early-years practitioners confirmed and extended the findings of previous research, and it provided new insights about this group of young children. Practitioners' perspectives on how much exposure and usage the children had with MTST, confirms the growing statistics around young children's adoption of these new technologies. Similarly, the ease with which young children can use tablets with minimal instruction is potential evidence of how much they are using technology outside of school as well as the intuitive designs of tablets computers that has allowed for such young users to purposefully engage with them.

The fear around technology of being passive devices and not allowing the young children to engage in other social and physical activity is still at the forefront of many practitioners. These are the exact same concerns that were put forth earlier by early years practitioners about desktop computers (Wood et al., 2008), so the mobility of the device and the new software has not been able to adequately address this major concern. Practitioners felt that limited use and balancing children's interaction with these devices and other activities was the ideal solution. Practitioners also reported that one of the most beneficial features was the connectivity to Internet; instant access to knowledge and images was a feature they felt has enhanced the learning experience for their students.

Although there were some themes that were presented across both educational settings, which highlights the commonality in hopes and concern around MTST devices, it should be noted that the tone and emphasis that each practitioner expressed on a theme would vary even within the settings. For example, in the London school there was one practitioner who enthusiastically commented on all the potentials of learning that had arisen because of technology presence, while another practitioner was quicker to highlight the addictive behaviour that has occurred because of technology presence. The disparity of opinion between practitioners is a common phenomenon when looking at the impact of technology on education that reaffirms previous findings (Guha, 2003). Subtle differences in views were to be expected. However, extreme inconsistency amongst practitioners within settings may hint at a more substantial problem in which there is not enough evidence and research to persuade practitioners one way or another. There is a need for more research with this age group to provide more evidence to practitioners and continue to engage them in the ongoing conversation around what type of interaction and engagement with technology are appropriate for young children.

16.5.1 Implications for practice

Chapter 16 suggests that practitioners should seek to understand how children engage with MTST to benefit from the ways technology can enhance young children's learning experiences. Practitioners' abilities to identify their own concerns about the usage of MTST in young children should be an ongoing discourse, to prompt innovate ways to integrate and address these worries. Therefore, educational settings should also consider setting more explicit and concrete boundaries to the use of MTST, and work towards formulating their philosophy towards technology that best suits their context so that it can be presented to both learners and parents.

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Chapter 17

Antecedents and consequences of uncertainties perceived by finance professionals

Vasudha Chaudhari, Allison Littlejohn and Simon Cross

17.1 Introduction

Uncertainty is an inherent component of the modern-day workplace (Brown et al., 2011). It is a major area of interest within the field of management, change management, and organisational learning (Bohlinger et al., 2015a; Downey & Slocum, 1975; Markowska & Wiklund, 2020). During ambiguous times, professionals need to learn to navigate their work lives through various uncertainties, as, for example, also illustrated in Chapter 18 (Iwaniec-Thompson, 2022). The ability to learn in uncertainty can be considered from two perspectives – individual learning that shapes the individual performance (micro perspective) and organisational learning that defines organisational success (macro perspective). However, much of the existing literature tends to focus on the macro perspective of the organisations (see, e.g., Michel & Wortham, 2009; Zhao & Wang, 2020). There are a few examples that combine the micro and macro perspective. For example, Wang et al. (2019) found that individual unlearning mediated by organisational unlearning (i.e., discard work practices that are no longer relevant or serve their purpose) and relearning (i.e., ability to forget practices gained from old knowledge and relearn new practices) has a positive effect on strategic flexibility. This means that strategic flexibility, which is an indicator of an organisation's ability to succeed in an uncertain environment (Bock et al., 2012), depends on the professionals' ability to learn, unlearn, and relearn. Hence, there is a need to focus on unpacking the individual learning processes in uncertainty.

The uncertain nature of workplaces warrants that professionals take charge of their workplace learning activities (Billet, 2011; Fenwick, 2001) and self-regulate their learning (Fontana et al., 2015; Margaryan et al., 2009). There is a growing body of research exploring the intersection between working, learning, and uncertainty (Bohlinger et al., 2015b; Markowska & Wiklund, 2020). However, there is limited focus on the professionals' perception of uncertainty. In particular, it is unclear how professionals conceptualise uncertainty in their workplace, the antecedents and consequences of the uncertainties they perceive, how they manage to learn during uncertainty, and the challenges they face in doing so. Examining these aspects are essential, as understanding how professionals perceive and learn in

uncertainty have implications for their job satisfaction and personal well-being (Fløvik et al., 2019).

Most existing research on uncertainty in organisational contexts has concentrated on the impact of environmental uncertainty on organisational factors such as strategic foresight (Vecchiato & Roveda, 2011), entrepreneurial decision-making (McKelvie et al., 2011), or innovation (Freel, 2005). In their seminal work on organisational theory and organisational learning, March and Olsen (1975) highlighted the importance of studying learning processes from an individual perspective. However, there have been surprisingly few studies that were conducted in the field of learning in uncertainty, especially from an individual perspective.

A problem that exists in fully understanding the concept of learning in uncertainty is the complexity associated with defining the objective and perceptual parameters of the environmental uncertainty. Weiss and Wittmann (2018) assert that in order to gain a holistic understanding of environmental uncertainty and the associated cognitive processes, it is essential first to establish the objective/tacit factors that define the nature of uncertainties within the research context and then to examine the perceptual factors. However, the tacit factors are context-dependent and subject to change with time (Hertati, 2015; Vanevenhoven, 2012). The analysis presented in Chapter 17 is part of a larger research study that sought to examine the relationship between self-regulated learning (SRL) and perceived environmental uncertainty (PEU) of finance professionals (Chaudhari, 2020). The research findings in Chapter 17 constitute the preliminary study undertaken to explore the nature of uncertainties within the finance sector and how the finance professionals perceived the antecedents and consequences associated with that uncertainty.

17.1.1 Uncertainty in the finance sector

The distinction between risk and uncertainty in finance is rarely made (Gigerenzer, 2018). Traditional finance literature encompasses the objective nature of uncertainty by focusing on the quantitative measures of risk (e.g., probability models, stochastic programming), with a fundamental assumption of a linear relationship between risk and return (Jo & Sekkel, 2019). However, there is an emerging body of literature in behavioural finance that examines the subjective aspect of uncertainty in which decision maker's perception of uncertainty is a substantial aspect of defining and understanding the processes of decision-making, innovation, and learning in uncertainty (Dow, 2010; Muradoglu & Harvey, 2012). In this study, uncertainty is conceptualised as per Milliken's (1987) framework of PEU. Ashill and Jobber (2010) identified three variants within the two categories of objective and perceptual measures of environmental factors in Milliken's (1987) framework − (1) measurement of individual environmental characteristics; (2) measuring the perceptions about the uncertainty; and (3) a composite measure. In their review of literature, they noted varied sources of objective environmental uncertainties. Perception of uncertainty is related to the objective environmental uncertainty (Weiss & Wittmann, 2018), which is subject to change with time and context (Hertati, 2015).

Before examining the learning processes in uncertainty, it was essential to establish the antecedents and consequences of uncertainties within the research context and how professionals perceived them. The present study addresses that gap by examining how the finance professionals perceive the environmental uncertainties in terms of their antecedents and consequences. In doing so, Chapter 17 answers the following research question: What are the antecedents and consequences of workplace environmental uncertainty perceived by finance professionals?

17.2 Methods

17.2.1 Settings and participants

The "Finance sector" is a broad term encompassing varying domains. Typically, very few organisations operate in all these domains, and ones that do are globally distributed. With a view of interviewing participants from different domains of the finance sector, the Chartered Institute of Securities and Investments (CISI) - an independent body that is responsible for professional training and development of finance professionals was selected as the research site for conducting this study. It provided access to individuals who experienced a broad range of uncertainties in the finance sector.

Selection of participants ensured an equal balance of practitioners and experts within the various sub-domains, to incorporate multiple perspectives from practice and academia. The distinction between "practitioners" and "experts" is based on industry terminology rather than academic classification. As per CISI's definition, practitioners were professionals who are currently active in the finance industry. In contrast, experts were either academics who conducted research in the finance sector or organisational heads who possessed in-depth insights into the uncertainties in the global financial sector. This distinction certainly does not imply that experts lacked practical experience or that practitioners did not have domain expertise, yet there is value in making the explicit distinction between experts and practitioners. In mapping the professional learning journey from novice to expert, Boshuizen et al. (2006) assert that, "experts do not just know more than novices, they also have a different way of structuring their domain-specific knowledge", and that experts can provide a "certain (very successful) perspective on a particular domain" (p. 6). Hence the intention of the sampling strategy was to ensure as diverse perspectives as possible through maximum variation sampling (Suri, 2011).

Based on the criteria outlined above, nine professionals were identified, two of them were female, and seven were male. As finance is a typically male-dominated industry, this sample was representative of CISI membership. Interview participants were categorised based on their expertise, knowledge of the specific domain, and their practical knowledge of the sector. The average work experience of the experts was 33 years, while the practitioners was 15 years.

17.2.2 Semi-structured interviews

Qualitative interviews allowed for capturing in-depth insights into professionals' experiences and perceptions of uncertainty. They also provided flexibility in terms of time and methods of participation – face to face or online interviews thus making them the appropriate choice for answering the research question. All the interviews were recorded on a voice recorder and transcribed, coded and analysed by the researchers using NVivo 12 software (Woolf & Silver, 2017). A combination of thematic analysis (Braun & Clarke, 2019) and qualitative content analysis (Mayring, 2014) was employed to analyse the interview data.

17.3 Results

17.3.1 Common themes between experts and practitioners

17.3.1.1 Antecedents to uncertainty

As indicated in Table 17.1, the most commonly prevalent perception was that the lack of knowledge was the main precursor to uncertainty. This is expected given the definition of uncertainty itself is the state of not knowing. For example, when talking about the MiFID II (Markets in Financial Instruments Directive) regulations, Participant E4 said that:

Table 17.1 Summary of findings

Common themes between experts and practitioners		
Antecedents of uncertainty	Lack of knowledge Fluctuations in the market Role of technology Lack of communication	
Consequences of uncertainty	Market Crash Regulatory Changes Reassessment of risk models	
Perception of uncertainty	Financial opportunity Learning opportunity	
Differences in perception of experts and practitioners		
	Experts	Practitioners
Antecedents of uncertainty	Lack of trust Disconnect with academic world	
Consequences of uncertainty		Lack of trust Changes in training requirement
Perception of uncertainty		Uncertainty as something to be avoided (negative perception)

…with all regulation there is a certain amount of interpretation that a firm has to make. So, it is quite challenging for a firm. I think that is where the uncertainty comes in is in not knowing how to interpret that guidance.

(Participant E4)

Another theme that was persistently present in all the interviews was the uncertainty caused due to fluctuations in the market. Given that finance professionals have to deal with the highly volatile and ambiguous nature of the economic markets, it was not surprising that market uncertainty was perceived as one of the common antecedents to uncertainty in the workplace.

Additionally, the role of technology was also mentioned by all the participants as being responsible for introducing uncertainty in their workplace. From blockchain based services to robo-advisory platforms, professionals cited technology as a dominant antecedent to uncertainty in various contexts. For instance, Participant E2 cited wealth management advice-giving robots as bringing uncertainty for practitioners. There were also examples of algorithms driving financial decisions that cause uncertainty for professionals, as evidenced in the quote below:

Ya, I mean the other interesting dimension is that it is increasingly becoming a less human problem. So, you know all about the amount of activities being allocated to algorithms. So, people don't adapt perfectly to market conditions, we know that from experience. But what we don't know yet, is particularly how will the algorithms that are taking note of this activity, how they respond to significant event, and how they interact with each other.

(Participant P1)

Similarly, eight out of the nine participants reported lack of communication to be an important factor in increasing the perception of uncertainty amongst professionals. The scale of this lack of communication varied widely from a communication gap between two nations to two or more individuals who were decision-makers. For example, the issue of people working in silos and therefore not always alert to issues external to their work environment was mentioned by one respondent (Participant E2). Likewise, Participant P3 shared a key issue highlighted in the Northern Rock crisis report was the lack of communication between the supervisors and management.

17.3.1.2 Consequences of uncertainty

Similar to antecedents, there were some common prevalent themes reported by experts and practitioners. For example, all the professionals gave an example of a market crash following a period of economic or political uncertainty. The most commonly cited among those were the UK Sterling International Monetary Fund crisis. Similarly, regulatory changes as a consequence of a period of uncertainty were cited as one of the common consequences of uncertainty by all the professionals. In explaining how Basel I, II, and III regulations came about, Participant E2

mentioned that "every piece of uncertainty resulted in unexpected volatility and downside returns, resulted in more and more regulations". The experts' view on consequences of uncertainty was mirrored by the practitioners with additional details about how the regulations imposed as a result of uncertainty had a trickle-down impact on the marketplace, as evidenced by the quote below:

> … [a period of uncertainty] subsequently led to a period of key regulation in financial market. And that key regulation resulted in the separation between alpha and beta and the leverage of both of those.
>
> (Participant P3)

Almost all the professionals (eight out of nine) reported reassessment of risk models as a consequence of market uncertainty. This shows that uncertainty was perceived as a learning opportunity, where the lessons learnt from uncertain times were incorporated into the economic models, thus converting future uncertainties into risk. Since the definition of risk is to be able to assign probabilities to events, learning from uncertainty events and feeding that information into the economic models provided data for the future, thus converting the future uncertainties into risk. In relating his experiences of the 1987 market crash, Participant E5 elaborated on the process of how the uncertainty caused by the crash lead to reassessment of risk models and the impact it had on the market:

> …lead people to reassess not only their risk models, but their interpretation of probabilistic estimates and returns and indeed what to do next in terms of asset allocation and so forth and whether any of the previous models worked.
>
> (Participant E5)

17.3.1.3 Perception of uncertainty

All the professionals perceived uncertainty as a financial opportunity. However, closer investigations of these examples that were cited as uncertainty being a financial opportunity related to the professionals' predisposition to think of uncertainty in terms of risk. For example, Participant E4 rationalised his viewpoint that uncertainty is a financial opportunity with the following argument:

> Traditionally uncertainty represents risk and risk has a trade-off through returns. But people are not focusing on returns at the moment, they are only fixing on the risks. So that certainly is new – this relationship between risk and return is manifesting itself in the way that it should. I mean, we got free money basically from Central Banks.
>
> (Participant E4)

All the professionals also reported examples of uncertainty where they perceived it as a learning opportunity. These were mostly examples when the organisations/individuals were unsuccessful in managing the uncertainty. This means that when

they failed to manage uncertainty, they viewed it as a learning opportunity. The following quote demonstrates an example given by a regulator when they were handling a 'full-blown financial crisis spilling over to the whole economy'.

> … These are not really Basel compliant, but this is something we felt that our market needed at that time, because of the specific risk that we faced. And as I said, it was too little too late – we were blamed when the whole thing started to fall apart. But we subsequently learned from this incident.
>
> (Participant P3)

Although the experts and practitioners shared some common perceptions about antecedents, consequences, and ways in which they perceived uncertainty, they also had some differences which will be discussed in the following section.

17.3.2 Differences in perception of experts and practitioners

17.3.2.1 Antecedents to uncertainty

A crucial difference between the experts and practitioners was that experts believed that lack of trust was an important antecedent to uncertainty, while practitioners believed that it was a consequence of uncertainty. Of the 35 items coded to this theme, 26 were from experts and only nine were from practitioners. Participant E5, who was a senior adviser, recounted how a period of uncertainty brought about the breakdown of trust between buyers of the firm and the employees:

> Trust was key and that created a big problem…. So, trust broke down and some bad things happened. I mean people did quite really naughty things about 20–30 years ago which created real uncertainty.
>
> (Participant E5)

Similarly, a disconnect to the academic world was reported as a precursor to uncertainty 15 times out of 21 by experts.

> …I blame it (lack of information) on our lack of contact with academic world. However, exactly because the academic world knows more about the history and what is happening around the world, and how Lehman used to overcome things. They could have probably suggested earlier that they see bad trends, that in other countries they dealt with in a certain way. So probably we should have had more contact with the academic research centres.
>
> (Participant E4)

17.3.2.2 Consequences of uncertainty

A key difference in the way experts and practitioners perceived antecedents and consequences to uncertainty was that practitioners were more likely to emphasise the consequences of uncertainty, whereas experts dwelled on the causes and lessons

learnt. Of the 28 instances of statements coded to the theme of changes in training requirements preceding a period of uncertainty, 22 were made by the practitioners, whereas only six of those were from experts. Practitioners called for organisations to be 'more proactive and delivering training and talk about the issues and help people understand better' (Participant P2). When asked about the consequences of technological uncertainty in a wealth management organisation, Participant P4 said:

> Yeah, I think some organisations are looking to create their own platforms and train their staff in using those going forward. That is one way to handle the uncertainty.
>
> (Participant P4)

As previously mentioned, lack of trust was cited as an antecedent to uncertainty by the experts. Interestingly, practitioners were more likely to perceive it as a consequence that followed the period of uncertainty. Of the 18 statements coded to this theme, 13 were from practitioners whereas only five were from experts. *Participant P3*, used the analogy of a family going through crises and how the trust would breakdown if family members don't support each other to depict the loss of trust after a period of uncertainty:

> You know like in a family when you are going through a crisis, you and your partner support each other, not become overly safe and say – hmm, there is something wrong with you, I should put you somewhere else. This is the same – in good times maybe the regulator and the market should be on the very opposite ends and in bad times they should probably come together to discuss what are the issues. Unfortunately, there is lot of blame game going on – you did not tell us that there was market over-heating, you should have stopped us before we lent too much.
>
> (Participant P3)

One of the critical differences in the perceptions of experts and practitioners was that loss of human resources due to uncertainty was discussed by all the practitioners but was never mentioned by any of the experts. When talking about the impact on human resources in the context of technological uncertainty in the wealth management sector, *Participant P4 said*:

> One of the regulations required all investment advisers to have a professional qualification, where historically people have been grandfathered in. And people who had worked for 30–40 years with no financial qualification suddenly had to get a financial qualification. That there was obviously uncertainty within the industry to how many people would leave the industry because of that.
>
> (Participant P4)

17.3.2.3 Perception of uncertainty

Although, both experts and practitioners perceived uncertainty as financial or learning opportunities, some professionals (four out of nine) attached negative

connotations to the word 'uncertainty', and as such viewed it as something to be managed or avoided. Practitioners were more likely to report negative perceptions towards uncertainty compared to experts. Of the ten statements coded to this theme, seven were from practitioners and only three from experts. In response to what professionals typically do when they perceive uncertainty, *Participant P2 said*:

> They do nothing, they become paralysed. So, you can find that people stop changing their jobs, get worried. That creates a world where internal rates of return projections are not acted on even though they are positive. That means that growth slows down. So that's the mess that we currently are in.
>
> (Participant P2)

Even in statements made by experts, they talked about the negative impact of uncertainty in the context of practitioners, as evidenced in the quote below, by Participant E2 as they recounted the reactions of their employees after the 9/11 crises:

> So, take for instance the 9/11 example. Even though it happened in the US, it was on the television screens. And everyone in the office was standing around and watching it on the screen, as the planes hit the towers. Now, we had contingencies in place, we had stop losses, and the European markets group but the people were just frozen looking at the screens. So, all the correct procedures were there but nothing happened. People literally could not respond. So again, the learning experience to me from that was that sometimes doing the calculations alone doesn't resolve the situation.
>
> (Participant E2)

17.4 Discussion and moving forwards

Chapter 17 examined the antecedents and consequences of uncertainties perceived by finance professionals and their general perceptions towards these uncertainties. A lack of communication and a disconnect with the academic world were reported as the key antecedents to uncertainty. This is in conformance with the findings from Novin et al's., (1997) study that identified the need for more effective communication and interaction between educators and practitioners. 'Trust' was yet another substantial theme mentioned by seven out of nine professionals, in relation to the antecedent of uncertainty. Research within the change management literature has emphasised the role of communication and trust linked to the professionals' perceived uncertainty during turbulent times. Typically, loss of trust was seen as a consequence of perceived uncertainty, whereas lack of communication was found to be an antecedent of perceived uncertainty (Arnaout & Esposito, 2018). The findings from Chapter 17 are in line with the previous studies with regards to the lack of communication being an antecedent of perceived uncertainty. However, it differs from the earlier findings, as a lack of trust was also noted as a potential antecedent to uncertainty along with being a consequence of uncertainty.

Another substantial contribution of Chapter 17 to the existing literature is the comparison between the perceptions of experts versus practitioners. This comparison revealed that experts were more likely to indicate a lack of trust as an antecedent of uncertainty in contrast to practitioners who were more likely to report it as a consequence. Beyond the finance sector, a study carried out by Adobor (2006) in the pharmaceutical and biotechnology industry in the US and Canada, found that certain amount of uncertainty is necessary for the emergence of trust within the dealing parties, however beyond a particular threshold increase in uncertainty leads to a reduction in trust. Findings from this study conform to the findings of Adobor (2006) as practitioners reported the loss of trust as a likely consequence of uncertainty. This finding also adds to the literature on change management, as it highlights the importance of studying the role of trust and communication from multiple perspectives.

Furthermore, professionals recognised changes in training requirement that followed a period of uncertainty, whether it was objective environmental uncertainty or subjective perceived uncertainty. This means that when the cause of uncertainty was related to any external environmental factors such as regulatory changes or technological changes, changes in the training requirement was mandated by the government or organisations. However, when professionals perceived uncertainty, they responded by investing time and effort in reskilling or upskilling themselves. The findings were in line with Bohlinger et al.'s (2015a) research examining workplace learning in uncertainty. They classified the challenges to learning under uncertainty under three levels:

- At the micro (individual) level, the onus is on the professionals to learn to manage continuous change as it is a key qualification for their employability.
- At the meso (organisational) level, the role of organisations is important in empowering their employees to manage uncertainty through upskilling, formal training, support for informal learning opportunities.
- At the macro-level (socio-political) upskilling of the global workforce.

An essential finding of this study was that finance professionals did not report high levels of negative perception towards uncertainty. For example, of the total statements coded in this study, only 1.14% of the codes were related to professionals talking about uncertainty negatively. This alludes to the possibility that finance professionals acknowledge and accept the fact that they work in a world of inherent uncertainty and they welcome it as a financial opportunity, or a learning opportunity or even something that they can manage.

Within the themes for perception of uncertainty, professionals specifically talked about uncertainty as a learning opportunity. Most of the empirical studies carried out around uncertainty look at how professionals make decisions or how they innovate in uncertainty (Freel, 2005) but there is very little focus on how they learn in uncertainty and findings from this study indicate that there is potential for further research.

17.4.1 Implications for practice

There is value in perceiving uncertainty as a learning opportunity. From managing workforce well-being to ensuring business continuity, learning in the face of uncertainty is a priority for organisations in order to survive and thrive in uncertain times. Thus, organisations and professionals should be looking towards novel ways of learning and building a repertoire of best practices in the new normal characterised by uncertainty. An important implication for organisations is to exercise transparency and clearly communicate information related to uncertainty in order to prevent loss of trust of their employees in times of uncertainty. Findings from this chapter highlight the significance of understanding one's learning behaviour during uncertainty, as it has implications for organisations as well as professionals.

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The identity trajectories of older academics

Workplace affordances and individual subjectivities

Gosia Iwaniec-Thompson

18.1 Introduction

With the rapid development of new knowledge, open digital networked technologies, and ever-evolving teaching methods and research trends in the Higher Education (HE) sector, older academics are as likely as other academics to continue developing their expertise and practice. Future projections of an ageing society and recent trends in delayed retirement indicate a growing number of older academics. Yet, empirical research considering older academics' identity development is scarce and thus, there is a need to examine the changing landscape of academic practice by focusing on older academics' identity development. Older academics are understood as 50 years old and over as aligned with the wider literature (Larkin & Neumann, 2009; ONS, 2006).

Academic identity in Chapter 18 is studied from a sociocultural perspective, whereby understanding changes in academic identity focus on participation in practice (Wenger, 1998; Wenger-Trayner et al., 2014). Academics have multiple sub-identities emerging through an engagement within a landscape of practice (McLean, 2012). Wenger's term "landscape of practice" is adopted here to refer to different communities of practice (CoP) of academics involving disciplinary, institutional and HE contexts that constitute academic sub-identities, for instance, a teacher, a researcher, a leader, or a manager. This research brings a unique perspective on academic's identity development by extending Lave and Wenger's work on identification by adding a dimension of identity development which involves an understanding of subjective interpretation of practice (Billett, 2004). In consequence, Chapter 18 explores tensions between different sub-identities, and affordances (enablers and constraints) of older academics' identity development in the changing landscape of their practice.

18.2 Ageing academics

HE institutions are positioned at the forefront of an ageing workforce boom due to trends in an ageing society, the lifting of retirement age, and thus prolonged retirement. Kaskie (2017) suggested that the HE academic sector employs a greater proportion of workers over 65 relative to the general labour force, thus

surpassing all other sectors. In fact, the annual UK Universities report (Universities UK & Higher Education Statistics Agency, 2014) compared statistics from 2006 to 2016 and found a general increase in numbers across all ages in full time academic roles (39.9% increase in the 31–35 year old age group, 36–40-year-olds accounting for a further 17.2%, and around 35% 51–55-years old). However, the proportion of part-time academic staff (aged 61–65 years old) increased by 44.1%, while those in the 66 and over age group rose by a staggering 148.5% over ten years. Thus, by 2016, more ageing academics were remaining in part-time employment. Figure 18.1 illustrates these changes for full time and part-time employment of academic staff.

18.2.1 Delayed retirement

In tandem with a growing number of ageing academics, empirical research suggests that older academics' transition to retirement is and will be increasingly extended (Cahill et al., 2018; Kaskie, 2017). Currently, in the UK, the State Pension Age is 66. At the same time, studies show that many countries abolished a mandatory age of retirement (Unwin et al., 2015). The UK introduced such policies in 2006 under the Equality Act, which makes it illegal for employers to require retirement to employees who are at the retirement age. Furthermore, there are several studies exploring motivational and other factors leading academics to delay their retirement. For instance, Cahill et al. (2018) concluded that amongst many predictive factors to remain in employment and delay retirement, the two most important reasons were financial necessity and job satisfaction. Dorfman (2009) found that professors remained employed as they enjoyed research, whilst Winston and Barnes (2007) concluded that academics work beyond retirement as they are often free of the responsibilities they dislike, for instance, teaching and administration or management and research (Williamson, Cook, Salmeron, & Burton, 2010). Also, Cahil et al. (2018) highlighted that many academics fear losing contact with their students and their colleagues, so they choose to stay in employment for as long as they can. The factor of flexibility related to working practice, working hours, and more opportunities of part-time work, was also identified by Koopman-Boyden and Macdonald (2003). They proposed that the very nature of academic work allows older academics to continue to undertake project-based work or consultancy, while moving into full retirement.

18.2.2 Identity tensions

Given the growing trend of ageing academics, there is a need to focus research on older academics. However, as the literature on older academics is limited, Chapter 18 drew on the broader literature about all academic age ranges when considering the changing nature of their practice in a dynamic HE sector, impacting their identity development. Contemporary research indicates that rapid changes in the UK HE sector and the dynamic nature of academic practice affect academic identity.
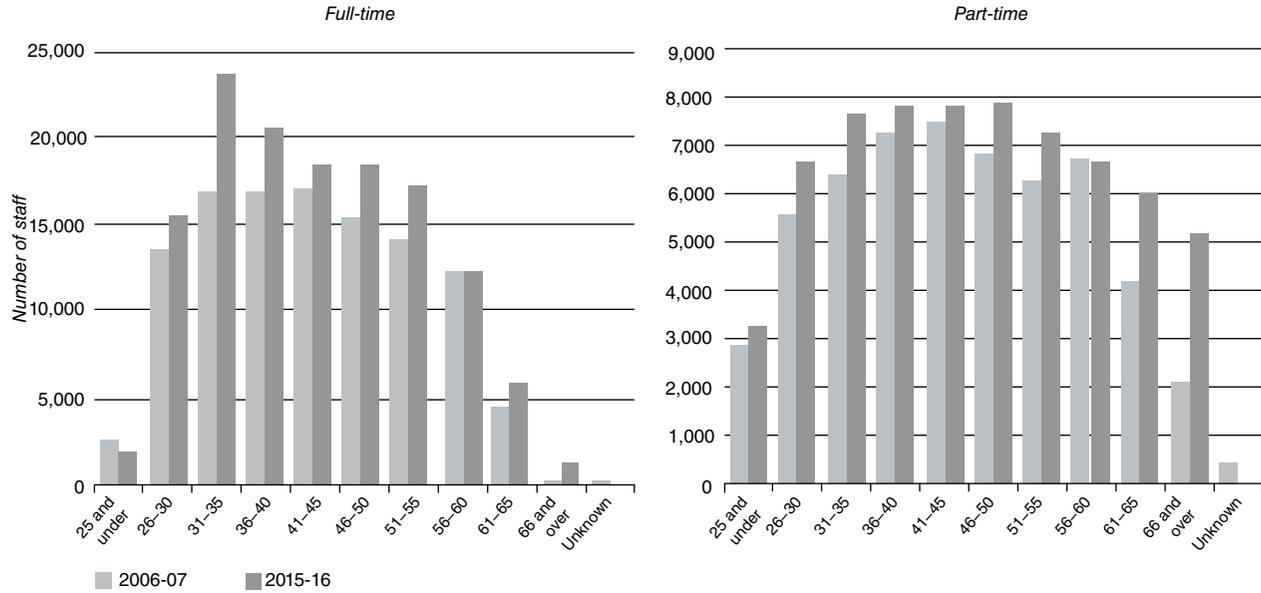
Figure 18.1 Change in age profile of full-time and part-time academic staff in UK universities between 2006–2007 and 2015–2016.

For example, a case study of two mid-career academics in a Cypriot university, discussed increased managerialism, marketisation and massification leading academics to negotiate the boundaries of their practice and the cost associated with their lateral moves (James & Lokhtina, 2018). Findings illustrated the unequal power relationships in the culture of academic practice that had an impact on academic identity and engagement in practice. Also, academics' practice and identities were often in constant tension, because of the struggles they encountered in their engagement with dynamic practice and the difficult relationships between colleagues. Furthermore, a phenomenological study of identity work that academics engaged in as they adopted web-based tools (Bennett, 2017). The study argued that some academics experienced feelings of anxiety and vulnerability as they made changes to their practices. These changes required undertaking identity work to manage increased exposure through social media and negotiate the risk of failure associated with trying something new. This study illustrated academics were primarily motivated to be a "good teacher" rather than responding to top down pressures to bring about change and overcome these feelings. These above studies highlight the changing landscape of the HE sector combined with dynamic academic practice that impacts evolving academic identity.

18.3 Introducing study design

The literature and initial reflections reported in Chapter 18 is part of a broader PhD thesis. The epistemological positioning of this study is one of constructivism. Constructivism seek understanding of the world in which individuals live, work and where knowledge is constructed by individuals in interaction with others, in consequence the ontological rejection of the notion of an objective external reality independent of people (Creswell, 2014). To that end, this study investigated academics' learning and identity, using an ethnographic approach. The experiences of eleven academics at the OU were investigated. The purposive sampling included academics aged 50- to 70-year-old, including six males and five females. The data were collected over a six-month period. Each participant was interviewed three times over the course of three months either face to face or via Skype. In between the interviews, participants were observed on at least two occasions as they went about their work (for instance, during various meetings, during their desk work, online meetings).

The goal of this research was for the researcher to report different perspectives as themes develop in the findings by relying on quotes as evidence and observation notes from the field. In consequence, this epistemological framing had a particular affinity with constructivism or interpretivist (Creswell, 2014). The focus on lived experiences and social behaviours of an identifiable group of people studied in their natural context to develop an overall cultural interpretation is defined as an ethnographic approach (Creswell, 2014). In making sense of how academics engage with those changes in their practice, the next step therefore is to explore the nature of academic identity.

18.4 Towards the conceptualisation of academic identity

The term "identity" is a contested term due to various epistemological traditions that can inform the conceptualisation of the term. For instance, identity can be understood as one's identification with a landscape of practice where an individual constitutes their identity through belonging to varied communities (Kreber, 2010). In contrast, identity can also be understood as a self-concept, a view which links identity to humanist notions of individuation, self-actualisation and gaining greater self-awareness of who they are (Hyland & Tse, 2012). Studies of academic identity recognise both individual and broader structural aspects of identity (Clegg, 2008; Henkel, 2005). Henkel (2000, p. 251) viewed academic identity as both distinctively "individual and embedded in the communities of primary importance to them", whereas Clegg (2008, p. 329) argued that identity is a

> multiple and shifting term [which] exists alongside other aspects of how people understand their personhood and ways of being in the world, is not a fixed property, but part of the lived complexity of a person's project and their ways of being in those sites which are constituted as being part of the academic.

Both examples, without being explicit, refer to the notion of practice as a way of contextualising an individual in the world. Thus, both authors suggested that academic identity is constructed and negotiated in social interaction in the everyday landscape of practices. To explore the identities of academics, there is a need to examine their landscape of practice, which impacts the development and renegotiation of their identities. To this end, the conceptualisation of identity used in Chapter 18 is positioned within a sociocultural and situated perspective that recognises identity as a relational phenomenon, mediated, developed and re-negotiated through practice in cultural and social settings (Lankveld et al., 2017; van Winkel et al., 2018; Wenger–Trayner et al., 2014).

18.5 Studies on academic identity through the CoP lens

Several studies have explored situated and sociocultural perspectives, and in particular, used the CoP framework in understanding academics' identity. For example, Swennen et al. (2010, p. 131) considered university teacher educators' identity as "socially constructed self", developed in participation with others in the landscape of practice. Whereas, Warhurst (2008) examined novice academics by emphasising that learning is a process of identity formation or re-formation in relation to the community sustaining particular forms of practice. Furthermore, Cahill et al. (2018) have argued for participation within a CoP as a "source of identity" within academic context.

Only one study was found considering older academics' identity formation, who experience transitions across the landscape of practice and changing forms of academic membership, drawing on Wenger's concept of CoP. Namely, James (2007) explored the tensions between academics different identities, and trajectories of

identification, that constitute the participation of academics in a landscape of practice. James (2007) argued that academics roles, as old-timers within CoP, may be shaped by institutional and societal contexts over which they have little or no control. Therefore, in line with studies using CoP framework, the orientation in Chapter 18 and the study context also considers academics' learning whereby engaging in social practice and negotiating meaning in the landscape of practice brings about changes in an individual's identity (Lave & Wenger, 1991).

18.5.1 Participation and reification in the landscape of practice

In order to apply the lens of CoP to older academic's practice, there is a need to discuss its main assumptions to understand the link between identity development and practice. Wenger (1998, p. 15) defined practice as "the body of knowledge, methods, tools, stories, cases, documents, which members share and develop together". He described a CoP as having the properties of mutual engagement, joint enterprise, and shared repertoire. Wenger (1998) contended that individuals' engagement in a CoP entails a process of negotiation of meaning which takes place in the convergence of two processes. Individuals move through both participation and reification on a trajectory from newcomers to a full participant through Legitimate Peripheral Participation (LPP).

Participation in a CoP considers acting and interacting in the community of others engaged in the same area of practice. The participation is both personal and social and based on mutuality, but not necessarily equal involvement. Participation involves academics engaging directly in activities, conversations, reflections, and other forms of personal participation in academic practice. For example, academics teaching or working collaboratively on a research project as noted in my study.

Reification, on the other hand, encompasses both a process and its resulting form. Reification involves academics producing artefacts (such as tools, words, symbols, rules, documents, concepts, theories, and so on) around which the negotiation of meaning is organised. For example, academics producing course contents, a policy document, or a theory in their discipline as found in the study. Participation and reification are complementary processes which are situated in practice.

18.5.2 Identity and practice

Wenger (1998) described a profound parallel between identity and practice. The formation of a CoP does not only involve the negotiation of meanings, but also, and of equal importance, the negotiation of identities. Indeed, each of the key concepts critical to negotiation of meaning in practice has parallel concepts in negotiations of identity; community as membership, shared histories of learning as learning trajectories, boundary and landscape as nexus of multi-membership, negotiation of meaning (in terms of participation and reification) as negotiated experience of self (in terms of participation and reification) (Wenger, 1999, p. 150).

A full CoP participant does not mean an older participant, but one that have developed expertise in the community. Full participation within a CoP is desirable as it provides access to certain knowledge, ways of knowing, and modes of conduct, which are inherent in the practice of a full participant (Wenger, 1999). Thus, participants wanting to achieve centripetal movement within the community negotiate participation and make sense of both the practice and their position in it.

18.5.3 Multiple identities of older academics

The practice of academics is ever changing and socially legitimated, where academics interpret themselves as a certain individual within a certain context (Winter, 2009). Academics' participation in various practices results in multiple identities. Traditionally, universities have been institutions of both learning and scholarly inquiry. Thus, in general academics would engage with teaching and research. More recently, academics also engage in management, administration, and leadership responsibilities (Winter, 2009). A study by Deem and Johnson (2001) highlighted that some academics manage to retain a balanced teaching and research portfolio, whilst others focus on one aspect of practice or the other. Furthermore, other studies showed that academics become full-time manager academics or take on leadership responsibilities, and thus have little or no time for teaching and research (Boyd & Smith, 2016). Both findings were confirmed in this study, whereby some academics' identity development focused on research, teaching, or leadership or a combination of both or even all three areas of practice, for instance, research and leadership. Moreover, initial findings in this study consisted of academics' identities including a teacher, researcher, scholar, leader, manager, cross disciplinary brokerer, consultant, discipline expert.

18.5.4 The dynamic nature of identity development in a landscape of practice

Along with my study initial findings, the literature (Lankveld et al., 2017) indicates that institutional factors, such as introducing new initiatives, goals, directions, and policies at their institution, may especially influence academics' administration, managerial, or leadership responsibilities and hence practices. In fact, the latter is prevalent amongst older academics who often take on management and leadership roles based on their long experience in academia. These roles are often temporary. McAlpine (2012) concluded that academics conceptualise themselves as having multiple identities due to the changing forms of academic community membership. Thus, they can become leaders and managers alongside their teaching identity. Furthermore, the boundaries of HE are increasingly "porous" and academics are developing a wider ranges of identities influenced by activity beyond the university (Clegg, 2008), such as international projects, cross–disciplinary research or governmental and private professional bodies and employers (Martin, Lord, & Warren-Smith, 2020). This leads academics to be involved in the landscape of CoP which extend beyond their immediate CoP.

Development of all these identities at the same time may not always be possible, and some may be more pronounced than others, or they may clash altogether. Winter (2009) suggested contradictions and conflicts that arise from these competing identities as academics enact their multifaceted practice. This leads academics to experience competing priorities in their identities (Bolden, Petrov, & Gosling, 2009). Furthermore, some authors have argued that academics most strongly identify with their discipline rather than their workplace (cf. Henkel, 2005) as confirmed in the findings of this study. For example, one academic in particular talked about his disciplinary work outside of his workplace with a great passion. Indeed, practices change and evolve over time and over contexts and new challenges require new ways of practising which affect identities of the academics.

18.5.5 Modes of identification

By participating in the landscape of practice academics engage in learning activities that imply changes in individuals' identities (Lave & Wenger, 1991). Wenger emphasized that these changes involve engagement, imagination and aligning one's skills, knowledge and identity with the community, thus learning arises out of engagement in the practice of the CoP rather than merely engaging in educational activity (Lave & Wenger, 1991). Wenger suggests three modes of identification that positions an individual in the landscape of CoP: engagement, imagination, and alignment.

18.5.5.1 Engagement

Engagement, being the most immediate relation to practice, involves engaging in work activities, working collaboratively or alone. Engagement provides direct experience of what the community is all about, whether this experience is one of competence or incompetence and whether participants develop an identity of participation or non-participation. For example, the findings indicated that some academics focused their engagement on the development of their research identities, but disengaged with leadership or teaching practices, and indicated no desire to get competence in these practices. Conversely, other academics practice focused on developing leadership identities which left limited time for research.

18.5.5.2 Alignment

Alignment involves a two-way process of coordinating perspectives, interpretations, actions, and contexts of a participant's trajectory into the CoP. For example, a teaching academic aligned some of their teaching methods to those practised in their department but also introduced innovation by suggesting using Twitter in their course, which changed aspects of the teaching culture of the department. Alignment becomes very deep aspects of participant's identities as it concerns power which can amplify but also disempowers sense of what is possible. For example, in my study one academic struggled to establish his area of work as "proper".

18.5.5.3 Imagination

Imagination involves an understanding of how we belong or not to a CoP, it is extrapolating our own experiences through time and space. For example, the study found that research-engaged academics imagine belonging to a wide disciplinary community even though they may be the only ones doing research in a certain area of their workplace. Indeed, the study findings showed that all participants expressed ongoing interests in research and scholarship practice and its value in their disciplines and workplace. Yet, some participants admitted having no time to engage in the activity itself. This finding has implications for participants' identity. Namely, participants recognise the importance of research in the identity of an academic and may even align their identity to the place of research even if they do not engage in primary research themselves.

18.6 Subjectivity in identity development

Thus far, Chapter 18 has argued that the development of academics' multiple identities is both social and CoPs dependent. However, researchers urge that both the context and the way that individuals make sense of this context should be examined when investigating professional identity. It is at this point, where Wenger's work has been critiqued, as he provides limited attention to individual subjectivities to understand the choices individual's make in participation in practice (Fuller et al., 2005).

Each academic's experience will be unique due to "the inevitable negotiation between the workplace's norms and practices and the individuals' subjectivities and identities" (Billett 2004, p. 114). Individuals enter workplaces with their own idiosyncratic personal learning experiences, perceptions and memories which will shape their dispositions to particular participatory practices For this reason, research focusing on academic identity should consider the subjectivities that individuals employ within their academic landscape of practice. Therefore, the processes of alignment (congruence and incongruence) with the values, practice and norms of the community and also individuals' biographies, norms and values are seen as integral to their academic identity formation. This duality is conceptualised by Billet's (2004) notion of co-participation, and describes how access to identity development is afforded, on the one hand, and how workers elect to engage with what is afforded to them which shapes their identity, on the other. Each individual's understanding is a subjective reconstruction or construal of practice that shapes one's identity (Hodkinson et al., 2008).

18.7 Affordances for identity development

By focusing on the situated nature of practice, Eraut (2009) pointed out that the different local goals, norms and role boundaries of workplaces create varied affordances to engage in participatory opportunities. Research suggests that the myriad forms of academic identities are constituted by multifaceted contexts. These are: the academic's workplace environment, the wider context of national

and international HE, their discipline context, as well as social interaction with peers and students. These contexts can play an important role in either strengthening or inhibiting the development of academic identity. Furthermore, each of these contexts can have a varying impact on academic identity (Lankveld et al., 2017). Furthermore, these contexts can be understood as learning affordances (Billett, 2004) which can constrain or resource the identity development. These highlight potential, disempowering, or exclusionary experiences in which affordances may not be evenly available.

18.7.1 Affordances enhancing identity development

One of the affordances that has been mentioned by several studies that align with the findings of Chapter 18 was a collegial and supportive environment in the academics workplace and across discipline networks (Martin et al., 2020). Feeling supported and respected by their colleagues meant for academics that they flourished and developed their identities by giving each other emotional and practical support (Lankveld et al., 2017). Furthermore, the study found being a recognised expert in a discipline afforded identity development by being invited to conferences or being approached by colleagues to participate in collaboration, thus developing expertise identity in respective discipline. The participants' strong identification with research and scholarship translated into the focus on intensive applied research that stressed collaboration and practical implications of their research across disciplines. The expressions of commitment, pride, and passion were evident in academics' accounts, reinforcing their identity as researchers and scholars.

The participants in this study also interpreted their past experiences as an affordance for identity development, for example, their teaching experience. Through reflecting on these experiences, they were able to develop themselves as professionals. These findings align with the conceptualisation of identity as negotiated in everyday interaction and experience (Archer, 2008).

18.7.2 Affordances restricting identity development

In contrast, other studies reported that the work environment had a constraining impact on identity when academics perceived their departments to be competitive, hierarchical, lacking in trust, or valuing research more than teaching. In such environments, academics felt isolated and inhibited to ask for help and support to develop either their teaching or research identities (Cahill et al., 2018). An example from this study's findings showed that some academics felt that their career progression was restricted, as well as having limited formal developmental opportunities.

The findings of this study also indicate that although the diverse prior experience in participants' practice meant that they could be involved in different practices, it also created some tensions. Thus, some of academics' identities were an obstacle for the development of other academic identities. Indeed, several academics discussed struggles with keeping up with research practice due to management and

leadership responsibilities and the specific nature of their discipline. These findings are aligned with other studies mentioned by Bolden et al. (2009).

18.7.3 Identity development in Open World Learning

With the rapid development of open world learning technologies older academics continue developing identities. However, the challenge of encouraging older academics in HE to adopt to these changes is frequently noted within the academic development community. The initial findings of this study noted two aspects of using social media. On the one hand, the study that the benefits of utilizing social networking when carrying out research were clearly recognised by many participants. Consistent results across studies have revealed that social media sites provided a convenient environment for scholarly communication and research dissemination. These findings aligned with other studies (Bennett, 2017; Kara et al., 2020). Furthermore, the findings reported that academics used ResearchGate and Academia.edu for keeping themselves up to date in their field, promoting their work online, and maintaining their professional image.

On the other hand, there were some barriers hindering the adoption of social media. The challenge of encouraging academics in HE to adopt social media to support their teaching, research, and management roles was frequently noted within the academic development community (Brown, 2013), especially amongst older academics (Gelade, 2013). For example, studies considering identity development uncertainties in adopting social media in teaching and research practice (Bennett, 2017; Kara et al., 2020). Indeed, Greenhow and Gleason (2014) found that age played an important role in the decision to adopt social media for teaching. The findings of this study aligned with Bennet's study (2017) whereby some academics discussed uncertainties related to the use of social media, yet these were alleviated by time they spent on getting used to new practice for the benefit of their research and teaching.

18.8 Discussion and moving forwards

The aim of Chapter 18 was to problematise the dynamic nature of older academics' identities and report some initial findings. The scarce literature on older academics necessitated drawing on wider literature. This calls for more research focusing on older academics given delayed retirement and the increased ageing academic population. The conclusions of James's (2007) study compared to the findings of this study revealed that an individual subjectivity (Billett, 2004) in understanding older academics identity development was not addressed. Thus, this study builds on previous work by adding an additional framework in order to understand identity development of older academics.

Chapter 18 indicated that older academic identity consists of sub-identities across a landscape of practice, including but not limited to: teacher, researcher, leader, consultant, discipline experts. The findings indicated that the academics were recognised for their expertise and thus seen as sources of knowledge. However,

multiplicity of academic identities means their practice is contested, hence future research should address the ways how those tensions could be addressed. Participating in the landscape of practice, academics involve dynamic context of HE sector and evolving workplaces including technological changes. The chapter indicated that both affordances (enablers and obstacles) of the practice but also individual subjectivities shape academics identities development. More research is necessary to understand how workplaces could use these insights to foster an environment where particularly the barriers are addressed. For example, the use of open access and social media use was discussed, both as an affordance that helped academics to promote their work, but also as an uncertainty that has implications for more focused help for individual academics' development.

18.8.1 Implications for practice

The practical implications of distinguishing multiple identities of older academics' could enhance an individual's understanding for thinking about their own professional development. There are several tensions caused by the dynamic and multiple identities of older academics. This could both inform practice, concerning, for example, emotional processes involved in these changes, but also encourage younger and older academics to negotiate time to maintain the identities that were pushed on the periphery for maintaining an appropriate balance.

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Chapter 19

Reflecting on the main findings and practical applications

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19.1 Introduction

The main objective of this book *Open World Learning: Research, Innovation and the Challenges of High-Quality Education* was to establish an informed theoretical and methodological basis for research and practical application of open world learning. As highlighted throughout this book, open world learning gives unprecedented access to information, knowledge, and education and provides support to learners across the globe. However, it is not the educational technologies themselves that represent the biggest change, but the opportunities for openness that flow from their thoughtful application, in the form of availability of and access to open and "closed" learning opportunities (Ferguson, Jones, & Scanlon, 2019; Hampel, 2019; Nguyen, Rienties, & Whitelock, 2022; Rizvi, Rienties, Kizilcec, & Rogaten, 2022).

The main question of this book was: **How can open world learning supported by technology help and/or hinder tackling the global challenges that open and high–quality education faces**? First, this book provided several integrated and cohesive perspectives of the affordances and limitations of open world learning. The eighteen chapters brought together a range of research communities, including colleagues in artificial intelligence (Hillaire, Rienties, Fenton-O'Creevy, Zdrahal, & Tempelaar, 2022), computing (Iniesto & Hillaire, 2022), education (Anastasiou, 2022; Mohamud, Buckler, Pitt, & Twining, 2022; Srisontisuk, 2022), educational psychology (Hall, Herodotou, & Iacovides, 2022), human–computer interaction (Iniesto, McAndrew, Minocha, & Coughlan, 2022), language education (Conde Gafaro, 2022; Vogiatzis, Charitonos, Giaxoglou, & Lewis, 2022), learning analytics (Korir, Slade, Holmes, & Rienties, 2022; Nguyen et al., 2022; Rizvi et al., 2022), linguistics (Chua, 2022; Rets, Stickler, Coughlan, & Astruc, 2022), and professional learning (Chaudhari, Littlejohn, & Cross, 2022; Iwaniec-Thompson, 2022).

Second, this book featured a wide range of open world learning topics, ranging from theoretical and methodological discussions to empirical demonstrations of how open world learning can be effectively implemented, evaluated, and used to inform theory and practice. This book provided in-depth analyses of the (potential) benefits and limitations of open world learning by bringing together insights from 387,134 learners and educators learning and working in 136 unique learning contexts across the globe (e.g., blended language learning in Italy and the UK,

Internet kiosks in Uganda, MOOCs involving learners across the globe, online courses in the UK, science learning in Greece). This interconnected body of work not only has tremendous reach, but by comparing and contrasting different learning experiences of academics, children, educators, gamers, learners, instructional designers, managers, professionals, students, teachers, and young adults in a range of local, national and international settings, the sum of these 136 learning contexts is more than each of its individual parts.

Third, this book brought together a range of innovative uses of technology in open world learning, such as digital games (Hall et al., 2022), Futurelearn (Chua, 2022; Conde Gafaro, 2022; Iniesto et al., 2022; Rizvi et al., 2022), iPads (Srisontisuk, 2022), open educational resources (Rets et al., 2022), solar-powered Internet kiosks (Mohamud et al., 2022), (student sourced) sentiment analysis classifiers of online chat (Hillaire et al., 2022), WhatsApp (Vogiatzis et al., 2022), and Youtube (Anastasiou, 2022). A range of complex and interlinked research methodologies have been used to understand how educational technology is used by people in open world learning settings. Several innovative methodologies were used, including quantitative methodologies such as discourse analysis (Chua, 2022), eye-tracking (Rets et al., 2022), learning analytics (Nguyen et al., 2022; Rizvi et al., 2022), machine learning (Hillaire et al., 2022), and (psychometric) online surveys (Conde Gafaro, 2022; Hall et al., 2022; Korir et al., 2022). Furthermore, a range of in-depth qualitative methodologies were employed throughout this book, including (ethnographic, longitudinal) observations (Anastasiou, 2022; Iwaniec-Thompson, 2022; Mohamud et al., 2022; Srisontisuk, 2022), and thematic analysis of artefacts, documents, interviews, and other qualitative data (Anastasiou, 2022; Iniesto et al., 2022; Mohamud et al., 2022; Srisontisuk, 2022; Vogiatzis et al., 2022). Finally, several chapters specifically embraced mixed method approaches (Iniesto et al., 2022; Rets et al., 2022; Rizvi et al., 2022).

In the remainder of this chapter, we will not try to summarise each of the chapters, but rather try to place the findings into a wider context of the open world learning framework previously described in Chapter 2 (Rienties, 2022). This framework helps to depict what we have learned about what works in open world learning, what practical advice we give to learners, educators, and institutions, and finally what the next steps in open world learning research could be. As is evident throughout this book the enablers and disablers for open world learning continuously change the fluidity of the open world learning framework. This means that the size and space of open world learning experienced by individual learners and organisations in any specific context might be substantially different from other learners and organisations, and will inevitably change over time as technology, society, and people continuously interact in a flux.

19.2 What is now known about what works in Open World Learning

As argued in Chapter 2, while substantial progress had been made in mapping and reviewing the macro (i.e., regional, national, international, global) trends and

concepts of open world learning until 2014, there was a paucity of evidence-based research how learners and educators make use of open world learning on a meso (i.e., institutional, cross-institutional, cross-discipline) and micro level (within institution, module, student). Chapters 14 and 15 specifically focussed on a meso level how MOOC organisations (Iniesto & Hillaire, 2022) and course designers at the Open University (Nguyen et al., 2022) make decisions in terms of how to design effective and inclusive learning designs and experiences.

Six chapters (Chaudhari et al., 2022; Iniesto et al., 2022; Iwaniec-Thompson, 2022; Mohamud et al., 2022; Rizvi et al., 2022; Srisontisuk, 2022) combined a meso perspective with more fine-grained micro-level analyses to understand how individual learners and educators are making decisions within a broader context. For example, in Chapter 17 (Chaudhari et al., 2022) a convincing narrative is provided how experts and practitioners in the finance sector dealt with uncertainty, and how this was influenced by both individual as well as meso-factors. Similarly, in Chapter 8 Rizvi et al. (2022) showed that how learners from across the globe engage with MOOCs is influenced both by micro factors (e.g., demographics, prior knowledge, motivation) as well as meso or even macro factors (e.g., culture, national educational provision).

Equally important, seven chapters (Anastasiou, 2022; Chua, 2022; Conde Gafaro, 2022; Hall et al., 2022; Hillaire et al., 2022; Korir et al., 2022; Rets et al., 2022) specifically focussed on the lived experiences of learners and educators engaging with open world learning on a micro-level. For example, Chapter 11 (Korir et al., 2022) explored how 447 students reacted to variations in privacy risks and/or benefits interventions in an experimental design. Chapter 3 (Anastasiou, 2022) explored children who received a different sequence treatment in using digital stories in science, with the results showing that children from an early age can creatively use a range of open world learning tools to tell their own stories and make meaning in their own language.

Irrespective of whether the focus was on a meso or micro level, the two main lessons from this book are (1) technology is not neutral; (2) open world learning is not necessarily open for everyone.

19.2.1 Technology is not neutral

Throughout this book how, why and with whom learners and teachers are engaging in open world learning was substantially influenced by the affordances and limitations of a respective (educational) technology. For example, while WhatsApp is omnipresent in many people's lives, just starting a suite of language tasks on WhatsApp to learn German is not a guarantee for success (Vogiatzis et al., 2022). While tablets provide teachers and children with opportunities to gain new insights and knowledge, at the same time tablets may distract from natural play and interaction (Srisontisuk, 2022). How MOOCs are designed often favours Western learning approaches as they are designed by Western educators (Rizvi et al., 2022), thus "forcing" learners from other cultures to adopt an unfamiliar learning approach. In addition, as educators' choices in terms of which learning design activities are

included or excluded in a particular week of learning are based upon their own experiences and expectations, this inevitably has profound implications for how learners are expected to study (Nguyen et al., 2022).

19.2.2 Open world learning is not necessarily open for everyone

Building on the first main lesson, even with the best Internet access, IT infrastructure, and educational support available, not everyone will benefit equally from the opportunities of open world learning. For example, Iniesto et al. (2022) showed that learners with accessibility needs often struggle to make use of open world learning. In MOOCs interactions, for example, some types and groups of learners are often more present than others (Chua, 2022; Rizvi et al., 2022), thereby potentially reducing the (heard) voices from other learners. As most open world learning opportunities are created in the medium of English, non-native English speakers are often put at a disadvantage in terms of benefitting from engagement with OERs or MOOCs for learning (Chua, 2022; Rets et al., 2022). While the community approach of Internet kiosks in Uganda by Mohamud et al. (2022) showed that learners in a community can teach each other to learn to use open world learning tools, this approach may not necessarily work in other contexts.

While the authors in this book acknowledge that technology is not neutral, and that not everyone may benefit equally from open world learning, throughout the book there are markers and evidence-based findings supported by robust methodologies how you as learner, educator, or as manager can ensure that you can benefit from the powers of open world learning. Implementing some of the practical advice may help you to become a more successful open world learner and/or educator, as illustrated in section 19.3.

19.3 Practical advice to support and mediate effective open world learning

Empowering learners (how to become an effective open world learner)
- Set your own goals what you want to achieve in open world learning (Chapters 5 and 9).
- Follow the learning design schedule set in open world learning, and adjust where needed (Chapter 8 and 14).
- Get involved in (co-)designing open world learning (Chapter 9 and 15).
- Think carefully about including open and inclusive language. This will increase constructive engagement with other learners (Chapter 6).
- Position yourself as a digital story maker and take the opportunity to do so in every step of the creation process in open world learning (Chapter 3).

Empowering innovative technologies (how to use them)
- There is no single universal learning design that works for all learners (Chapters 5, 6, 8, and 9).
- The mere use of innovative tools like WhatsApp or Massive Open Online Courses (MOOCs) cannot guarantee interaction and knowledge

construction amongst your learners. These tools need to be appropriately embedded into your learning design (Chapters 4 and 6).

- As long as the linguistic accessibility of online materials is ignored, and these resources continue to draw on native speaker capital in language, the capacity of these resources to widen access to quality education will only remain that: a potential (Chapters 7 and 9).
- When using artificial intelligence tools to identify complex patterns in data (e.g., emotions, discourse), you should consider how to align the lived experience of students to model highly subjective topics (Chapters 6 and 13).
- Think about possible concerns regarding the usage of smartphones and tablets with young children (Chapter 16).
- Solar-powered Internet kiosks can support low-income communities to achieve their desired goals and facilitate soft skills development (Chapter 10).
- As a developer you could use the Creative Gaming scale as a guide on what aspects of creativity are most important to players and learners (Chapter 12).

Empowering educators (what you need to do as educator)

- It is crucial for you as educator to identify how learners set and assess their goals in open world learning (Chapter 5).
- Simplify your language! We repeat: Simplify your language! (Chapter 7).
- There are many potential misalignments between what you as an educator think your learners do and what they actually do (Chapter 14).
- As educator you should seek a better understanding of your learners and their needs (Chapter 9).
- Set clear guidelines on specific, realistic, measurable, and attainable goals so that your learners can effectively self-regulate their learning in an open world (Chapter 5).
- It is important to have frequent check-ins with your learners, not only at the point of an assignment deadline but throughout their learning process (Chapter 14).
- Simplification strategies in writing online materials, such as splitting sentences, choosing words of a shorter length and higher frequency, and using fewer nouns and more connectives between/within sentences have a beneficial effect on the text processing of learners, in particular non-native English speakers (Chapter 7).
- Use digital stories to communicate complex information (Chapter 3).
- There is a strong need for flexible, culturally adaptive learning designs of open world learning, taking a balanced approach by combining different types of learning activities (so not just more text and videos) (Chapter 8).

Empowering your educators (how to get the best out of your staff and learners)

- Any online course development processes need to be reviewed from the early design stages to produce accessible content (Chapters 9 and 15).
- Your design focus should change from meeting legislative requirements to meeting learners' needs (Chapters 9 and 15).

- Extensive training of educators in using innovative technologies and pedagogies is needed to ensure the full potential of open world learning. So do provide more training and support if your educators or staff need them (Chapters 4 and 17).
- Institutions should examine ways to empower students with respect to the use of their data by allowing them to indicate whether and which data items they would be willing to share (Chapter 11).
- Be transparent regarding the use of student data (Chapters 11 and 13).
- There are several tensions caused by the dynamic and multiple identities of (older) academics. Becoming familiar and proficient with open world learning takes time and resource (Chapter 18).
- Organisations need to exercise transparency; if there is uncertainty, this needs to be clearly communicated in order to prevent loss of trust of their employees (Chapter 17).

19.2 What is next for open world learning?

As indicated in Figure 19.1, a lot of progress has been made in understanding how *people* make use of open world learning, both on a meso as well as a micro level. All but one Chapter specifically focussed on how learners and educators used particular open world learning approaches in their context. Some of this usage of open world learning seems to depend on individual people factors, such as accessibility needs (Iniesto et al., 2022), age (Iwaniec-Thompson, 2022; Srisontisuk, 2022), conceptions of teaching (Nguyen et al., 2022), emotions (Hillaire et al., 2022), engagement (Chua, 2022; Rizvi et al., 2022; Vogiatzis et al., 2022), language skills (Chua, 2022; Rets et al., 2022), self-regulation (Conde Gafaro, 2022), and socio-economic factors (Rizvi et al., 2022).

Furthermore, some substantial progress has been made in terms of *practices*, as the practices people and institutions are surrounded by influence how they engage with open world learning. For example, Chapter 9 (Iniesto et al., 2022) showed how the organisational practices around MOOC providers and the legislative context substantially influenced how accessible a particular learning unit was. Chapter 16 indicated that how children were able to use iPads in the classroom depended in part on the practice in their respective school (Srisontisuk, 2022). Overall, our 136 unique learning contexts discussed in this book provide a rich and diverse overview of some of the practices used in open world learning.

	People	Places	Practices	Properties	
Meso	1	0	2	2	5
Meso/micro	6	2	6	1	15
Micro	8	1	1	4	14
	15	3	9	7	

Figure 19.1 Heatmap of 4P themes covered in this book.

While in 2014 there were hardly any studies on the *properties* of open world learning technologies and data, substantial progress has been made in this book, with seven contributions focusing on how data use might enable or thwart open world learning. For example, Chapter 11 (Korir et al., 2022) showed that most of the 447 UK students involved in an online experiment focusing on privacy and learning analytics were reasonably comfortable to share their data with higher education institutions. Chapter 12 (Nguyen et al., 2022) showed that OU educators made substantial use of student engagement data to determine how to design online courses. At the same time, with the triangulation of more and more data and Artificial Intelligence becoming more intertwined with education (Rienties, Køhler Simonsen, & Herodotou, 2020), there are substantial concerns about how algorithms are potentially making decisions (e.g., in- or excluding learners on a particular invention, profiling, automatic feedback) that could influence behaviour and performance of learners (Baker & Hawn, 2021).

As evidenced by Figure 19.1, relatively few Chapters focussed on *places*, which is perhaps surprising as places where people learn, work and live might substantially impact on how they get access to open world learning opportunities. With governments across the globe setting national agendas for (open and closed) education, and some governments restricting access to Internet and knowledge, more research is needed how places impact on learners and learning. Beyond actively restricting content and access to open world learning, even when learning activities are openly available, this does not necessarily imply that users will universally make sense of them in the same way. For example, in Chapter 8 Rizvi et al. (2022) showed that MOOCs were not culturally inclusive, with large differences in engagement patterns by 49,582 learners in 10 Futurelearn MOOCs. Therefore, there is an urgent need to understand how the construct of places influences open world learning and the lived experiences of people who live in those places.

Given the growing maturity of open world learning research, now is the time to usefully gather, compare and contrast more data on a wide range of experiences from a micro–meso level to inform an evidence-based macro perspective of open world learning. As editors we hope that this book has been inspiring, and that you might try some of these tools, approaches, and pedagogies in your own context. Please share your perspectives and insights with us and tell us what has worked, and what has not worked via our social media (@IETatOU). Only together can we help to further empower open world learning.

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