

Anat Zohar

# Scaling-up Higher Order Thinking

Demonstrating a Paradigm for Deep  
Educational Change

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Anat Zohar  
Seymour Fox School of Education  
Hebrew University  
Jerusalem, Israel

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*With love, to my parents, Dina and Eytan,  
who taught me to investigate my thoughts  
and strive to fulfill my goals.*

*With gratitude to Prof. David K. Cohen who  
encouraged me to write this book.*

# Foreword

The quest for transformative innovation at scale has haunted the minds of educators for a long time. Decades ago, surveying the landscape of school change, I winced at how powerful paradigms appeared here and there in pockets and occasionally across sizable coalitions – but truly wide scale? Not so much!

The challenge might remind us of the Greek legend of Sisyphus, its protagonist doomed to roll a huge boulder up a steep hill only to have the boulder roll back down each time. Happily, the circumstances in education are not quite that bad. Even so, truly effective innovation at truly wide scale has proved unsettlingly evasive. Why? What goes wrong? And what might be done about it?

Anat Zohar explores these and related questions in *Scaling Up Higher Order Thinking*, and the answers she offers reach well beyond academic speculation. It's been my pleasure to know Anat for some decades, appreciating the hands-on ways she has engaged educational research and innovation in Israel. This has given her the opportunity to both foster and investigate various scaling initiatives related to higher order thinking. As a scholar, she displays a wide knowledge of the literature on innovation across international settings. Finally, while her principal cases in point concern higher order thinking, the lessons she draws seem just as applicable to any fresh paradigm calling for complex nuanced practices.

So what does Anat Zohar tell us about the forces that knock the boulder back down the hill? Let me sample a few findings. For a headline, it's not so much a single factor. Perhaps "Murphy's Law," which could be seen as a contemporary version of the legend of Sisyphus, applies – "If anything can go wrong, it will!"

For instance, Anat observes that teachers vary hugely in their readiness for innovations, reflecting not only their craft but their general epistemological level. Professional development is often too thin for anyone beyond enthusiastic early adopters. Also, professional development commonly neglects how innovations need adaptation to the particularities of different disciplines, one size not fitting all!

On the plus side, educators in administrative roles readily recognize the need for supportive structures such as policies and time allocations. On the cautionary side, administrators do not so readily recognize the challenges teachers face in adopting

and sustaining new pedagogies. The same applies to government policymakers. To align with this reality, teachers and whole faculties frequently end up veering toward more manageable token versions that miss the core.

To touch on one more factor among many, everyone in the game from teachers to principals to government figures knows all too well that the winds of change commonly change direction. This year's priority may prove passé two or three years later, often for political rather than substantive reasons. A common response among busy and cautious teachers is to try a few things while mostly waiting it out. A common response for genuinely committed government figures is to rush the process so that at least something will get done. Neither accomplishes what one would like.

All this might sound like a tale of despair – the boulder rolls down the hill again. But that is not at all the point of Anat Zohar's analysis. A better characterization would be: *we need to get smarter about this!* She tops her tales of trouble with considerable strategic lore toward doing better.

The rich account she offers reminds me of a contrast I have used from time to time in speaking and writing about the challenges of change, the contrast between an installation and an ecological perspective. Often in educational and other settings, people adopt an installation perspective, something like getting a new refrigerator – bring it in, find a corner for it, connect it up, and it purrs along doing its job. Analogously, introduce the new practice, provide a guidebook, offer a workshop and perhaps a refresher, and from then on the practice purrs along.

In contrast, the ecological perspective warns of cascading complexities. As in a literal ecology, newly introduced elements are fragile. Survival is tricky, competition from other interests normal, pushback likely, marginal results typical, unexpected consequences common. Effective and lasting change calls for something far closer to supporting an ecology through a transition than to setting up the refrigerator in the corner. Certainly the complications charted in *Scaling Up Higher Order Thinking* exhibit the messy and intertwined character of an ecology. The installation approach would be easier, but that's not the world we live in.

Of course, this broad contrast says nothing specific about how to manage ecologies of change. We need not only a sense of the complexity but a sharp operational vision of the hazards coupled with promising ways to deal with them. It is just this that Anat Zohar provides. Taking her cues toward more craft and insight, we can push our educational innovations up our particular hills with much better prospects of them staying near the top.

Carl H. Pforzheimer Jr. Professor of Teaching  
and Learning, Emeritus  
Harvard Graduate School of Education  
Cambridge, MA, USA

David Perkins

# Introduction

I feel fortunate that my educational career has taken place in a particularly challenging time. It allows me to join numerous other educators in searching for new ways to make learning and instruction in our schools more interesting and more intellectually challenging. My work has focused on the effort to move the school system forward so that learning and instruction in schools will be based less on rote learning and more on deep understanding and higher order thinking (HOT). In the course of my career, I have had an opportunity to work in diverse and interesting roles, including: teaching in junior high school and high school; teaching pre-service and in-service teachers; lecturing in the university; conducting educational research; supervising graduate students; working as a consultant; working as Director of Pedagogy in the Ministry of Education, developing educational leadership; lecturing to diverse audiences; developing curricula, writing textbooks, leading educational projects; and leading a large-scale educational change process. Over the years, these roles have taken me on many fascinating journeys. I have met numerous educators from diverse backgrounds and ranks and had enlightening conversations with many of them.

In the beginning, every meeting about developing students' thinking had to start with an introduction to HOT – explaining what it is and why we should transform instruction to focus less on rote learning and more on thinking-rich learning. At a certain point, I realized that such an introduction was unnecessary. The people I talked to were already familiar with this issue and believed it was important. At the same time, thinking-rich instruction was becoming prevalent in a growing number of classrooms, schools, professional development (PD) programs, educational projects, etc. Within the span of three decades, teaching thinking had changed from an obscure, unfamiliar issue to a recognized educational goal of research and practice with a prominent presence in the Israeli school system.

Does that mean that the Israeli school system has implemented teaching for thinking across all schools in a satisfactory manner? The answer is no. There are currently dozens of wonderful programs aimed at fostering students' thinking. Many of these programs employ high-quality pedagogies and can definitely be considered instructional “pearls.” Yet, these pearls, or islands of instructional innovations, are



still far from becoming a continent. Unfortunately, boring, “transmission of information” teaching methods still dominate large segments of the school system.

Why does this happen? Why does this pattern of instruction persist despite decades of hard work by women, men, and various institutions, and despite system-wide reforms that have attempted to change this situation? I ask these questions in a particularly critical voice following my personal experience as Director of Pedagogy in the Israeli Ministry of Education. For 3 years (2006–2009) I had the opportunity to initiate and lead in a national change process called “Pedagogical Horizon: Teaching for Thinking.” The goal was to implement the instruction of HOT throughout the school system (Gallagher et al., 2012). The change process did succeed in passing through the closed doors of many classrooms, changing the course of thousands of lessons. It also made its way into the national testing systems and PD programs (Ministry of Education, 2009; Zohar, 2013). Following this change process, hundreds of thousands of students participated in more thinking-rich lessons (with diverse levels of depth and scope) compared to previous years. In this sense we can talk about success. If, however, the criteria for success are a comprehensive revolution in teaching methods, learning, and assessment, the aspiration for change did not materialize.

This experience illuminated for me the complex challenges involved in system-wide implementation of a pedagogical policy addressing the core of learning and instruction. It raised multiple questions, most of which have been the focus of prior research: why, despite so many reforms and so much effort, has the school system not improved as we would have hoped? Is it at all sensible to expect that the school system would change in the desired direction? Although my main research area is learning and instruction rather than educational change, I started to read, think, and conduct research about educational change processes, with an emphasis on pedagogical reforms. The literature answered some of my questions, but studying this area also made me wonder. I noticed that most scholars in this area are experts in organizational change in general or educational change in particular. Too few researchers come from the field of learning and instruction. My comprehensive reading indicated that the large body of empirical research in learning and instruction is not represented well enough in discussions concerning large-scale educational changes. Its scarcity is particularly alarming in changes that aim to improve pedagogy. It seems to me that expertise in the research about learning and instruction is crucial for a better understanding of the pertinent change processes. In addition, I was surprised to discover that the relevant literature explicitly notes that research in this area is still in its infancy and cannot yet provide good enough answers to many of the acute questions regarding the challenges involved in implementing instructional change. These realizations tempted me to venture into this area of research.

The discussion here revolves around two areas in education that are rarely brought together – teaching HOT and producing educational change on a large scale in the core of learning and instruction. The two areas inform each other throughout the book, responding to two main questions: (a) What can educators in the field of teaching HOT learn about how to scale up their small successful projects? And, (b)

What can we learn from the specific case of teaching HOT about the more general topic of change processes in the core of learning and instruction? The book summarizes insights I have gained from many years of engaging with these topics as a practitioner who led a large, national reform change, and as an academic researching and teaching these topics.

Rather than being unique to the Israeli school system, the challenges raised throughout this book are universal. Education systems all over the world are undergoing great upheavals, and consider fundamental school reforms. The call for thinking-rich learning and instruction is central in numerous policy documents and curricula in many countries, often as part of addressing the needs of education in the twenty-first century (see Chap. 1 for more details). Yet, it is much easier to make declarations about the need for teaching students to think than to succeed in actually implementing such teaching in schools, especially on a large scale. More generally, the book addresses the universal challenges involved in scaling up change processes pushing schools away from rote learning. These challenges are universal, but the actual form they take in reality is highly contextual. Challenges in scaling up such innovations therefore must first be studied in specific circumstances (Maass et al., 2019), yielding insights as to how to overcome them; these insights can then be generalized. Thus although the book centers on how these challenges were dealt with in a specific school system, many of its insights are useful for educators in other school systems as well. Moreover, the overview of the succession of reforms related to teaching HOT in the Israeli school system (see Chap. 1) explains why it is a fertile location for studying the scaling up of education for thinking across a school system. The content of this book is therefore relevant to the educators in many countries who are currently struggling to improve the scaling-up of instructional innovations in general and of teaching HOT in particular.

This book focuses on issues that previous discussions of educational reform have not yet developed adequately, issues grounded in expertise regarding a specific area of learning and instruction. While I am no expert on the general topic of educational change or reform, I believe previous discussions have left out a critical piece of the puzzle. The book's chapters show how exploring one particular educational objective – the teaching of HOT – from many different perspectives can enrich our general understanding regarding the scaling up of instructional innovations.

Although the book presents many challenges reformers must face on their way toward success, the bottom line carries good news: it is within our power to improve learning and instruction and, consequently, the school system as a whole. To achieve this goal, we need to work in a systematic way on transforming teachers' practice so that they will introduce a deep change in core elements of learning and instruction. But what does this general statement actually look like in the complex reality of schools? The chapters which follow use the teaching of HOT to examine crucial dimensions of this statement, showing the reality of how the desired change process can in fact be applied across a whole school system.

Chapter 1 defines the main challenges involved in the unsuccessful reform efforts to achieve wide-scale implementation of pedagogical innovations in general, and

pedagogical change in the area of teaching HOT in particular. Following a brief introduction to teaching HOT, the chapter examines the challenges involved in scaling up efforts to promote thinking-rich instruction. I argue that in order to scale up instructional innovations that were successful as small-scale projects, we need to focus on the *depth* of the change process. According to this idea, discussions of change processes need to focus on the *quality of pedagogical aspects* rather than only, or mostly, on quantitative aspects of change. It means that rather than thinking mainly about the number of schools affected by a reform, we need to think about the extent of changes in the *quality* of teachers' practice and how they affect students' thinking and deep understanding. This is the essence of the new optimistic message carried by the book's various chapters: it is possible to end the repeating cycles of fruitless efforts to change learning and instruction, if leaders of educational change are prepared to seriously consider research findings from studies in learning and instruction (including teacher learning) and integrate them in a meticulous and strategic way into the design and implementation of new reforms.

Chapter 2 addresses tensions between goals related to knowledge construction and goals related to the construction of skills and capabilities. Such tensions often characterize many of the efforts to implement "twenty first century curricula". The chapter raises the concern that an unintended consequence of unsuccessful reforms efforts in this area is that they may undermine the intellectual goals of education: construction of knowledge through deep thinking about that knowledge.

Visits to many Israeli classrooms involved in recent reforms show an emphasis on superficial activities rather than on teachers' supporting, developing, and eliciting student thinking, or on helping students assess the quality of the ideas on the table. This raises a concern that there are no criteria for assessing the quality of knowledge produced by students' learning. Too often, one gets the impression of a relativistic attitude implying that "anything goes." Borrowing a conceptual framework from the field of epistemic thinking (i.e., the field investigating peoples' thinking about the generation, justification, and evaluation of knowledge), the chapter draws a parallel between stages of epistemic thinking and pedagogy. Indeed, state-of-the-art thinking about current ways of teaching suggests a need to abandon "transmission of information" pedagogies, pointing to their failure to produce meaningful learning. Efforts to implement more advanced ways of teaching, however, have not yet succeeded in generating large-scale, deep learning of content involving assessment and evaluation of knowledge claims. To achieve this goal, it is not enough to engage individual thinking strategies in a somewhat "mechanical" way. Rather, both students and teachers need advanced epistemic thinking, including the ability to justify and evaluate knowledge claims. In addition, teachers need the pedagogical knowledge required for teaching toward the development of such advanced epistemic thinking.

The chapter thus highlights current challenges related to the status of knowledge and skills in today's schools. It shows how – in addition to philosophical and normative considerations – the effects of poor instruction may influence people's beliefs about what schools should be teaching. It demonstrates educators' contradicting views regarding the question of whether schools should still be teaching

knowledge in the twenty-first century, when students have direct access to all the information they may need. It also explains the interrelationships that exist between “how” to teach (i.e., instructional methods, or pedagogy) and “what” to teach (knowledge goals). Educators who believe that schools are capable effective implementation of progressive instructional methods yielding deep knowledge, may agree that knowledge is still important. However, educators who believe that schools are only capable of traditional methods that yield mainly rote learning and superficial knowledge, are likely to believe that knowledge is no longer an important educational goal.

Integrating the teaching of HOT into the mainstream activities of learning and instruction is therefore of utmost importance because, among other reasons (for elaboration see Chap. 1), it may support the construction of knowledge that will be worth teaching: knowledge that students will be able to understand, explain, justify, and use in new contexts. This assertion is fundamental to the discussion in the following chapters. In what follows, I discuss the wide-scale implementation processes that may allow the desired integration of HOT into diverse knowledge areas. Only success in such implementation processes can save current reforms from the grim fate of previous progressive reforms in education.

Chapter 3 opens with a discussion of the multiple meanings of the concept “pedagogy”. In the context of the present discussion, it is crucial to explain just what we mean by using this concept. Chapter 3 defines the concept “substantive pedagogy,” as the pedagogy that deals with fundamental patterns of learning and instruction. It involves issues such as: teaching for understanding, achieving change in the way students understand concepts and procedures, integrating higher-order thinking (HOT) into the teaching of content, and more. The chapter clarifies this concept, explaining its uniqueness relative to other concepts relating to pedagogy, such as administrative or structural pedagogy. Administrative pedagogy deals with budgets, teachers’ positions, etc. Structural pedagogy deals with issues pertaining to the structure of the classroom learning environment, such as using ICT or group work. The chapter explains that only change processes that address substantive pedagogy may bring about the much hoped-for improvement in the quality of learning and instruction. Discerning the nature of substantive pedagogy can help us focus on the deep level of instruction and thus improve it.

The ensuing sections of the chapter discuss instructional leadership. The argument is that this is the only type of leadership that enables educational leaders to engage extensively with substantive pedagogy, rather than merely with the structural conditions within which instruction takes place. The chapter ends by analyzing three concrete examples demonstrating how engagement with substantive pedagogy is crucial for the success of educational change.

Chapter 4 discusses teacher knowledge, which is the most crucial component in any educational change addressing substantive pedagogy. The chapter begins with an attempt to define the body of knowledge teachers need in order to engage with HOT in the classroom. The required teacher knowledge is rich and complex, consisting of the following components: *Knowledge of HOT*; *Knowledge of metacognition*; *Pedagogical knowledge in the context of teaching HOT*; *Epistemic knowledge*;

and *General knowledge concerning pedagogies of knowledge construction*. Then, the chapter asks to what extent we can expect teachers to master that knowledge when they participate in large-scale efforts to implement HOT. Supported by empirical findings from previous studies, the chapter argues that teachers' intuitive knowledge (i.e., their initial knowledge before they participate in formal PD) is lacking. In addition, the scope of typical PD programs in large-scale implementation processes is often limited and is insufficient for facilitating the development of the complex required knowledge. This conclusion is supported by data from interviews conducted with eight instructional leaders who had prominent roles in change processes designed to implement thinking-rich instruction at the national level. The import of this conclusion is *that large-scale efforts to implement HOT often take place while teachers' knowledge is too fragile to support the change*. The chapter ends with the implications of this conclusion for large-scale implementation of HOT.

The next four chapters (Chaps. 5, 6, 7, and 8) enhance the discussion by analyzing specific cases of implementation: inquiry-based learning, a reform in civic education, the "meaningful learning" reform, and changes in science education. Inquiry-based learning (IBL) is one of the most popular ways in today's schools for transforming learning so that it will be more interesting and challenging. Chapter 5 provides a critical examination of the specific case of inquiry learning, explaining its interrelationships with HOT and arguing that instruction of IBL has multiple pathways. The chapter also describes the disagreements about the value of inquiry learning reflected in the literature, highlighting its strengths and weaknesses. In addition, the chapter analyzes difficulties in scaling up efforts to engage in inquiry learning. More specifically, it highlights the concern that when inquiry learning is scaled up, students' inquiry processes often tend to be superficial and "mechanical." Learning may adopt external features of inquiry practices but fails to engage with its deep features. In particular, such learning fails to employ the thinking strategies that are the essence of inquiry practices.

The analysis presented in Chap. 5 suggests a direction for dealing with this problem. The main idea is not to look at inquiry learning as "an all or nothing" approach. In addition to engaging in full inquiry cycles that may offer students the emotionally gratifying experience that comes from independent discovery, it is also possible to work in a more modest, modular way, engaging with smaller components of the inquiry cycle. Implementing the full inquiry cycle is indeed a revolution in classroom teaching and learning. Implementing smaller portions of the inquiry cycle contributes to a slower implementation that has an "evolutionary" rather than a "revolutionary" pace. It is however, more likely to avoid the sin of being superficial. An informed choice regarding the precise scope of an activity for learning by inquiry that would be most suited for a large-scale change process is a complex decision influenced by multiple considerations. Some of these considerations are at the level of general organizational and administrative planning. Other considerations, however, are strictly at the level of substantive pedagogy and therefore require careful attention to what teaching inquiry requires teachers to know and to be able to do. This is the point where the discussion of large-scale implementation of inquiry demonstrates one of the main ideas of the book, namely that any *deep*

*scaling-up process* of instructional innovation requires an intelligent combination of general aspects of strategic planning and particular aspects pertaining to the specific instructional goal under consideration. Consequently, planning of large-scale implementation of any instructional innovation necessitates deep understanding of the substantive pedagogy that is unique to that particular instructional goal.

Chapters 6 and 7 present two examples of system-wide implementation of instructional change processes. Developing students' thinking was an important component in both change processes. Chapter 6 describes a large-scale change effort in civic education, highlighting the integration of HOT into the curriculum. The chapter begins with a historical analysis of the transformations of teaching HOT in civics between 1995 and 2006. Then it zooms in on a three-year period when there was a focused effort to implement HOT in civics on a national scale. Some of the measures taken consisted of developing instructional leadership through intense PD at all levels; of detailed design of assessment and learning materials; and of sophisticated interplay between central control and autonomy of educators at all levels. Addressing the case of one particular school subject as an example, the two parts of the chapter combine to provide a wide perspective demonstrating what it takes to implement HOT in all schools and what sort of factors are involved in this enterprise.

Chapter 7 examines the "Meaningful Learning" reform, the largest effort ever conducted in the Israeli school system to change substantive pedagogy. Facilitating more thinking and inquiry-rich instruction were among the major goals of this reform effort. Drawing on interviews with 46 teachers, the chapter portrays the variability of implementation experiences reported by teachers in different schools regarding the first years of this major reform. In some schools the reform facilitated a substantial improvement in the quality of learning and instruction, and also in teachers' pedagogical self-efficacy. According to teachers in other schools, the reform created chaos, a decrease in the quality of teaching and learning, and a decrease in teachers' pedagogical self-efficacy. Teachers in the latter schools vividly describe the frustrating processes they experienced, stressing the absence of opportunities to learn how to teach differently and of practical tools to do so, and thus to carry out the change they were required to enact. Their descriptions provide first-hand testimony that it is indeed impossible to generate a deep change in learning and instruction without meticulous work on substantive pedagogy. This chapter connects to Chap. 5 by bringing evidence from the field regarding the significance of teachers' knowledge for methodological large-scale change processes, and planning of PD. It also connects to Chap. 2 by raising concerns regarding the depth of students' knowledge following a reform that highlights progressive pedagogy.

Chapter 8 addresses the relationship between a policy advocating thinking-rich instruction and a policy advocating a quick change that consists of "raising students' test scores" in standardized tests. Top-down pressure to raise test scores turns standardized assessment into "high stakes testing." The chapter analyzes how leading science teachers view the influences of high-stakes testing on the implementation of the policy advocating thinking-rich instruction. The chapter draws on 20 individual interviews conducted with leading science teachers at the time they were preparing their students for the TIMSS international test. The findings show that the

teachers' expectations regarding a "new spirit" of teaching HOT and inquiry were not met. Teachers report that following the inclusion of more HOT items in national tests, test preparation indeed consisted of an increased engagement with HOT items. However, because of the high-stakes climate, engagement with these items consisted of training and practicing toward the exam. Under pressure, teachers focused on mechanical learning of techniques for answering HOT items correctly rather than on nurturing authentic students' thinking. Moreover, the high-stakes climate actually generated an increase in achievement gaps with regard to the development of students' thinking, despite an explicit policy statement calling for the opposite. From a perspective of the whole book, this chapter adds an important component. It shows the extent to which educational policies may affect education for thinking, documenting how this influence can actually take place in the reality of schools.

Chapter 9 ties everything together by discussing the implications of serious consideration of substantive pedagogy for policy and for implementation of deep changes. The chapter revisits the idea that it is indeed possible to achieve the desired deep change in the quality of education, summarizing what it takes to do so successfully. The desired improvement requires a change in substantive pedagogy, making it an explicit and salient part of strategic planning and of implementing educational change processes. We need to create a detailed *strategic plan of how to make changes at the level of substantive pedagogy* (rather than planning only the administrative and structural levels). For example, it is not enough to plan PD courses in terms of their budget, hours, and locations, but it is also necessary to plan the knowledge of HOT and the pertinent pedagogical knowledge the courses will address in their first year and in subsequent years; to design rubrics for assessing students' learning outcomes; to design learning materials for teachers' PD; and to generate an adequate PD course for teachers' educators. We also need to allow substantive pedagogy to prescribe the design of the administrative and structural levels rather than vice versa, while verifying that administration and structure support pedagogy in the best possible way. Finally, we need to coordinate all levels, and guarantee adequate and long-term resources. In sum, *the key to success lies in serious and systematic work on substantive pedagogy*.

Because educational reforms have hardly experimented with this idea in a systemic and research-based way, there is hope that these recommendations may break the vicious cycles of reforms that follow each other without making progress. This argument is relevant for change processes in educational systems of diverse sizes: for changing large systems such as the entire school system, and also for changing smaller systems such as a network of schools, a district, a single school, or even one cohort within a single school.

Referring to teachers' knowledge as a pivotal factor in the success of change processes, the chapter concludes with the need to adjust the scope and pace of change to teachers' level of knowledge. This idea suggests a new model for deep change processes that pertain to substantive pedagogy. Traditional models of change imply a simple causal relationship in which the initial goals of the change (usually stated in its policy documents) dictate its design, including any design pertaining

to PD. To avoid mechanical and shallow implementation, the proposed model of change processes posits that it is futile to ignore the considerations regarding teachers' initial knowledge and the realistic expected scope of PD. This model therefore suggests that in addition to the initial goals of the change, considerations regarding teachers' initial knowledge and expected scope of PD must also affect the reform's design. Rather than being ignored, the question of teachers' knowledge will be recognized as a bottleneck to the possible pace and scope of change, and will therefore have a decisive role in generating updated goals and in the design of any change process. The outcome of an implementation process working under the conditions defined by this model can indeed be *deep change*. Two additional important conclusions are a need to combine general knowledge about scaling up with content-dependent knowledge in order to achieve successful wide-scale implementation, and a need to conduct deep PD processes for middle-level pedagogical leaders.

The chapter also reminds us that the book provides specific insights and recommendations for educators involved in the implementation of teaching for thinking. Its chapters explain and demonstrate how knowledge pertaining to substantive pedagogy can in fact be used in large-scale implementation processes of teaching HOT. For example, understanding the nature of the knowledge teachers need to teach HOT in a sound way is essential for designing large-scale PD; and understanding the considerations pertaining to various forms of IBL is necessary for making sound decisions regarding the scope and nature of a desired IBL curriculum. This book is therefore relevant to a wide range of readers: those interested in educational change at diverse levels, as well as those interested in teaching students to think.

Finally, a note is warranted regarding the use of the term "Scaling up." By using this term, I do not mean top-down implementation of fixed and predetermined procedures and regulations. Instead, what I mean is wide-scale spreading and realization of powerful, research-based, pedagogical ideas, with a focus on the idea of instruction that combines students' active thinking within the learning of rich contents.

The rationale behind scaling up of instructional innovations acknowledges that deep changes cannot simply be dictated from above. Particularly, they cannot be disseminated and implemented in a deep, sustainable way without long-term, deep, and collaborative learning by all those involved in the change processes. Part of the collaborative learning involves ongoing discussions about the change itself, recognizing that all participants' points of view and field experiences should be respected, and that they make valuable contributions to its final design. Doing this in a serious way means that educational change needs to combine both bottom-up and top-down goals, initiatives, and creativity. Each of these directions is crucial for success. The bottom-up direction is essential for preserving the professional autonomy of educators at all levels, for recruiting their internal motivation for change, and for harnessing their creativity and wisdom to adapt the ideas involved in the change process to the unique circumstances in which they work and the diverse populations whom they serve. The top-down direction is crucial for introducing ideas of change that are beyond what educators currently know how to do on their own, with an emphasis on



ideas that are supported by educational theory and empirical research. The spreading and realization of such ideas constitutes the core of scaling up.

Some scholars currently reject the idea of scaling up, maintaining that “best practices” are not tips and tricks that can be readily assimilated by reading the right books, or hiring the right consultants, but rather, they require serious investment in developing advanced professional practices (e.g., Elmore, 2016). I agree wholeheartedly with the latter sentence, but I think that it does not mean that we can overlook the aspiration to bring “best practices” to scale. As I will explain in detail throughout the book, I see very clearly the multi-layered complexity of education systems of all sizes, recognizing what it takes for educators to learn about new pedagogies that challenge their preexisting knowledge. Yet, I do not share the disdain for the idea that in order to develop their professional capabilities, educators need introduction to, and modeling of, new ideas by experts. Unfortunately, I have witnessed all too many change processes (and/or “learning communities”) that wasted precious time and money to re-invent the wheel of educational innovations, often resulting in mediocre initiatives that ignore the wealth of research-based wisdom found in the numerous publications in the Learning Sciences. I therefore believe that it is crucial to invest concerted efforts toward wide dissemination of challenging ideas initiated by knowledgeable change agents. I believe that striving toward wide and wise dissemination of such ideas through long-term professional development, intertwined with supporting administrative and regulative infrastructures, is the only way to improve learning and instruction in educational organizations of diverse sizes (e.g., a single school, a school network, an educational district, or the entire education system in a state or country). It is in this sense that the concept of scaling up is used throughout the book.

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# Abbreviations

HOT	Higher order thinking
PD	Professional development
IBL	Inquiry-based learning



# Chapter 1

## On Thinking-Based Teaching and Large-Scale Implementation



**Abstract** This chapter discusses the persistent challenges underlying repeated unsuccessful reform efforts to achieve large-scale implementation of instructional innovations. More specifically, the chapter addresses the particular challenges involved in scaling-up changes in the area of teaching higher-order thinking (HOT). The chapter opens with a brief introduction to teaching HOT and to implementing it on a large scale. Then the chapter examines reforms centering on promoting thinking-rich instruction, highlighting the challenges involved in scaling them up. The main argument is that in order to scale up instructional innovations that were successful as small-scale projects, we need to focus on the *depth* of the change process rather than on its width. Rather than thinking mainly about the number of schools affected by a reform, we need to think about the extent of changes in the *quality* of teachers' practice and how they affect students' thinking and deep understanding. More generally, it is important to highlight the unique aspects of the *specific pedagogical innovation* that is at the focus of a reform. This chapter provides theoretical background for the following chapters, reviewing topics such as large-scale implementation of pedagogical reforms in Israel and other countries. The chapter highlights the complexity of deep pedagogical changes, the need to seriously consider findings from studies in learning and instruction, and the need to integrate them strategically into the design and implementation of new reforms. Pursuing such efforts may contribute to ending the repeated cycles of fruitless attempts to change learning and instruction.

**Keywords** Higher-order thinking (HOT) · Large-scale implementation · Scaling up · Educational reform · Deep educational change

### Objective and Target Audience

Dissatisfaction with the school system is a growing global concern. In the age of information and digital technologies, it becomes increasingly clear that instructional methods developed in the nineteenth and twentieth centuries do not meet the social needs that the twenty-first-century school is supposed to serve. Over the past

decades, hundreds of educational projects have been developed in order to cultivate a variety of innovative pedagogies. Despite ample financial and other types of resources invested in those projects, most classrooms worldwide are still characterized by traditional pedagogies focused on transmission and rote learning of information. This description is increasingly less applicable to the education of younger students (Pollak et al. 2015) but still applies significantly to subsequent educational stages: middle and high schools, colleges, and universities. Many educational systems can currently boast multiple “islands” of pedagogical innovation and excellence. Unfortunately, these islands do not connect to form a continent, but sit amidst a dreary ocean of mediocre pedagogies that are no longer suitable to our time. By focusing on the example of teaching students to think, this book examines how such educational innovations can be effectively promoted throughout the school system.

Developing students’ thinking is central to innovative pedagogies. The aspiration to teach students to think is not new. Socrates envisioned developing the thinking of his fellow Athenians. The early twentieth century saw the emergence of the progressive movement informed by John Dewey’s writings, which emphasized the development of children’s thinking and was implemented in many schools. The ambition of teaching students to think is supported by several reasons. Two have already been present in previous periods: developing the human mind and appreciating the central role of critical thinking in educating future citizens for life in a democratic society.<sup>1</sup> Additional reasons are inspired by more recent ideas:

1. Research findings show that thinking-rich learning supports the construction of deep knowledge and understanding.
2. The growing recognition that in the information age, school graduates must be equipped with the necessary skills for acquiring new knowledge on their own. Many of these skills (such as evaluating or integrating sources of information) are in effect HOT skills.
3. The changing structure of the global labor market, where jobs increasingly involve evolving roles that require problem-solving skills, critical and creative thinking, as well as metacognitive thinking and self-regulated learning (Zohar, 2013).

Policy papers recently published in multiple countries point to the teaching of students’ thinking as one of the key objectives of twenty-first-century education (e.g., Hadar and Zviran, 2018; OECD, 2018; Volansky, 2020). This is true also of Israel, where, in recent decades, several such policy papers have been published and numerous relevant reforms and a variety of projects have been attempted. Consequently, many schools currently engage in teaching HOT in its various forms. Yet, as discussed in detail in what follows, the need to implement pedagogies that highlight the development of students’ thinking and deep understanding on a wide scale, presents a complex challenge both in Israel and elsewhere. This complex challenge is at the core of the present book.

---

<sup>1</sup>Note that the term “critical thinking” is used here in the sense of the rationalism of Siegel and other scholars, such as McPeck and Ennis (Ennis, 1962; McPeck, 1981; Siegel, 1988), rather than in the sense of “critical education” as in Freire’s writings, for example, where the emphasis is on the influence of power on pedagogy.

Education for thinking is one of the many aspects of progressive pedagogies. Diane Ravitch (1983) explains that progressive education has never been adequately defined and that educators differ in the ways in which they view it. Nevertheless, its proponents usually emphasize at least one of the following: active learning (including experiential and project-based learning), collaborative learning, recognition of students' diversity, and recognition of the significance of making the curriculum relevant to individual students' needs and interests, and to the lives of their communities. This list is also relevant for teaching methods informed by constructivist learning theories. According to Ravitch, the literature describes progressive pedagogies as "democracy in action," since they have replaced the teacher's absolute authority with teacher-student collaboration. Summarizing the doctrine promoted by Dewey, she writes that he rejected the rigid practices characterizing the traditional education that had dominated public schools in the nineteenth and early twentieth centuries. These practices included teaching according to a uniform curriculum, excessive reliance on rote learning and on drill and practice, and students as passive learners. Combined, these practices tended to suppress students' curiosity and interest in their learning. Dewey, on the other hand, called for experiential learning and for carefully selected activities as starting points from which teachers would lead their students toward constructing high levels of cultural, social, and intellectual meanings.

According to Ravitch (1983), Dewey's ideas were complex and were therefore not always fully understood. His followers excelled in attacking traditional pedagogies more than they did in constructing new pedagogical alternatives. Indeed, the main problem at hand is that attempts to transform traditional learning and instruction on a large-scale often fail, and this is an understatement. Larry Cuban (1990) expressed this frustrating insight in his famous article "Reforming Again, Again, and Again."

In an attempt to improve our ability to promote system-wide pedagogical change processes, this book addresses the interface of two related areas: large-scale, system-wide implementation of innovations in learning and instruction, and thinking-rich instruction that fosters deep understanding. The basic assumption is that large-scale implementation of pedagogical innovations has many general aspects, but also many content-specific ones that vary with the particular nature of the innovation involved. I have chosen to focus on the specific case of educational change processes related to the development of student thinking because this is a valuable and important goal in itself. It also serves, however, as a good example for examining more general aspects related to large-scale changes in learning and instruction.

The book is therefore relevant to anyone involved in one way or another in attempts to transform education because they have had enough of the dreariness of so many schools. Even though much of the ensuing discussion will focus on large-scale implementation in the entire school system, the book is also relevant for those dealing with systemic change on smaller scales, such as leading a change process in a school network, district, single school, or even a specific subject or age group within a school. The book is therefore intended for all those who consider themselves

leaders of pedagogical changes and of innovation processes in education: leading teachers, subject coordinators in schools, school pedagogical coordinators, principals, teachers' educators, superintendents, policymakers, senior Ministry of Education officials, and officials in educational institutions and NGOs.

## Teaching Higher-Order Thinking (HOT)

Since the change process discussed in this book is focused on teaching HOT, I will briefly explain the concept (for a more detailed discussion, see Zohar, 2013). Schraw et al. (2011) explain that it is not easy to define HOT. Resnick (1987) writes that thinking skills necessarily "resist the precise forms of definition we have come to associate with the setting of specified objectives for schooling" (p. 2). She adds that even though we are unable to define HOT, it is relatively easy for us to identify certain key properties that can help us determine when it occurs. For example, HOT is not algorithmic (i.e., the activities that comprise it are not set in a predesigned order), it tends to be complex, it often involves multiple criteria and solutions, and it frequently involves uncertainty. In general terms, HOT is related to thinking levels such as application, analysis, evaluation, and creativity (Bloom, 1956; Krathwohl, 2002; Leighton, 2011).

Another way of identifying HOT points to a series of thinking strategies that are activated when it occurs. Some key thinking strategies are asking questions, argumentation, making comparisons, identifying components and relations, drawing conclusions, integrating information, hypothesizing, planning, controlling variables, suggesting multiple perspectives, and determining cause-effect relationships (Israeli Ministry of Education, 2009). These thinking strategies can either stand on their own or be used as building blocks for more complex thinking processes, such as scientific thinking, inquiry, problem-solving, and decision-making (Schraw et al., 2011; Zohar, 2004a, 2013). Despite the significant differences among the various thinking strategies and processes listed above, they also share much in common, particularly when we think of them as complex learning objectives that are more complex than retrieving facts from memory or executing algorithmic rules for solving problems.

The working assumption informing this book is that schools should engage in developing students' HOT according to the infusion approach. This means that thinking is not an isolated learning objective, but is integrated with or infused into the curricula of various school subjects (Abrami et al., 2008; Ritchhart et al., 2011; Swartz et al., 2008; Swartz & Perkins, 2016; Zohar, 2004a). Researchers argue that when the teaching of thinking is integrated with learning contents, it affects students' thinking abilities as well as their knowledge, because it contributes to a deep understanding of concepts, theories, and processes (National Research Council, 2012a; Perkins, 1991; Perkins & Blythe, 1994; see more in Chap. 2).

Over the last several decades, hundreds of projects have been initiated worldwide in order to cultivate students' thinking skills during teaching and learning processes

that take place under authentic school conditions. By “authentic conditions,” I mean projects that occur in the course of natural classroom instruction, as opposed to ones conducted under “sterile” laboratory conditions. Many of these projects have been studied empirically, showing significant results, often with impressive effect sizes (e.g., Abrami et al., 2015; Adey and Shayer, 1990, 1994; Halpern, 1998; Iordanou et al., 2019; Osborne et al., 2004; Reisman, 2012; Zohar and Nemet, 2002; Zohar, 2004a).

In addition, HOT is more central than ever to current educational discourse and policy papers in many countries. A review of recent curricula in seven countries and territories (Australia, British Columbia, Finland, New Zealand, Scotland, Singapore, and the USA) indicates a strong emphasis on the development of thinking skills (Hadar & Zviran, 2018). Similarly, Volansky (2020) described three waves of educational reforms and noted that the third, which started with the third millennium, is characterized among other things by aiming for critical and creative thinking. Volansky demonstrated this direction in the curricula of Alberta, Australia, Finland, Hong Kong, Ontario, Singapore, and the USA. This tendency is also salient in position papers and policy documents recommending education policies at the multinational level, such as various EU documents (e.g., European Union, 2006; National Research Council, 2012a, b; Osborne and Dillon, 2008; Partnership for 21st Century Skills, 2011). Moreover, an OECD (2018) document that charts future directions for education systems throughout the developed world toward 2030 suggests that students will need a broad range of skills, including cognitive and metacognitive skills such as critical and creative thinking and self-regulated learning. This trend is also emphasized in the master documents of major international tests such as the PISA and TIMSS tests (Mullis et al., 2009; OECD, 2012, 2016). For example, 35% of the 2009 TIMSS test was devoted to applying and 30% to evaluating scientific thinking (Mullis et al., 2009). These data are important mainly because the specific contents of international tests have a considerable impact on the curricula of many countries (Zohar, 2013). The sources cited here attest that developing students’ thinking is indeed a central goal in the contemporary educational arena. Accordingly, it is important to understand the challenges involved in attaining this objective on a large-scale.

## Large-Scale Implementation of Thinking-Rich Instruction

As mentioned, there are currently multiple endeavors for developing students’ thinking and multiple policy papers calling to turn the development of HOT into one of the key educational objectives of twenty-first-century schools. Yet, most classes worldwide are still dominated by transmission-of-information pedagogies, focusing on low cognitive levels. For example, a survey of science and math classes in the USA found that only 14% of the classes consisted of an intellectually demanding learning climate, characterized by critical thinking and dealing with challenging ideas (Weiss et al., 2003). Similarly, Osborne (2013) quoted a comment by Martin et al. (2012) on the international TIMSS of 2011, according to which students in

most countries did better on items requiring scientific knowledge (such as recall, definition, and description) than on items requiring application of scientific knowledge and scientific thinking. Resnick (2010) also argues that large-scale implementation of a thinking-based curriculum in a way that would advance the thinking abilities of *all* students, including those with low academic achievements, is currently one of our most important educational challenges:

Today we are aiming for something new in the world: *An elite standard for everyone* [...]. That is what the term *21st-century skills* really means. [...] the aspiration to successfully teach knowledge-grounded reasoning competencies to everyone is still just that – an aspiration. [...] the transformation of the *institution* of schooling that will be needed to come close to making the aspirational goal a real achievement is huge. (p. 184; italics in original)

A troubling question that begs to be asked is whether pedagogical reforms seeking to foster HOT for *all* students across the entire school system have any chance to succeed. Such reforms touch upon the core of learning and instruction, which, as shown in detail throughout the book, is extremely difficult to change on a large-scale. The following sections of this chapter, will explore the reasons for this difficulty and the conditions for overcoming it.

## Can Educational Reforms in the Core of Learning and Instruction Be Successful?

As mentioned, the twentieth century and the beginning of the twenty-first have seen recurring waves of educational reforms attempting to improve schools worldwide. These have made many changes in various aspects of school systems, but despite this, learning and instruction have remained surprisingly constant and unchanged. Salomon addressed this phenomenon from the point of view of the school principal:

Had my grandfather, who was a school principal in Germany at the beginning of the 20th century, entered the office of a principal of...[our]... generation [in the early 2000s], he would have been completely disoriented. But had he entered the classroom, he would have immediately identified the pedagogy and the climate, the procedures and activities, as if he were in his own classroom, back in Berlin of the early 20th century. (Salomon, 2005, 9)

The statement that a principal of a school from a century ago would have felt at home in a present-day classroom expresses the pedagogical conservatism of educational systems worldwide. I believe that if we had access to surveillance cameras monitoring a thousand classrooms in Israel and in many other countries, particularly in junior high and high schools, we would find that, in most, the lesson proceeds quite traditionally in terms of its instructional methods: we would see a teacher-centered lesson with an emphasis on transmission of information, where students who sit passively in rows, are required to absorb and memorize numerous facts comprising the learning the material.

Please note that I do not argue that there is absolutely no room for traditional pedagogies in twenty-first-century schools. Dewey (1902, 1938) has already taught

us that the tendency to classify our pedagogical approaches as mutually exclusive is unproductive. He opens his book on *The Child and the Curriculum* by stating that it is easier for us to see how educational theories contradict and rule each other out than to come to terms with the complex reality whereby each theory can make a significant contribution. In practical terms, this serious problem prevents potential synergies between theories (Dewey, 1902). Dewey repeats this idea in the very first lines of *Experience and Education*:

Mankind likes to think in terms of extreme opposites. It is given to formulating its beliefs in terms of Either-Or, between which it recognizes no intermediate possibilities. [However,] when it comes to practical matters circumstances compel us to compromise. [...] At present, the opposition, so far as practical affairs of the school are concerned, tends to take the form of contrast between traditional and progressive education. (Dewey, 1938: 1)

In the following lines, Dewey explains that educational problems are not miraculously solved when traditional education is abandoned for the opposite extreme of progressive education that completely denies the traditional one. It is not exaggerated to state—continues Dewey—that an educational philosophy that declares itself to be founded on the concept of freedom might turn out to be as dogmatic as the very traditional education it rails against. He goes on to elaborate on how education based on complete denial of the advantages of either approach is flawed, whereas their synthesis enhances the advantages of each.

Like Dewey and subsequent scholars who have rejected the dichotomy he had criticized (see Harpaz, 2009, for a review), I too believe that the school system does not need to view traditional and thinking-based instruction as two mutually exclusive educational approaches. Although the book presents them as contradictory, this is only designed to highlight the theoretical differences between them, and does not reflect the desirable reality. The reality of the educational act, I believe, should be comprised of a continuum of approaches to learning and instruction. The two ends of the continuum are represented by traditional and thinking-rich teaching. Quality traditional teaching—such as a fascinating lecture that raises and answers important and interesting questions, reading a superb source of information, or even rote learning certain facts—can play a major role in learning. There is also much value in a clear summary of a subject as the background for an inquiry-based paper, or in rote learning the principles of a certain procedure to reduce cognitive overload while working on a challenging task. The problem is not that traditional teaching is used in schools, but rather that it is *overused*, too often as the sole or main method, even when it obviously cannot achieve the desired learning goals of meaningful learning. In other words, we need to strike the right balance rather than eradicate any form of traditional teaching.

Yet, along the continuum of teaching and learning approaches, many school systems are much too close to the traditional end of the continuum and much too far from the thinking-based learning end. The reforms discussed throughout this book are designed to “push” the system along that continuum, away from the end of traditional learning and closer to the end of thinking-based learning. Educators at all levels need to carefully choose where they would like to locate their teaching along

the continuum. Making this choice is an important part of pedagogical autonomy. One of the objectives of this book is to shed light on various considerations that can help make such choices in a reasoned and informed way.

Our discussion is based on the assumption that learning and instruction are the essential core of education. Elmore (2004) explains this in his discussion of educational reforms. He argues that the core of educational practice is shaped by teachers' perceptions of the nature of knowledge, of how knowledge should be addressed in class, and of student's role in learning. He acknowledges that education includes multiple valuable aspects apart from the core of educational practice, but states that if an educational change does not involve the components noted in the previous sentence, he is not interested in it. Subsequently Elmore argues that educational reforms that do not involve any interactions taking place between a teacher and her students in the presence of content, usually do not change anything substantial.

Despite numerous efforts to reform processes of school-based learning and instruction, educational researchers have found that classroom learning interactions between teachers and their students, in the presence of content, remain surprisingly constant over the years. Very few changes in the essence of teaching and learning processes actually succeed in entering through the closed classroom door. Reforms touch upon many things surrounding the classroom, but pedagogy, which is at the very core of schooling, tends to remain constant. This disappointment is not new. Fullan (2007a) describes several classical examples of studies from the 1970s (e.g., Goodlad and Klein, 1970; Sarason, 1971) expressing a similar sentiment.

Elmore (2004) reiterates that system-wide practices related to the definition of knowledge, to teacher-student interactions around knowledge-related issues, to the division of students into learning groups, to the allocation of time to various teaching goals, and to the evaluation of student work—all remain surprisingly stable across time. He therefore suggests that although it is possible to dramatically transform school organization and educational practices, such a reform has never been successful on a large scale. According to Elmore, “the closer an innovation gets to the core of schooling, the less likely it is that it will influence teaching and learning on a large-scale” (Elmore, 2004, p. 11). Although schools are constantly changing, he stresses, those changes are irrelevant to the issues that matter most, namely, to long-term transformation of the traditional patterns of teaching. Elmore's fundamental question is how is it possible that despite the constant change in schools, teaching practices hardly change and, when they do, it happens only on a very small scale? Elmore (2004, p. 212) states this point unequivocally by writing that “Educational policy in the United States has arguably not been much about education, at least the sort of education that occurs among teachers and students in classrooms.” He concludes by saying that educational policy and practice have been engaged in “parallel play” (ibid, p. 212).

As noted, researchers and practitioners know very well how to reform classroom learning and teaching processes in small-scale projects. However, they are often unable to scale-up such reforms, that is, expand them in a sustainable way to include entire systems. This ongoing failure has several reasons. First, the small-scale projects usually lack the political and financial support required for scaling them up.



Second, those leading the projects are often academics who are unrelated to the practitioners who actually work in classrooms and run schools. Finally, it is difficult to reliably convey the pedagogical messages of these projects to widening circles of educators. These three factors result in the “ripple effect” inherent to implementation. The ripple effect leads to a significant difference between the potential results of attempts to change teaching and learning in small-scale projects and those of attempts to do so on a large-scale. The difference between the two educational contexts—small-scale projects versus whole systems—has not yet been studied systematically and extensively. Therefore, we still lack an authoritative, evidence-based model of how to make progress in this area (Fullan, 2007a; Maass et al., 2019; Zohar, 2013).

In summary, it appears that bridging the gap between educational policies directed toward learning and instruction and the learning and instruction that actually occur in classrooms is an important and complex issue that has yet to be properly addressed (Elmore, 2004, 8–11). The failure of educational reforms to transform the instructional core of teaching and learning leads to recurring waves of reform, in many places around the world (Volansky, 2020; Zohar, 2013).

## Global Waves of Educational Reforms

Cuban’s (2010) explanation for the recurrent waves of educational reforms is that they keep coming because they fail to produce real change. Indeed, researchers of the American education system have reviewed several major waves of pedagogical reforms that have swept the country during the twentieth century, and reached fascinating insights (Zohar, 2013). Elmore (2004), for example, reviews the progressive movement that was most active in the USA in the first half of the twentieth century, under Dewey’s influence. The most interesting point regarding the progressive reform compared to many other reforms is that one of its stated goals was to transform pedagogy. Another interesting point is that it had a relatively strong foundation at both the intellectual and practical levels. Leading intellectuals, primarily Dewey, thought about how schools could be different than they were, and their ideas found their way into classrooms and schools. The progressive movement had a broad agenda, but one of its most important emphases was an explicit attempt to transform the core of the school from a teacher-centered, fact-oriented, and rote learning-based pedagogy to one based on an understanding of children’s thinking processes and their ability to acquire and use ideas in the context of real-world problems. Other emphases included active inquiry learning that involves questions raised by the children and group work. The progressive movement was responsible for multiple changes in the field, evident in both select schools that modeled progressive pedagogies and in the adoption of select aspects of these models by mainstream public schools. According to Elmore, this was the longest and most intensive reform in the history of the American education system.

The fate of the progressive movement has been well studied and documented (e.g., Cremin, 1961). According to Elmore (2004), who summarized the relevant literature, when the language that was formulated with the expansion of the movement began entering educational discourse (albeit not practice) on a wide scale, the movement's principles were diluted, and turned into a series of clichés. Opposition to the movement emerged in the 1920s and peaked in the 1940s. The public and press were skeptical about the reform and attacked it mainly for the supposed damage it caused to the learning of contents. Critics argued that schools were engaged with sparse contents, emphasizing children's psychological adjustment at the expense of their learning, and that the reform valued self-expression more than learning. As described in detail in the next chapter, despite the significant differences between the progressive movement and present-day pedagogical reforms, there is reason to worry that the latter will fail for similar reasons.

Additional studies on the extent of the pedagogical innovations implemented as part of the progressive movement confirm that they were not common in schools (Cuban, 2010). Even where a deliberate effort was made to adopt them, the results were usually a kind of hybrid between traditional and progressive teaching: the main tenets of traditional teaching remained in place, and teaching remained mainly teacher-centered and based on rote learning. According to Elmore (2004), the progressive movement struggled with the dilemma characterizing every pedagogical reform: we know well how to produce multiple examples of optimal educational practices but can point to only few examples (if any) of teachers who apply these practices on a large-scale, particularly in schools serving diverse student populations (rather than a small number of select schools). This is due, among other things, to the lack of deliberate attention to planning a systematic and comprehensive implementation of the reform's pedagogical aspects.

Another reform in the spirit of education for thinking took place in the USA in the 1950s, involving programs for inquiry-based teaching of mathematics and science (BSCS, 1965; Cohen & Barnes, 1993a, b; Elmore, 2004; for more on inquiry in education, see Chaps. 5 and 7). The main objective of these programs was not students' acquisition of facts, but rather the study of the main concepts, methods, and ways of thinking typical of scientific inquiry processes. The main efforts that took place as part of the reform were the development of curricula and learning materials. The program's designers, however, underestimated teachers' huge influence on the way their materials were used. Cohen and Barnes (1993a, b) argue that the reform failed because it did not devote enough attention to professional development (PD) that would enable the teachers to properly guide their students. In other words, the notion was that implementing high-quality learning materials could succeed even without teachers' guidance. However, the idea that quality learning materials can somehow bypass the need for good teachers failed miserably. Nevertheless, the pedagogical approach underlying this reform had substantial advantages, and the materials it produced found their way into many schools. Some of them are used even to this day.

Elmore (2004) also reviewed other efforts to implement inquiry-based learning and instruction. He suggested that a quantitative evaluation of the curricula

developed in such reforms indicated that their influence was extensive—hundreds of thousands of teachers were trained—but its effect was relatively short-lived and necessarily also shallow. Millions of students were exposed to at least one of the learning materials developed, but only few schools tried to comprehensively transform their learning and teaching programs according to the new ideas. In most cases, the results were similar to those of the progressive movement: a diluted, watered-down, and hybrid model of teaching practices, with the new curriculum harnessed to old, traditional habits. Elmore agreed that the reform enabled many educators to view innovations in teaching and learning practices in a new light, but its concrete effect on the major trends of the American education system was negligible.

## Reforms in Israel

Over the past 50 years, the Israeli education system also experienced recurring waves of pedagogical reforms, oriented toward turning learning and instruction into thinking-rich experiences (Nir et al., 2016; Zohar, 2013). During the 1970s, Tamir (2006) led a comprehensive reform in biology education. This move was based on the learning by inquiry reform in the USA (BSCS, 1965; Cohen & Barnes, 1993a, b; Elmore, 2004). It focused on instruction, assessment, development of learning materials, and teachers' PD. This reform succeeded in making a sustainable change in biology teaching in Israel. One of the reasons for its success was that it combined in-depth work on pedagogical aspects (including teacher PD), with administrative changes.

During the 1990s, Israel implemented “Tomorrow 98”—a comprehensive national reform in teaching mathematics, science, and technology. The reform emphasized progressive approaches to teaching and learning, including the integration of HOT in the teaching of school subjects. The implementation included mainly pedagogical changes but also structural ones considered essential for supporting the former, such as creating regional PD centers for teachers. Nevertheless, 10 years into the reform, it left very little traces in Israeli schools. An interview-based evaluation study found that the main reason for the dissipating effects of the reform was the duration of implementation: the original intent was to complete all activities and recommended revisions within 5 years, in order to reach substantial achievements in these areas by 1998—Israel's jubilee. However, all interviewees thought that 5 years were simply not enough to produce sustainable outcomes of such a comprehensive plan (Fortus et al., 2009). Yet, many of the reform's principles somehow survived in the system and found their way into subsequent change processes, in one way or another.

That decade also saw the Ben Peretz Committee Report (“Bagrut 2000,” 1994)—a radical attempt to reform the Israeli matriculation (*Bagrut*) exams. The report proposed progressive approaches to teaching, learning, and assessment, in order to attain more meaningful learning that emphasizes thinking. The committee's recommendations were never implemented, but, again, most found their way into

subsequent policy documents. One such policy document was the General Director's Circular No. 20, which defined the image of the appropriate education system graduate. However, although this Circular had been cited extensively in debates about the future of education, it remained on the shelf and was also never implemented (Israel Ministry of Education, Culture and Sports, 1996).

These ideas later influenced the Dovrat Report, which also emphasized – at least at the declarative level – the cultivation of a creative and independently - thinking school graduate. This objective was supposed to align with school autonomy on the pedagogical, budgetary, and administrative levels, and to include aspects related to transparency and accountability (Israel Ministry of Education, 2005). The report goes on to elaborate on the practical details of the principals' administrative responsibilities, but with regard to pedagogy, it settles for a rather general statement on the need to encourage teachers to develop new resources for teaching and learning. Namely, on the declarative level, the report offers detailed recommendations for improving pedagogy in general and thinking-based teaching in particular. However, a practical discussion of pedagogical aspects addressing the core components of teaching is almost completely absent (Adler, 2006; Harpaz, 2005; Salomon, 2005). Most of the Dovrat Report's recommendations were not implemented either.

From 2006 to 2009, the Ministry of Education's Division of Pedagogical Affairs formulated the policy entitled "Pedagogical Horizon: Educating for Thinking" (Gallagher et al., 2012; Israel Ministry of Education, 2009; Zohar, 2008, 2013, Ch. 6). The innovation of that policy lies in the fact that thinking-based teaching was defined, for the first time, as a key explicit and universal goal of the Israeli school system. Moreover, the formulation of the policy on the declarative level was followed by methodical planning of practical ways for its large-scale implementation across the school system. The implementation plan included both pedagogical and structural aspects related to three dimensions: developing suitable curricula and learning material, PD of educators on all levels, and appropriate changes in assessment methods (Zohar, 2013, Ch. 6).

A change of government in 2009 was accompanied by radical changes in the Ministry's educational policy in many areas, including an aggressive drive to raise students' scores in national and international comparative tests (Zohar, 2013). Despite the change of government, the Ministry of Education continued to support the implementation of the "Pedagogical Horizon" reform, although it had gradually become less central when new reforms eventually pushed it aside.

In 2013, a new government rose to power, bringing with it the comprehensive pedagogical reform called the "Meaningful Learning Reform" (Israel Ministry of Education, 2014; see Chap. 7). This reform integrated some outcomes and processes from its "Pedagogical Horizon" predecessor, including theoretical concepts, learning materials, changes in the national standardized tests, and the expansion of inquiry-based learning and assessment. Thus, here too, we can see how concepts and outcomes formulated as part of one reform do have some effects when this reform is implemented, but they can also produce ongoing influences in future reforms.

Due to these succession of reforms, quite a few changes occurred in the Israeli school system since 2006. Although no systematic study of these reforms has been

conducted, there is considerable evidence to the effect that during those years activities related to the teaching of HOT expanded and that this emphasis increasingly found its way into curricula, learning materials, assessment methods, and teacher professional development. Thus, the “islands” expanded, with more and more students benefitting from instruction of HOT. Nevertheless, the huge challenge of implementing pedagogies that promote thinking and understanding systematically throughout the school system has yet to be met.

To conclude, the overview of the large-scale reforms related to the development of student thinking indicates that the general statements made earlier regarding the challenges involved in scaling up the “thinking curriculum” across many schools are genuine and are relevant to school systems around the world. The overview of the succession of reforms related to teaching HOT in the Israeli school system explains why it is a fertile location for studying the scaling up of education for thinking across the school system.

## The Challenge of Scaling Up Reforms Promoting Deep Pedagogical Change

This section turns to a more theoretical perspective of how to scale up reforms promoting deep pedagogical change. McDonald et al. (2006) define the scaling up of educational change processes as a practice of translating interventions that have proven their success in a small-scale system into new systems, with the goal of achieving similar positive influence with broader and more diverse populations. According to Dede (2006), scaling up educational change processes involves the adoption of educational innovations whose success has been proven in one context and reapplying it effectively on a broader range of contexts.

From a *quantitative viewpoint*, a broad variety of contexts means implementing the educational innovation in an entire region, in dozens of schools, or even countrywide. Coburn (2003), however, suggests that definitions of scaling up focusing on the *quantitative* aspects of the reform, that is, on the challenge of affecting a large number of schools, mask the challenge involved in cultivating the *deep aspects* of change required to sustain the reform over the long run. Accordingly, she suggests that definitions of scale must attend to four elements: (1) *depth*, which is the nature of change in classroom teaching processes; (2) *long-term retention*; (3) the spread of *norms, principles, and beliefs*; and (4) change in the *ownership of the reform*. Coburn adds that the scaling up element in the implementation process is one of the major challenges of educational reforms—an issue that has yet to receive proper theoretical treatment in the professional educational literature. Others also highlight the need for further research, for conceptualization, and for maintaining an appropriate intellectual level in future discussions and studies (Lee & Krajcik, 2012; McDonald et al., 2006; Raudenbush, 2007). Among the issues involving large-scale implementation, this book will mainly address Coburn’s first and second element, that is, the *depth of change* in classroom teaching processes designed to

improve students' learning and the *sustainability* of this change. The book will therefore examine the meaning of profound change and suggest ways of scaling it up to a large number of schools and of retaining the change over the long term.

At this point, I need to elaborate on the meaning of “depth,” as it is used throughout the book to refer to seemingly different issues, which in fact share the same meaning. For example, in this chapter, the focus is on deep pedagogical change and deep implementation, whereas the next chapter focuses on deep learning and deep knowledge. As elaborated in the following chapter, deep learning is a process that enables learners to apply the learned material in a new situation (i.e., transfer). Thus, the outcome of deep learning is deep or transferable knowledge or, in other words, the knowledge of why, how, and when to apply it in answering new questions and solving new problems (National Research Council, 2012a). Deep pedagogical change touches the core of learning and instruction processes in a way that can lead to students' deep learning and therefore also to its outcome—which is deep knowledge. Deep implementation of pedagogical change is one that manages to generate a deep or fundamental change in learning and instruction on a large-scale.

Cohen and Barnes (1993a, b) focus on the *depth* of change in teaching practices and explain that one of the reasons for the slow and inconsistent progress in this area usually eludes those in charge of promoting innovative changes. Their explanation reflects Raudenbush's (2007) definition of teaching as teacher-student classroom interactions around learning material. Cohen and Barnes suggest that the slow and inconsistent progress in deep change processes aimed at moving away from the traditional teaching model, is related to the difficulties involved in providing the quality teaching many of the reformists seek. Therefore, in seeking ways to improve scaling up, we must delve into the details of teaching and learning processes and see how they both affect the implementation and are affected by it.

Note that despite the pessimistic viewpoint presented above with regard to the success of large-scale pedagogical reforms, some have nevertheless been successful in recent years. These attempts provide us with insights on how to successfully scale up educational change processes (e.g., Barber and Mourshed, 2007; Cohen and Ball, 1990; Cohen and Barnes, 1993a, b; Cohen et al., 2013; Elmore, 2004; Fullan, 2007a; Hargreaves and Fink, 2006; Krainer et al., 2019; Levin, 2008; Maaß et al., 2015; Maass et al., 2019; Mourshed et al., 2010; Niesz and Ryan, 2018; Payzant and Horan, 2007; Shaari et al., 2019; Simper et al., 2019; Volansky, 2020). The most salient aspect of the literature on these insights has to do with *teachers' knowledge*: it emphasizes the need to build up the teachers' relevant professional abilities and support them within the schools in their transition to new practices. Although professional development is almost always an essential element in implementing educational policies, it is not always equally important. Some educational changes mainly require teachers' consent and collaboration. However, an educational policy of the kind addressed in the present book, that is, one that seeks to develop understanding and thinking, poses unique difficulties for teachers. Traditional teachers find it very difficult to teach differently. To change their practice, they need deep knowledge in both the contents and the pedagogical aspects of teaching. Therefore, promoting the kind of innovative teaching that can facilitate instruction of HOT,

requires particularly profound and long-term PD. Chapter 4 explores these issues in more depth.

The centrality of this idea in the literature is evident in its recurrence in multiple studies (e.g., Cohen and Ball, 1990; Cohen et al., 2013; Elmore, 2004; Fullan, 2007a, b; Darling-Hammond, 2010; Mourshed et al., 2010). In many reform proposals, however, pedagogy seems to be “transparent,” and the reform’s leaders hardly address it. This idea will be demonstrated in the Meaningful Learning Reform analyzed in Chap. 7. This is particularly true regarding the pedagogical aspects related to teachers’ relevant knowledge. Cohen and Barnes (1993a, b) argue that policymakers usually fail in scaling up the deep knowledge teachers require in order to be able to support the reform adequately. This idea was demonstrated earlier as part of the criticism of the programs for inquiry-based teaching in the 1950s in the USA (see page 10). In fact, the reformers often lack a precise definition of the new and desirable target teaching methods and therefore cannot define what teachers would have to know and do in order to perform them. Under these circumstances, reformers also have no idea of how to bring the teachers to the point where they own the knowledge and pedagogical tools needed for a different kind of teaching. These points highlight the crucial role of PD in implementation processes. The complex and sophisticated knowledge teachers need for supporting deep pedagogical changes is illustrated in a series of projects (e.g., Ball, 1996; Zohar, 2004a, b). Due to the significance of this issue, Chap. 4 is devoted to discussing it at length.

Another important aspect has to do with assessment and particularly the way various types of assessment may promote or impede pedagogical changes (Osborne, 2013). I have elaborated on this matter in my book *It’s Not All about Test Scores* (Zohar, 2013; Ch. 10) which discusses assessment in the context of teaching HOT. Particularly, within school systems with high-stakes testing regimes, it examines how teaching students to think is affected by policies calling for raising test scores. In the present book, Chap. 8 discusses the implementation of HOT in an era of high-stakes testing.

To conclude, the aspiration to focus on the *depth* of pedagogical changes makes it necessary to go beyond the general literature on the implementation of change processes. As explained, *deep* pedagogical changes (later referred to as “reforms in substantive pedagogy”; see Chap. 3) touch upon deep learning processes and therefore also upon deep knowledge. Hence, the search for solutions to the challenges in scaling up pedagogical innovations requires us to delve into the literature on learning and instruction in order to examine how insights from studies in this field may contribute to our understanding of how such innovations can be implemented.

The main contribution of this book relates to this point: it attempts to uncover some of the significant connections between concepts and ideas from the literature on learning and instruction and the ongoing discussion regarding deep, large-scale, sustainable change processes. At this critical junction, the insights derived from the analyses in this book offer an optimistic message, which can free us from the vicious cycle of the recurring failures described above. In the following chapters, I demonstrate the complexity involved in deep pedagogical changes but also claim that it is possible to succeed as long as we do something that has rarely been done in the

scaling up processes of previous reforms. I argue that while planning the reform, there is a need to devote far greater attention to the extensive research on learning and instruction. In particular, it is crucial to highlight findings related to the unique aspects of the *specific pedagogical innovation that is* at the focus of the reform. The following chapters elaborate on this idea regarding the pedagogies involved in teaching students to think, examining how they interact with large-scale change processes.

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## Chapter 2

# What and How to Teach in Twenty-First-Century Schools: Common Confusions Regarding Knowledge, Thinking, Pedagogy, and the Curriculum



**Abstract** The chapter highlights current challenges related to tensions between knowledge and skills in today's schools. An important question is whether in the twenty-first century, knowledge construction should still be a major goal of education. The chapter argues that an unintended consequence of the tension that often exists between teaching knowledge and teaching skills is that it may push aside the intellectual goal of education: knowledge construction through deep thinking about that knowledge. Instead, visits to classrooms show an emphasis on superficial activities, indicating a lack of criteria for assessing the quality of knowledge produced by students' learning. The impression is that of a relativistic attitude, implying that "anything goes." Parallel lines are drawn between stages of epistemic thinking and pedagogy, arguing that both students and teachers need advanced epistemic thinking, including the ability to justify and evaluate knowledge claims. The chapter demonstrates educators' contradicting views regarding the question of whether today's schools should still be teaching knowledge, when students have direct access to all the information they may need. Arguing that the status of knowledge in schools has been declining in several countries, the chapter points to the interrelationships existing between "how" to teach (i.e., instructional methods, or pedagogy) and "what" to teach (knowledge goals). The feeling that knowledge is no longer an important educational goal is often supported by traditional methods that bring about rote learning and superficial knowledge. Finally, the chapter presents a new model for a curriculum that will balance knowledge and thinking goals.

**Keywords** Higher order thinking (HOT) · Epistemic thinking · 21st century curriculum · Knowledge and skills

## The Story of Three Authentic Snapshots from the Field

**Snapshot #1 Lesson Observation** I recently visited an elementary school to observe a lesson, which, according to the teacher, was an example of small-scale, project-based learning. The teacher prepared an outstanding lesson plan: she took a chapter from the textbook, adapted it, added more sources of information, presented a relevant key question, and prepared cards with a separate task for each group of students. In order to answer the question, students worked in small groups, consulting their cards. Each student group was supposed to present their ideas graphically on a poster in preparation for presenting their work to the entire class in the following lesson. The students researched the problem using the information cards for a few (5–8) minutes. Then they spent most of the lesson (more than 25 min) working on the graphic product.

**Snapshot #2 Evaluating an Educational Project** A group of educators involved in implementing project-based learning in a school district presented an evaluation study of their work. The study showed that lessons using project-based learning are indeed common in the schools and that both parents and students are pleased with the new learning approach. The study also indicated improvement in attitudes towards the schools and in motivation for learning. The evaluation study completely ignored questions regarding what students had actually learned. Accordingly, the evaluation did not address students' knowledge, their understanding of the contents, or their thinking skills.

**Snapshot #3 on Anxiety and a Footnote** I was recently asked to read and provide feedback concerning a draft document on educational policy in behalf of an official government agency. When I got to the section addressing the future roles of secondary schools, I was overcome with anxiety. All the supposedly “correct” slogans in terms of the messages currently dominating public educational discourse were there: education for values, developing an independent and self-regulated learner, reducing achievement gaps, developing learning and thinking skills, preparing students for the twenty-first century, educating for lifelong learning, IT skills, etc. At the end of the list, I found an asterisk referring to a footnote: “Please keep in mind that one of the roles of secondary schools is also to provide knowledge”.

These three snapshots reflect recent attempts to implement pedagogical reforms. I have selected them out of dozens of similar anecdotes I have encountered in the course of my diverse work in the school system. What they have in common is the marginalization of the intellectual aspects of school life, which should emphasize knowledge construction while engaging students in deep thinking about the contents under consideration. In the first anecdote, the teacher worked hard to adapt the textbook contents and create innovative task cards. During the lesson, however, students discussed the content for only a few minutes, in other words, the activity of preparing the physical aspects of the graphic product pushed aside, spending most of their time on the graphic product, while engaging in lengthy discussions about

the desirable font, colors, and decorations they would use. Conversely, the time and thought devoted to answering the question about the content of the lesson were minimal. Obviously, under these circumstances, students did not learn too much.

In the second snapshot, the project evaluation had nothing to do with knowledge or thinking, but only with the frequency of project-based learning lessons and with attitudes towards them. Given the variables selected for the study, the evaluation findings were highly positive. The project leaders were proud of their work. They felt that the implementation was extremely successful, despite the fact that no information was collected on the breadth and depth of the contents and skills students had acquired in the course of the program.

The third example is obviously the most extreme. I was shocked to discover that one of the most significant roles of school—constructing students' knowledge and thinking skills—was literally pushed to the margins. Moreover, it was shocking to discover that the ones who marginalized this learning were the leaders in charge of policy-making for a large number of schools. The document was revised after I had commented on this point. Nevertheless, this case demonstrates the confusion and lack of focus that are currently prevalent throughout the school system with regard to the status of knowledge and to the depth of school intellectual life.

Whoever walks around today's Israeli schools can see that recent reforms have indeed spurred a significant degree of active and relevant learning, including inquiry- and project-based learning. Despite that impression, however, it seems that these reforms also spurred lack of knowledge, superficiality, and the absence of intellectual depth. This view is supported by several studies in Israel and elsewhere. A study of Israeli elementary schools had pointed at a common tendency of engaging with shallow knowledge and avoiding in-depth discussion of issues related to the curricula (Pollak et al., 2015). A more recent study asked how frequently progressive teaching practices are applied in junior high school lessons and what are the most common teaching practices in those lessons. Using a newly developed observation tool and rubrics, the findings from 103 junior-high classroom observations indicate that only 23% of the lessons observed were completely traditional, whereas all other lessons included evidence of using various quantities of progressive practices. Nevertheless, despite this divergence from the traditional teaching approach, these lessons were still characterized by a low cognitive level. In other words, the structure and organization of learning processes, namely, the structural pedagogy, was modified. However, the pedagogical core of learning goals, namely, the substantive pedagogy, remained unchanged (Bogler et al., 2019).

A decline in the status of knowledge in relation to skills in the curriculum, together with confusion about how to balance content knowledge and skills, is apparent from various international recent documents and research papers. For example, Young (2013) describes university colleagues who visit student teachers in schools and report something akin to a “fear of knowledge” in the schools they visit—knowledge is either not mentioned or seen as intimidating. Priestley and Sinnema (2014) assert that since 2000 several new Anglophone national curricula signal a move away from the explicit specification of content towards a more

generic, skill-based approach. The empirical part of their study offers an analysis of New Zealand's Curriculum Framework and Scotland's Curriculum for Excellence. They conclude that, while these curricula continue to accord considerable importance to knowledge in their statements of policy intent, both curricula are characterized by a lack of coherence and mixed messages about the place of knowledge. Discussing recent reforms in Australia and Ireland, Gleeson et al. (2020) compare curricular changes in the two countries. They assert that the strong focus of both reforms on general capabilities (Australia) and key skills (Ireland) is indicative of a shift away from knowledge in the direction of skills. They note, for example, that the Irish junior cycle framework published in 2015 contains more than twice as many references to skills acquisition than to knowledge. This emphasis is explained by considerations such as the changing nature of knowledge, the ease with which students have access to information, and the pace of change in the workplace. Gleeson et al.'s comparison (2020) concludes by asserting that despite considerable differences (the tendency seems to be stronger in Ireland than in Australia), the overall picture emerging in both countries is one where the development of twenty-first-century skills permeates the rhetoric of both policy documents, often at the expense of knowledge and understanding. Addressing the quality of knowledge, Zohar and Hipkins (2018) draw on senior secondary school examples from two national contexts (New Zealand and Israel), demonstrating how the implementation of student-centered pedagogies often results in fragmented, shallow knowledge rather than the deep, connected knowledge envisaged by the actual policies.

A similar fear regarding the quality of the knowledge taught in schools doomed previous reforms that promoted progressive pedagogies. Indeed, a significant reason for abandoning past progressive reforms was their opponents' claim that they seemed to raise a generation of ignorant students (Zohar, 2013b). Since this issue is liable to thwart every effort to implement thinking and inquiry processes on a system-wide level, it is important to discuss it thoroughly. The present chapter addresses the role of knowledge and thinking in twenty-first-century schools. It discusses various aspects of the widespread confusion in today's schools regarding the status of teaching knowledge and regarding what we should expect from students in this context.

## **The Subjective Knowledge Confusion: Does “Anything Go?”**

Visits to classrooms that apply active learning, inquiry, and project-based learning often make the visitor feel that “anything goes.” In many classes (although certainly not all), there are no real quality standards or criteria for evaluation of students' answers, and therefore, any answer may be considered correct. Since this state of affairs may legitimize shallow learning, it is important to understand it.

Part of the traditional model of instruction, which centered on transmission of information, included the delivery of an organized body of “objective” facts and



procedures that students needed to absorb passively. The criteria for good learning were crystal clear: the better students were in retrieving the facts and procedures from their memory, and the closer they were to the source (teacher's lecture or textbook), the higher their test score. The transition to a new model of learning and instruction involves a transformation of teachers' role. According to the new model, teachers' main role is to initiate processes of meaningful learning among students and to guide them as they engage in active knowledge construction. Consequently, the old criteria for good learning are no longer valid. While this in itself is a welcome result, we need to ask, what new criteria have replaced the old ones? As reflected by the first two snapshots described earlier, it appears that there is great confusion in the field with regard to that question. I have witnessed that confusion in numerous school visits intended to observe inquiry- and project-based learning. It was enough for students to find some relevant information and to include it in their final paper or project in order to be appreciated by their teacher and peers. The evaluation they received was often higher when the final product was presented in a creative way, particularly if it combined technology and/or some kind of artistic expression (visual, or musical). All too often, however, these evaluations lacked any criteria for the intellectual robustness of the knowledge and thinking involved in the learning process. It appears that the rejection of the previous evaluation criteria is often accompanied by a lack of any criteria whatsoever. Namely, any student's manifestation of knowledge and thinking is considered equally good. Educators I talk to often explain this view in terms of the alleged characteristics of knowledge in the twenty-first century: when knowledge is changing and being updated so quickly, it is impossible to know what is true, because what is considered "true" keeps changing. Since this view is reminiscent of the multiplist stage in epistemic thinking, let us examine the various dimensions of this thinking in order to understand what they can teach us about the issue at hand.

## Epistemic Thinking

Personal epistemology is the study of individuals' thinking about knowledge and about how people know (Hofer & Pintrich, 1997; Kuhn, 2001; Hofer & Bendixen, 2012). Note that the term "knowledge" is used in that context in the psychological sense of representations stored in the knowing person's mind (Southerland et al., 2001), rather than in the traditional philosophical sense of right and true beliefs (Pollock & Cruz, 1999). Some personal epistemology scholars use the term "epistemic thinking" or "epistemic cognition" and ask questions such as how people acquire and justify knowledge and how they understand the nature of the knowledge acquired.

Research in this field has produced several models that describe different dimensions of epistemic thinking. In the following paragraphs, I will use concepts borrowed from one of these models to present an analogy between developmental stages in epistemic thinking and pedagogical development. Despite the criticism

directed at developmental models of epistemic thinking, I have chosen to use a developmental model here, because I believe it is the most appropriate for clarifying the analogy outlined below between epistemic thinking and pedagogy (Barzilai & Zohar, 2014; Brownlee et al., 2017; Barzilai & Chinn, 2018).

Kuhn (2001; Kuhn & Weinstock, 2002) identified three main stages of epistemic thinking. In the *absolutist stage*, people treat knowledge as a certain, objective entity originating outside the individual. Knowledge of this kind is made up of “objective” facts that are certain and that rely on an external source of authority (textbook, professional expert, God, etc.). According to developmental theories, this perception of knowledge is transformed in adolescence and replaced by a *multiplist* view, often also referred to as relativist. According to this view, since everyone is entitled to an opinion, all opinions are equally valid.

The third, *evaluationist*, stage is the most advanced. Here, knowledge consists of judgments that may be evaluated and compared using evidence-based claims. An individual who has reached that stage reintegrates the objective dimension of knowing with the recognition of uncertainty and the need for evaluation. At this stage, it is legitimate for two people to have different views on a certain matter. Both can be “true,” but one can be “more true” (or “truer”) if it is better supported by evidence and arguments. Knowledge in the evaluativist stage requires use of higher-order thinking (HOT), which includes (among other types of thinking) evaluation, comparison, and intensive argumentation, with a constant focus on supportive evidence.

## **Comparing the Stages of Epistemic Thinking to the Reality of School Instruction: Are We in an Era of Multiplist Pedagogies?**

Careful examination of these stages of epistemic thinking from a pedagogical point of view indicates a similarity to the reality in our schools. The traditional model of learning and instruction is based on the transmission of “real” and “objective” pieces of information from an external authoritative source (such as the teacher or textbook) to a passive student. This model is in many ways parallel to the first, absolutist stage: both teachers and students do not ask questions about the knowledge addressed during instruction and do not challenge or examine it critically.

The model focusing on teaching HOT, aiming at a deep understanding of the content is largely parallel to the evaluative stage. It refers to knowledge construction by applying active thinking, which includes critical thinking, assessment of arguments, searching for evidence, making comparisons, etc. Likewise, the evaluative stage is also characterized by clear criteria for the quality of knowledge, related to the reliability and robustness of the intellectual processes leading to knowledge construction. Thinking is seen as valuable because it produces well-justified arguments and high-quality knowledge.

The similarity described in the previous paragraph relates to a desirable theoretical model of thinking-rich instruction. It appears, however, that in terms of what actually happens in schools, this desirable model is usually not implemented. What I described earlier, based on my acquaintance with the reality of schools, corresponds more closely to the multiplist model. Accordingly, when students are engaged in active learning, in inquiry, or in project-based learning, the feeling that “anything goes” often reins. This feeling seems to be tightly related to the lack of clear criteria for assessing the quality of learning (for further support of this claim, see Tabak and Weinstock, 2011). It also seems that the knowledge itself is always tentative and subjective. Therefore, the pedagogy actually applied in schools often corresponds to the multiplist stage of epistemic thinking that is neither the most advanced nor the most desirable.

The analysis in the previous paragraphs compares stages of the development of personal epistemic thinking to stages in pedagogical change processes of educational systems. The analysis explains the actual pedagogical practices prevalent in the field using terms borrowed from the field of personal epistemology. The transition from a pedagogy based on transmission of information to one based on HOT and deep understanding is parallel to the transition from an absolutist to an evaluative epistemic approach. In practice, however, learning and instruction processes often become stuck in the intermediate, multiplist stage—hence the feeling that “anything goes.” The third stage, which corresponds to evaluative thinking, is missing from many of the system-wide implementation processes of progressive pedagogies. This deficiency is the main reason for the feeling that the implementation of progressive pedagogies leads to superficiality or even to ignorance.

This point is critical. First, this state of affairs flattens the goal of teaching for thinking, overlooking its profound objectives. Thinking-rich instruction should help students develop robust intellectual abilities around knowledge construction, rather than have them acquire “mechanical” thinking skills. Second, as explained above, the superficiality and ignorance that appear to be the outcome of inadequate processes of knowledge construction might lead to widespread opposition to the reform. Such opposition might therefore produce backlash, pushing the educational pendulum once again towards the pole of traditional learning and instruction. Third, the evaluative epistemic stage makes it clear that thinking-rich instruction cannot settle for a “mechanical” and decontextualized application of thinking skills. Instead, it must be inherently integrated into the content students learn as part of the processes of knowledge justification and evaluation. To do so, students must not only master thinking strategies, but also understand the relevant body of knowledge and how to apply advanced epistemic cognition.

To promote students’ epistemic cognition, educators should promote “epistemic education” that is based on two main principles: (1) developing the awareness that knowledge is complex, diverse, developing, constructed out of unique perspectives, and evidence-based and (2) developing the notion that alternative explanations or arguments are not equally correct or valid, that some ways of knowing are better

than others, and that knowledge can be subjected to criticism and evaluation (Brownlee et al., 2017; Barzilai & Chinn, 2018). These principles highlight the strong relationship between epistemic education and education for thinking, since reliance on evidence, as well as the criticism and evaluation of knowledge, requires the use of thinking strategies.

It is important to see things as they are. As shown in the following sections, the problem is not with the progressive pedagogies themselves, but with their faulty implementation. In the twenty-first century, education that is based mainly on a pedagogy of transmission of information is no longer an option, as it cannot prepare students for their future life in the world beyond school. From the point of view of the pedagogies used in schools, there is therefore no choice but to move the education system forward. The problem today is not that schools move away from traditional pedagogies, but that they are stuck midway: they have abandoned many of the pedagogical traditions in which a teacher would transmit preconstructed knowledge, but they have yet to reach the promised land of an evaluationist pedagogy. The latter would be characterized by deep learning, profound grounding in contents, and knowledge construction through the use of thinking and evaluation.

Note that the last sentence requires critical examination. Is deep learning of contents still needed? Perhaps in the current information age all schools need to do is to teach the skills that will enable students to access the Internet and study on their own any content they would choose? The following section discusses this issue in its full complexity.

## **Is Knowledge Still Important Even in Twenty-First-Century Schools?**

The information age offers both students and teachers unprecedented easy access to huge and constantly expanding amounts of information. What should be the goal of education when information is so accessible and is “at the tips of students’ fingers”? Should knowledge acquisition remain one of the school system’s main roles?

There are two main approaches with regard to this issue. According to Cookson (2009), some believe that using the likes of Google and Twitter, students can navigate themselves to education. The idea is that unsystematic data may facilitate knowledge construction through some process of random, continuous, and collaborative patching together of pieces of information. This claim relies on the assumption that we learn best by free data collection that does not involve any external guidance and judgment. Bauerlin (2008) is among the opponents of this view, arguing in *The Dumbest Generation* that being constantly online does not lead to growth but rather to the stifling of intellectual development.

In my view, instruction directed at knowledge construction must remain one of the main goals of schools, even in the information age, for three main reasons. First,

the unprecedented availability of information does not interfere with the school's historical role of teaching a core body of knowledge to be shared by all students. According to this approach, all students need to be introduced to the basic cultural assets society seeks to transfer across generations. This statement does not preclude the need for a constant critical and open-minded reexamination of the desirable components and scope of that shared corpus of knowledge, which may in turn lead to radical updates of the curriculum. In other words, the argument is not that curricula introducing students to disciplines such as literature, history, or culture have become redundant. Instead, the emphasis is on the need to constantly reexamine the goals of the curriculum and of specific school subjects, their organizing frameworks, and their scopes, leading to constant renewal and update. Potential changes in the structure of the curriculum are also needed in order to make room for new school subjects (such as financial education or sustainability), or for interdisciplinary learning. However, the need to revise or even to make radical changes in the corpus of knowledge students need to learn does not cancel their need to learn any corpus of knowledge as such.

Second, the lack of any basic knowledge stands in the way of acquiring new knowledge. One of the fundamental insights of constructivist learning theories is the importance of previous knowledge in acquiring new knowledge (Bransford et al., 2000). Previous acquaintance with a given area is necessary for asking intelligent questions in that area. A basic conceptual framework is necessary for the construction of high-quality knowledge from new pieces of information acquired by independent searching of digital databases. Having gigabytes of information at the tips of their fingertips does not mean that students have the cognitive structures needed to assimilate and understand the knowledge that can be created by an Internet search. Even if cyberspace offers different conditions for understanding than those offered by schools, the solution is not to abandon the latter, but to find proper ways of merging the two spaces (Varshavsky, 2016). Accordingly, even in the information age children need schools to help them construct new knowledge and conceptual frameworks. Indeed, an examination of the curricula of seven developed countries (Australia, British Columbia, Finland, New Zealand, Scotland, Singapore, and the United States) indicates that all have formulated goals related to deep knowledge construction in diverse content areas (Hadar & Zviran, 2018). Moreover, the objective of deep learning that may result in constructing “deep knowledge” is also at the center of a major US document that summarizes the goals of education in the twenty-first century—“Education for Life and Work” (National Research Council, 2012, see more below).

Third, in order to develop HOT, it is necessary to study content knowledge in depth. In fact, this means that there is a necessary internal relation between thinking and knowledge, such that one cannot exist without the other. This important point requires further elaboration.

## The Relationship Between Content Knowledge and Thinking

The knot tying together content knowledge and thinking has been extensively discussed in my first book (Zohar, 1996). McPeck (1981) argued, based on a philosophical analysis, that knowledge without thinking is impossible. Perkins and Salomon (1989) argued that thinking skills are neither general (that is, completely independent of content) nor content-dependent (that is, completely independent of general aspects of thought), but are a kind of synthesis between general skills and content-specific knowledge. From an educational perspective, my first book reviewed various ways of teaching HOT, assessing their strengths and weaknesses (Zohar, 1996). The review provided an extensive rationale for preferring the infusion approach to teaching students to think. This approach integrates instruction of HOT with ongoing instruction of ordinary school subjects: while the contents are taught in depth, students are required to demonstrate deep thinking with respect to the contents they are studying. At the same time, there is constant discussion of general principles of thinking.

Recently, the strong relation between content knowledge and thinking has been discussed in various official documents. One important example is the “Education for Life and Work: Developing Transferable Knowledge in the 21st Century” (National Research Council (NRC), 2012) noted earlier. The document reviews the extensive literature and policy papers on teaching and learning in the twenty-first century, presenting the state of the literature and updated practical recommendations in this area:

In contrast to a view of 21st century skills as general skills that can be applied to a range of different tasks in various academic, civic, workplace, or family contexts, the committee views 21st century skills as dimensions of expertise that are specific to—and intertwined with—knowledge within a particular domain of content and performance. To reflect our view that skills and knowledge are intertwined, we use the term “competencies” rather than “skills.” (NRC, 2012, 3)

According to the American authors, the twenty-first-century competencies are an inseparable combination of content and skills. These competencies are constructed using what the authors call “deeper learning” (*ibid.*, 5–6): a process that enables learners to apply what they have learned to a new situation (i.e., transfer). Accordingly, the product of deeper learning is transferable knowledge (that the authors also call “deep knowledge,”<sup>1</sup> see p. 80). This includes content knowledge in a specific discipline as well as the knowledge of how, when, and why to apply that knowledge in order to answer questions and solve new problems. The NRC document argues that these competencies are structured around key principles of the discipline and the relationships among them, rather than around discrete, superficial facts or around procedures. Other types of learning may enable people to retrieve

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<sup>1</sup>The term “deep knowledge” is used here to note transferable knowledge that is well-understood, consisting of multiple interrelationships among concepts, rather than the meanings offered to “deep knowledge” in theories of artificial intelligence.

facts, concepts, or procedures from memory, but only deeper learning enables them to transfer what has been learned to solving new problems. Notably, the OECD's PISA tests follow a similar approach, whereby what is important for an educated person in today's world is knowledge that can be transferred and applied in new contexts (OECD, 2005; Schleicher, 2010). This approach is also reflected in the more recent "Education 2030" policy document (OECD, 2018).

At this point, I need to elaborate a bit on the meaning of understanding (Harpaz, 2016) as well as on its relationship to the concept of transfer. Perkins and colleagues (Perkins, 1991, 1998; Perkins & Blythe, 1994) chose to explain understanding through the concept of performance: understanding means that the learner is capable of performing a variety of actions that require thinking about the subject she/he has learned. Examples include explaining the subject, finding related evidence and examples, generalizing, applying the related knowledge in new contexts, forming analogies with other topics, drawing conclusions, or representing the topic in new ways. The better a student is able to perform a variety of new tasks requiring new types of thinking about a topic, the more we will be willing to say that she/he has indeed understood it. Therefore, the way to assess understanding is by assessing a learner's ability to transfer knowledge to new contexts.

Deeper learning that leads to understanding therefore involves thinking and is the only type of learning that can lead to high-quality, transferable, and "deep" knowledge. It is important to note that the statement implying that thinking-rich instruction improves students' knowledge (in addition to improving the quality of their thinking) is supported by empirical studies. These show that although thinking-rich instruction "covers" less material, it makes a positive contribution to improving students' knowledge (e.g., Zohar et al., 1994; Lee et al., 1995; Zohar & Nemet, 2002; Zohar, 2004; Darling-Hammond, 2010; NRC, 2012; Reisman, 2012). Deep learning in a specific content area is also essential for developing thinking competencies, as demonstrated in cognitive studies that have aimed to create a model for good learning by examining the knowledge of experts. These studies showed that experts differ from nonexperts not necessarily in their general thinking skills but mainly in the breadth and depth of their knowledge (Chi et al., 1988; Bereiter & Scardamalia, 1993; Bransford et al., 2000). Thus, deep disciplinary thinking requires context and deep acquaintance with the knowledge within which the thinking takes place. The authors of these studies concluded that instruction of deep contents is necessary for developing deep instruction of thinking skills or competencies.

To conclude, these considerations support the view that although the definitions of knowledge and how it should be taught do need to change, instruction of content knowledge is still essential even in the schools of the twenty-first century. According to the new definitions, knowledge construction requires students' active thinking. Coherent planning of how to combine and balance thinking skills and contents to be taught in twenty-first-century schools represents a complex challenge in the attempt to implement HOT throughout the school system.

One of the disadvantages of thinking-rich instruction is that it requires more time than simply transmitting information. The transmission-of-information approach to instruction (for example, a teacher-centered lecture) is a very efficient way of

“covering” a large amount of material in a short time. Therefore, in a school that considers transmission of information to be its major role, this approach may seem more efficient in terms of the ability to “cover” the curriculum. Since the time allocated to instruction is a limited resource, thinking rich instruction requires discarding a considerable part of the curriculum.

Some countries have done so, adopting the slogan “teach less, learn more” (Hadar & Zviran, 2018). They include Singapore, with its national program for thinking-rich instruction (Asia Society, 2017). Similarly, the education system of British Columbia, Canada, has reduced a considerable amount of the contents in two major knowledge areas—mathematics and social sciences. In mathematics, the goal was to expand the time dedicated to experiential learning, to enable students to acquire basic skills and to apply them to a variety of situations relevant to daily life. In the social sciences, the objective was to enable students to delve deeper into the materials they learned and to develop thinking competencies and independent understanding about basic concepts in this area (British Columbia, n.d. a, b). Finally, the OECD Future of Education and Skills 2030 project also states the need to eliminate contents from overcrowded curricula in order to facilitate deeper, higher-quality learning (OECD, 2018).

Apparently, however, giving up contents is a painful and highly controversial process. In recent years, both as Director of Pedagogy in the Israeli Ministry of Education and as a teacher in various academic settings, I have lent my ear to voices of practitioners who highlighted the complexity of the dilemmas involved in planning curricula for today’s schools.

Time for teaching and learning in school is a limited and precious resource. In fact, funding teachers’ salaries for the hours they spend in classroom instruction is the largest single expense item of the education system. We do not have enough resources to teach everything we would have liked to teach. Although the literature I described earlier clearly indicates the objectives to be pursued in today’s schools, it is difficult to understand how this is to be done in practice. Usually, it is easier for education experts to propose new goals, but much more difficult to suggest goals that can be discarded. Is it conceivable, ask the skeptics, for students to graduate without having studied about quadratic equations or some particular, important historical event?

In countries, states, districts, or organizations that have a centralized curriculum, the narrowing of contents in the curriculum may be achieved by working in two different directions, which are of course not mutually exclusive: giving up required school subjects and reducing the extent of concepts and ideas studied within subjects. Dozens of discussions in which I have participated as Director of Pedagogy in the Israeli Ministry of Education with professionals of all levels have taught me that both directions are difficult, painful, and complex. A common phrase in the pertinent professional discourse is “it’s inconceivable that.” For example, “it’s inconceivable that high school students shall not study literature or geometry, or even a particular chapter within these subjects”. In effect, over the years in Israel, attempts to do away with some of the required school subjects have repeatedly encountered intense public and political opposition. When the possibility of removing this or that



subject as a mandatory subject was raised in the past, the public and political discussion became heated, pressures were applied, and eventually, in practice, nothing changed.

It would appear that an alternative to cancelling entire subjects may involve a reduction of the amount of contents within existing school subjects. Such a reduction may make more time for deeper learning by creating time slots for engaging in HOT and inquiry-based learning (IBL). This too, however, proves difficult. Time after time, I have witnessed intense debates among education professionals on contents that “must” be included in the curriculum, because they are “important and central and it is simply inconceivable that we would not teach them.” The debates reflect the belief that without the removed contents students would become seriously ignorant with regard to key concepts and issues. Current curricula are thus the product of painful compromises achieved following heated debates. Under such circumstances, as Director of Pedagogy in the Ministry, most of my suggestions for reducing the scope of curricula contents in order to make more room for deeper thinking and IBL ran into strong opposition. I particularly remember such oppositions in the case of accelerated physics, middle school mathematics, and history.

As suggested earlier, the swift changes the world is currently witnessing make it imperative to consider a dramatic transformation in the composition of school subjects. Indeed, this transformation was considered by a Committee for Curricular Planning for 21st Century Schools (Zohar & Busherian, 2020). Selected recommendations of the committee are described towards the end of this chapter.

Some of the reasons used to justify the unwillingness to remove certain contents are related to legitimate disagreements on profound issues regarding the nature of knowledge in general and disciplines in particular. Other parts of the debate have to do with disagreements over the quality of the knowledge produced through various pedagogies. I believe that the choice at this point is not between the acquisition of meaningful and transferable knowledge of an extended versus a narrow curriculum, but between nonmeaningful learning of an extended curriculum and a more meaningful learning of a narrower one. With regard to this issue, American scholars have criticized their mathematics curriculum as being “a mile wide and an inch deep” (NRC, 2012, 128). Accordingly, my argument is that there is little value in transmitting large amounts of information or fixed routines for solving problems if this only means going through the motions (“checking the box” in teachers’ manner of speaking) of covering the curriculum in a mechanical way. Under these circumstances, nothing important is left in students’ minds because most of what they learned is not deep, transferable knowledge. It was very difficult for me to convince my colleagues in the Ministry of Education that it is precisely the reduction in the scope of the content that would facilitate the acquisition of deeper knowledge, which is also better understood and retained over time. It is not easy to accept that eventually, such learning may result in both a larger quantity and in a higher quality of knowledge in students’ minds. My colleagues did not view the quality of knowledge created in the learning process as an important factor. Instead, the discussion tended to center mainly on considerations related to the *quantity* of knowledge.

These ideas clearly contradict some of the ideas in other parts of this chapter implying that many educators believe knowledge is no longer an important

educational goal for twenty-first-century schools. This contradiction reflects the extent of the confusion and disagreements that currently exist with regards to the desired place and role of knowledge in today's schools. In addition, educators are concerned about the quality of innovative learning and instruction methods. The development of such methods has been slow. Even if we believe in the long-term benefit of such methods, in the short term we lack the knowledge and tools for sustaining their high quality in large-scale implementation processes. Here is where the present discussion connects to the overall theme of this book and to the ideas raised at the beginning of this chapter. The severe difficulties involved in trying to reform traditional instruction in favor of more progressive methods and the empirical evidence coming from the field are worrying. They suggest that current reforms may flatten the knowledge acquired in school, making it more superficial compared to earlier times. These difficulties therefore raise the poignant issue of quality assurance: How can we guarantee, ask the sceptics, that thinking-rich instruction will indeed lead to the deepening rather than to flattening knowledge? How can we avoid a situation where the students would know little about little, rather than much about little? For example, some educators would have agreed to reduce the literature curriculum from 50 to 30 pieces, had they been persuaded that those 30 pieces would be studied in depth. They fear, however—a fear that is well grounded in the reality of the school system—that we will eliminate 20 pieces, but instruction of the remaining 30 pieces would still be superficial, since innovative instructional methods are not implemented in a satisfactory manner. It is not difficult to see that this view contradicts the view presented in the previous sections of this chapter, indicating that many educators believe that knowledge is no longer important in twenty-first-century schools. This contradiction will be revisited in the Summary and Conclusions section of this chapter.

According to my own view, schools will clearly be unable to progress towards twenty-first-century learning and instruction unless they give up on large chunks of the contents they are currently teaching. Doing so is important in order to make time for thinking-rich instruction, to engage in deep learning, and to be able to teach the new contents and skills that are becoming increasingly important in this era. As noted earlier, this view is currently supported by several countries and international policy documents. Yet, the move of giving up on contents that has been taught in schools for years has many opponents. It is therefore essential to ask who should be making the decisions on that controversial issue and how the various contradictory points of view may affect the decisions regarding the scope of the needed change, its pace, and the best strategies for its implementation.

## **The Pitfall in Striving for Relevant Instruction**

One of the reasons for the difficulty in discussing the goals of learning in the twenty-first century has to do with the conflation of learning goals and methods, or in other words between the “what” and the “how.” The teaching method, or pedagogy, is

supposed to be a means for achieving the goals of the curriculum, rather than an end in itself.

A common pitfall in addressing this point is related to the issue of relevance and to the belief, misguided in my view, that in order for learning to be relevant, its content must derive from the students and from the topics that interest them. One of the principles of the “meaningful learning” reform (Israeli Ministry of Education, 2014; see also Chap. 7) is for learning to be *relevant* for the students (see also Chap. 5). Children have a rich and dynamic inner world. All too often, however, school learning is alienated from the child’s inner world and fails to connect to it. Relevant learning occurs, conversely, when the learning process manages to connect to students’ inner world rather than remain alienated from it.

In order to connect to children’s world, however, learning does not have to focus on topics derived from their own areas of interest. Given the recent developments characterizing the information age, some of the topics in the curriculum have clearly become obsolete and require thorough changes. But this does not necessarily mean that in order for learning to be relevant, it is the child who has to set the agenda in terms of deciding what she is going to learn.

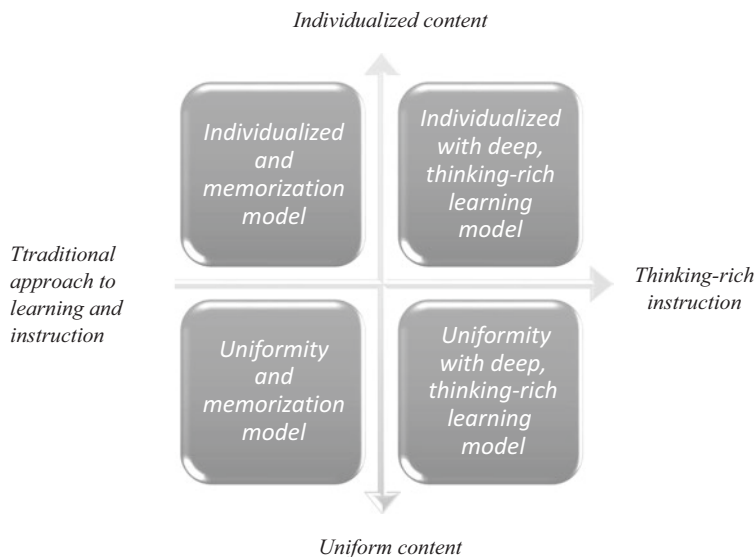
It is important for schools to allocate time slots for studying contents suggested by the students themselves. In these slots, students can investigate and develop areas and contents that stimulate their interest and curiosity. Such learning offers special value increasing students’ motivation for learning. However, other areas, which the child has probably not heard of before encountering them at school, can also elicit interest and curiosity, if they are taught well. If children study only what has interested them in the first place, how will the cultural assets of humanity be transmitted across generations? Good teaching means having students come to grips with an unfamiliar subject, one they could not even conceive of wanting to learn in the first place and make it relevant. This can be done by presenting the topic in an attractive, thought-provoking manner, by making the child ask questions and seek answers through active learning, by connecting the topic to the child’s initial conceptual framework and by showing how the new topic can connect to her inner world.

Relevant instruction needs to take the child and her inner world into account. As an ideal, child-centered considerations should influence the way students are taught, but this does not mean that the child and the subjects that interest her at the moment are the main factors that should dictate the curriculum; namely, *what* schools teach. Note that this insight is not new: Dewey (1938) already wrote about it in *Experience and Education*. In my view, the confusion between these two meanings of relevant teaching (i.e., the “what” and the “how” we teach) is one of the causes behind the increasing flattening of the curricula and the knowledge taught at school. The issue here is the view—which I think is misguided—that if our aim is meaningful learning, it is illegitimate to teach topics that are not initiated by students.

## Uniform or Individualized Content?

Another important discussion concerns the degree of uniformity versus individualized content of the curricula. How uniform should the contents studied at school be? Alternatively, to what extent should the local levels of individual schools, teachers, or even the children themselves be allowed to determine the contents of the curriculum? This is a fundamental question regarding the content children should learn in school, and it has a huge effect on the curricula and the very structure of schooling. It is important, however, to separate the discussion of this question from the issue of relevance. When thinking about what is worthy of teaching, it is important to consider relevance, but relevance is only one consideration in determining the goals of education. Another important consideration is the school's role in bequeathing cultural treasures across the generations.

Previous researchers (Van-Leer Group of Education, 2007; Yair, 2007) discussed the interaction between the degree of uniformity or individualized content of the curriculum and the instructional methods that are used and formulated a theoretical approach informed by four “pure” models of educational policy (see Fig. 2.1). The first is the *uniformity and memorization* model, which prioritizes both the traditional approach to learning and instruction and the concept of social uniformity. The curriculum informed by this model is nationwide, with a central examination system that focuses on contents determined by a central Ministry of Education. The instructional methods emphasize transmission of information and memorization. This model enables centralized regulation, encourages excellence in a narrow range of skills, and is relatively cost-effective. The most common criticisms voiced against



**Fig. 2.1** Four models of educational policy

it are that it narrows the autonomy of principals, teachers, and students, that it narrows the choice of instructional methods, and that it produces superficial, low-motivation learning.

The second model is the *individualized and memorization* model. This model prioritizes the uniqueness and autonomy of the learners, but its concept of learning still relies on predetermined contents and traditional methods of learning and instruction. The most common criticisms against it are that it undermines the creation of a common foundation of knowledge and social values and that, like the first model, it narrows the choice of instructional methods and produces superficial, low-motivation learning.

The third model is *uniformity with deep, thinking-rich learning*. This model also prioritizes social uniformity, but the curriculum dictated by the state is taught using thinking-rich instruction. This model highlights deep knowledge and HOTS, but uses standardized tests that allow nationwide comparisons of individual learners, schools, and municipalities.

Finally, the fourth model—*individualized with deep, thinking-rich learning*—conceptualizes individualism as the top priority, along with thinking-rich learning and instruction methods. Standardized curricula and tests have no place in this model: schools and teachers have the professional responsibility to adapt instruction to students' needs and to evaluate their unique capabilities. According to this model, students' achievements are evaluated using school-based, alternative modes of assessments.

The researchers (Van-Leer Group of Education, 2007) believed that the Israeli education system was located too close to the first model. Whereas the researchers left it to the policymakers to determine the more desirable model, they made it clear that they did not recommend shifting from one pole to the opposite one but to move along a continuum that exists between poles.

During my teaching in recent years, I have had the opportunity of talking with hundreds of university students about this issue. I have presented the four models, asking students for their opinion regarding the desirable application of these models. This request triggered hot debates in my university classroom. Yet, the opinions expressed by many of them—all members of Israel's educational and academic elite—were surprisingly conservative. The majority did believe that the education system needed a push towards more individualized curriculum, but only slightly, enough to introduce a bit more autonomy in choosing what should be taught in school. Only a few students believed that the system had to be pushed all the way to the individualistic pole by providing considerable autonomy to the school, the teachers, the students, and their parents in determining what students should learn. The university students spoke mainly about the need to allow teachers to address topics that interest them and offer inquiry projects on topics that interest their public school students. At the same time, my higher education students emphasized that uniform contents had to remain central even in the twenty-first-century curricula, for two main reasons. First, the basic and "classical" bodies of knowledge in every school subject are important for creating a common knowledge base of general education and that abandoning these bodies of knowledge might result in an

“ignorant generation.” The second reason concerns the need to provide students with a broad cultural knowledge base that will serve as a basis for constructing students’ national identity and values. Once again, these models and the ways higher education students reacted to them demonstrate: (a) the challenges involved in determining the right amount of fixed, common knowledge in future curricula, (b) the diversity of opinions around this issue in today’s educational arena, and (c) the interdependency between “what” should be taught in schools and which instructional methods would be used to teach it.

## Principles for a New Curriculum

Many of the ideas discussed in the previous section are expressed in a proposition for reforming the state curriculum, as offered by a committee of experts commissioned by the Israeli Ministry of Education (Zohar and Buserian, 2020;<sup>2</sup> Zohar and Colleagues, submitted). The report offered by the committee makes a case for the claim that knowledge is indeed still important in twenty-first-century schools, but also justifies the need to develop students’ HOT, to increase pedagogical autonomy throughout the school system, and to foster more progressive ways of instruction. The report acknowledges that the Israeli education system must confront a challenging local reality: On the one hand, despite considerable beginnings of implementation efforts, thinking skills have not yet been adequately integrated into the mainstream of learning and instruction; on the other hand, the status of knowledge may have been impaired. This state of affairs may lead to intellectually shallow learning. It weakens the ability of school graduates to cope with the accelerated pace of change and thus requires creative and extensive remedial measures. The question then arises of how to support processes of knowledge construction as well as the development of thinking skills within the schools. In response to these challenges, some of the committee’s recommendations are as follows:

1. Even in the twenty-first century, the study of knowledge should remain an important educational goal. Any new curriculum should therefore aim to highlight processes of knowledge construction.
2. Efforts should be made to organize knowledge around big questions, central ideas, and core principles within and across the disciplines.
3. A transition should be made from learning fragmented facts to knowledge that can be connected to other facts, conceptual frameworks and topics (in the same discipline or in other disciplines).

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<sup>2</sup>In the course of writing of this book, I was appointed Chair of the Committee on Adjusting Curricula and Learning Materials to the 21st Century, on behalf of the Initiative of Practical Research in Education, which is the educational branch of the Israeli Academy of Sciences. The committee examined the dramatic changes that need to take place in the knowledge and skills taught in school. The committee’s report and recommendations can be retrieved from <http://education.academy.ac.il/SystemFiles/23399.pdf>.

4. Curricula must devote a central place to developing diverse thinking skills and types of thinking such as argumentation, critical thinking, creative thinking, quantitative thinking, system thinking, metacognitive thinking, epistemic thinking, thinking dispositions, and self-regulated learning skills.
5. Knowledge and thinking skills should be integrated into the curricula in a cohesive and productive manner. Thinking skills must be learned as part of knowledge domains and not as general techniques in a content-free environment. Thinking skills must also be adapted to the epistemic structure of the various knowledge domains.
6. The development of students' thinking should be integrated in teacher professional development and learning. This requires developing instructional materials that will help preservice and in-service teachers foster students' thinking in their disciplinary areas.
7. The evaluation of students' thinking should be integrated in assessment frameworks at all ages, including in the high school matriculation exams in all study areas. This should be achieved not just through written tests, but rather through innovative assessment methods such as inquiry learning, project-based learning, portfolios, computerized simulations, digital analysis of students' open-ended writing, and more.

In light of these recommendations, the committee was persuaded that a closed, fixed curriculum could not be the answer. The search for a suitable solution led to suggest a model consisting of the following five flexible components:

1. **Crosscutting dimensions:** Cross-cutting dimensions are study areas that need to be addressed in each area taught in school, across the curriculum. Instruction of HOTS is an example of a crosscutting dimension. Accordingly, the study of HOTS should span all of the different components and subjects in the curriculum. It is suggested that HOTS should be promoted in all of the curriculum components and in all subjects of study according to each subject's specific characteristics. Among other things, part of developing the crosscutting dimensions should create conditions for coherent development of students' thinking in diverse age groups, populations, and diverse content domains. HOTS should also be taught as a crosscutting dimension because it is essential for facilitating students' ability to deal with changes in their out of school reality by providing them with necessary skills and knowledge.
2. **Foundational fields of study:** Foundational fields are compulsory study subjects (language, math, science, humanities, social studies, arts, etc.) for which curricula will be prepared by the Israeli Ministry of Education. It is recommended that curricular development will include the planning and reorganization of existing curricula in traditional school subjects, as well as adjusting the scope of learning, its subjects, and its character according to contemporary goals of teaching. It is also suggested to significantly narrow the scope of existing curricula so that more time could be devoted to in-depth study of knowledge and thinking skills. Doing so requires critically examining existing curricula, defining key concepts in each subject that will remain in the new curricula, organizing

knowledge around “big questions,” and promoting subjects that can integrate content and thinking skills in an authentic way. Curricula will also express ethical deliberations, social-emotional learning, and the epistemic structure of each discipline. The inclusion of foundational fields of study was also intended to contribute to bridging some rifts in the fragmented Israeli society by providing at least some common ground to all students.

3. **Interdisciplinary studies:** It is suggested that a number of school hours will be devoted to the creation of integrative knowledge based on a combination of different disciplines. This type of learning will take place through engaging with “big” cross-disciplinary issues, such as immigration, leadership, or freedom. The introduction of interdisciplinary studies is meant to respond to the changing structure of knowledge and thinking in the twenty-first-century that emphasizes the need to cross disciplinary boundaries in order to navigate the complexity of our changing world.
4. **New subjects of study:** To better deal with a changing world it is essential to introduce new fields that were not previously taught systematically in schools, such as sustainability, ethics, or financial education. The new subjects should be selected in a judicious and dynamic process based on changing local and global needs. This was viewed as a crucial ingredient for enabling the education system to deal with the rapid changes taking place around it.
5. **Encouraging initiatives and autonomy of schools and teachers:** A portion of school hours will be designated to encouraging initiatives and free choice of local authorities, school networks, school principals, teachers, parents, and students. As explained earlier, autonomy is seen as essential both for dealing with global change and adapting to local demands.

The school study hours are therefore viewed as a mosaic of these five components that changes over time. Accordingly, the proposed model is flexible, since the relative size of the components and the decisions regarding their internal composition are to be dynamic. Changes should follow the gradual improvement in the ability of schools and teaching staff to use progressive teaching and assessment methods, as well as changes in ecological, social, and technological conditions. To assist educators at all levels to reach judicious decisions over the years, the committee proposed detailed criteria that can support educators in making decisions regarding future changes in the components of the curriculum (see Table 2.1).

## Summary: Tying It All Together

This chapter highlights current challenges related to the status of knowledge in today’s schools. It shows how—in addition to philosophical and normative considerations—bad pedagogy may influence people’s beliefs about what schools should be teaching. It also demonstrates educators’ contradicting views regarding this issue and explains the interrelationships that exist between “how” to teach (i.e., instructional methods, or pedagogy) and “what” to teach (knowledge goals). If educators



**Table 2.1** List of criteria for supporting educators in making decisions regarding future changes in the components of the curriculum

<b>Goals</b>
(a) What are the general or specific goals that the field of study or subject is intended to fulfill/advance?
(b) What should be the guidelines for designing the curriculum of a specific field of study/subject to guarantee optimal fulfillment of the stated goals?
<b>The field’s essential characteristics</b>
<b>Does the choice of a new subject or field of study facilitate explicit expression of the field’s essential characteristics? Namely:</b>
(a) Does it emphasize central ideas and “big questions” as perceived and addressed by experts in the field of study?
(b) Does it emphasize basic and canonical conceptual frameworks?
(c) Will students have opportunities to experiment with characteristic ways of thinking and representative problem-solving methods?
(d) Will students gain familiarity with (or at least “a taste of”) the essential characteristics of the work of experts in the field?
(e) Will students gain knowledge and understanding of the field’s epistemic structure?
<b>The above aspects should be expressed in learning materials, teaching methods, and assessment means.</b>
<b>Coherence</b>
(a) Does the new subject contain a “coherent story”? Does it contain interconnected knowledge (within the subject/field, or with other fields)? Is this knowledge dynamic, advancing deep understanding? Is it rooted only in a specific context and/or can also be generalized and applied in other contexts?
(b) Does the field intersect with other subjects/fields, and does it afford a deep understanding of these fields, both in terms of conceptual frameworks and in terms of thinking skills? Does studying it enrich more than one field?
<b>Knowledge and skills</b>
(a) Do the subjects/fields/domains support the construction of close connections between knowledge and thinking skills? Fields in which the focus is solely on content (information, facts, procedures, superficial knowledge about concepts) or fields in which the focus is on general thinking skills unconnected with a specific field of knowledge should receive a lower priority.

assume good implementation of progressive instructional methods that can bring about deep knowledge, they may adopt a positive answer to the question of whether knowledge is still important. However, assuming traditional methods that often bring about rote learning and superficial knowledge may lead to a feeling that knowledge is no longer an important educational goal.

Integrating the teaching of HOT into the mainstream activities of learning and instruction is therefore of utmost importance because, among other reasons (see Chap. 1), it may support construction of knowledge that will be worth teaching: knowledge that students will be able to understand, explain, justify, and use in new contexts. The ideas in this chapter expresses a concern lest, just like in previous progressive reforms, current system-wide pedagogical changes may impair learning and push content knowledge aside. The chapter opened with an analysis showing

how the intellectual aspects of school life, which include knowledge construction and deep thinking about that knowledge, have been marginalized. In many classrooms that have undergone pedagogical reform, there is too often a sense of no criteria for the quality of knowledge. Consequently, there is a feeling that “anything goes.”

Using a conceptual framework borrowed from the field of personal epistemology, I argued that stages of pedagogical changes are parallel to those of epistemic thinking. I argued that the school system has grown beyond the stage of absolutist pedagogy but has not yet reached the stage of evaluative pedagogy. It seems that only too often, the system is “stuck” in the stage of multiplist pedagogy.

Teachers have abandoned much of the traditional “transmission of information” pedagogy, but have yet to reach a prevalent state of deeper learning that supports meaningful knowledge construction, thinking, and evaluation. To achieve that purpose, both teachers and students need an advanced epistemic conception of evaluative knowledge and the appropriate pedagogies for operating according to this conception. HOT is crucial for this endeavor.

Next, the chapter addressed the question of the appropriate role of knowledge and skills in twenty-first-century curricula and argued that although knowledge remains a key educational goal, the definition, scope, and nature of the required knowledge must change. The chapter also showed that the cultivation of thinking is central to the goals of future education. It is important both as an end to itself and because it is a condition for *deep* knowledge, as defined, for example, in the National Research Council’s (2012) “Education for Life and Work” document. Without thinking about the body of knowledge one learns—whatever it may be—it will be impossible to construct deep knowledge. This thinking, however, must be part of the evaluative epistemic conception mentioned earlier, rather than a collection of isolated thinking skills. Finally, the chapter addressed two further related issues: the difficulty of reducing the scope of contents in the curriculum and the myth of relevant learning. This chapter refined the view that the goal of thinking-rich instruction is not to focus on skills that are detached from content nor make the instruction of content areas redundant. The argument is that only the integration of content areas and thinking strategies, combined with pedagogies that promote advanced epistemic conceptions, can realize the present goals of learning. As difficult as it is to put those goals into words, implementing them in actual teaching practices is far more difficult. This difficulty lies in the extreme complexity involved in achieving goals that have to do with the quality of instruction (or, with substantive pedagogy, as will be explained in the next chapter).

These conclusions are fundamental to the discussion in the following chapters. In what follows, I will touch upon deep processes of learning and instruction and issues related to their quality assurance when implementing system-wide change processes. Only success in those implementation processes can save current reforms from the grim fate of previous progressive reforms in education.

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## Chapter 3

# Substantive Pedagogy and Its Role in *Deep* Large-Scale Change Processes



**Abstract** The goal of enacting an educational reform that succeeds in making *deep changes in the core of learning and instruction* requires a clear explanation of what is meant by a deep change, how it is different from other changes, and what type of leadership can support it. This chapter opens with a discussion of the multiple meanings of the concept “pedagogy,” followed by a definition of the concept “substantive pedagogy” that deals with fundamental patterns of learning and instruction. It addresses issues such as teaching for understanding, achieving change in the way students understand concepts and processes, and integrating higher-order thinking (HOT) into the teaching of content. The chapter explains that distinguishing the nature of substantive pedagogy from other types of pedagogy, such as administrative or structural ones, can help us focus on the deep levels of change processes and thus to improve them. The ensuing sections of the chapter discuss the characteristics of instructional leadership, arguing that this is the only type of leadership that enables educational leaders to engage extensively with substantive pedagogy, rather than only with the structures dictating the conditions within which instruction takes place. The challenges addressed in this chapter are relevant to leaders across all the administrative levels of the educational system from the level of individual schools to the level of the whole educational system. The chapter ends by describing and analyzing three concrete examples demonstrating how engagement with substantive pedagogy is crucial for the success of large-scale educational change.

**Keywords** Substantive pedagogy · Deep educational change · Instructional leadership · Higher-order thinking · Large-scale educational change

### Distinguishing Between Types of Pedagogy: Administrative Pedagogy, Structural Pedagogy, and Substantive Pedagogy

The root of the word pedagogy comes from ancient Greek. Its literal meaning is to “lead and escort a child.” In ancient Greece, it was customary for the pedagogue (who was usually a slave) to lead his master’s son to school, escort him, take care of

him, and carry his supplies (Sergiovanni, 1998). Today, pedagogy is used as a general term for various aspects of education, some of which are more closely related to the emotional and ethical aspects of education, while others are more closely related to the cognitive aspects of teaching. In the Israeli educational system, the term is used to refer to vastly different things. For example, one central unit in the Israeli Ministry of Education is the Division of Pedagogical Administration (that deals with teachers' salaries, school budget, etc.), and another central unit is the Division of Pedagogical Affairs (that deals with K–12 curriculum across the school subjects). Schools have “pedagogical coordinators” and “pedagogical meetings.” In order to distinguish between various uses of the term pedagogy, I shall refer to them as administrative pedagogy, structural pedagogy, and substantive pedagogy.

*Administrative pedagogy* deals with systemic managerial issues related to teaching and learning, such as organizing the schedule of vacation days, placement of teachers, budgeting ongoing instruction and special programs, or monitoring curriculum implementation.

*Structural pedagogy* refers to activities that organize classroom learning and instruction. These activities include the use of worksheets, students' independent work, group work, writing papers, and use of technology. Although activities at these two levels may facilitate deep changes in the cognitive processes that affect students' thinking and understanding, simply enacting them does not necessarily bring about the desired changes.

*Substantive pedagogy*, on the other hand, deals with fundamental patterns of learning and instruction. It addresses issues such as teaching for understanding; achieving change in the way students understand concepts and processes; integrating higher-order thinking (HOT) into the teaching of content; integrating discussions of social, moral, and ethical issues in the teaching of content; using metacognition; and adopting assessment processes that examine students' abilities to think critically and transfer ideas to new contexts. Serious work addressing such issues has a potential to improve students' deep understanding and thinking. Therefore, substantive pedagogy can facilitate a profound change in the quality of teaching and learning and in the profile of school graduates.

Although Elmore (2004) did not use the term substantive pedagogy, his writings on educational change processes (discussed in Chap. 2) reflect a similar idea. Elmore argues that the heart of educational practice consists of teachers' perceptions of the nature of knowledge, of students' role in learning, and of how teaching and learning processes are expressed in the classroom. He notes that education includes many additional valuable aspects. Yet, according to Elmore (as noted in Chap. 1), if an educational process does not involve classroom interactions between teacher and students in the presence of content, it will not touch upon anything substantive (Elmore, 2004). Elmore's ideas are close to the ideas involved in the concept of substantive pedagogy defined here. Similarly, Spillane (2000) does not use the specific terms defined in this chapter, yet expresses a similar idea using the terms “form” and “function” (see more details on page 59–60).

Is it necessarily a change in substantive pedagogy that will bring about the desired improvement in an individual school or in the overall quality of the educational system as a whole? I will try to answer this question in a number of ways. First, on an intuitive level, it is reasonable to argue that if most reforms focus on peripheral issues rather than on the substantive nature of instruction, then it is no wonder that the essence/substance does not change. If we aim to influence the quality of learning and instruction, we need to invest direct effort in this particular dimension of education rather than in dimensions that are only indirectly related to it.

Second, a series of diverse studies indicates that the greatest impact on student achievement is produced by educational interventions at the level of substantive pedagogy. The most comprehensive data on this subject are found in Hattie (2009), which consists of a synthesis of more than 800 meta-analytic studies related to student achievement. In one of the most interesting analyses in his book (Table 11.2, p. 244), Hattie calculates the average effect size of two types of educational interventions: interventions that can be classified under the definition of substantive pedagogy versus interventions that can be classified under the definitions of administrative or structural pedagogy. The first category includes interventions pertaining to aspects such as the quality of teaching, feedback to students, or the adoption of metacognitive teaching strategies. The second category includes interventions pertaining to aspects such as increasing the budget, reducing the number of students in each classroom, grouping students by ability, or expanding summer studies. Calculation of the average effect sizes of interventions in both categories indicates that the first category is significantly more effective than the second (average effect size of 0.68 vs. 0.08 respectively). In other words, these findings suggest that interventions directly related to substantive pedagogy have a far greater impact on student achievement than interventions related to other types of pedagogy. These figures are quite surprising in light of the widespread belief that increasing budgets or reducing the number of students in the classroom has a significant positive impact on the quality of learning.

What is required to succeed in bringing about a real change in substantive pedagogy? The answer seems simple. One necessary (although insufficient) condition for such a change is focused, well-planned, and intensive engagement with various components of substantive pedagogy. Although this statement sounds almost trivial, it is surprising to see how rarely this condition is met. This statement is true for change processes of all scales, namely, for efforts to bring about systemic change in a single school as well as for efforts to improve large educational systems.

The next sections of this chapter examine challenges related to substantive pedagogy at the individual school level by delving into the concept of instructional (or pedagogical) leadership. The final parts of the chapter examine the challenges involved in substantive pedagogy at the level of the whole school system.



## **Educational Challenges in Substantive Pedagogy at the Individual School Level: The Search for School-Based Instructional (Pedagogical) Leadership**

In many educational reform processes, substantive pedagogy is “transparent”: it is not seen as a factor, and it is not considered in planning or in implementing educational change processes. In order to bring about change in substantive pedagogy, it is essential to make it a visible component of discussions and planning of educational change processes. What is needed to fulfill this purpose is instructional (or pedagogical) leadership (see definition below).

To explain the roots of pedagogical leadership, Sergiovanni (1998) draws on philosophical discussions of human nature and on the two narratives on this subject. According to Sergiovanni, the constrained narrative, based on the theory of Hobbes (1950), relates to the selfish side of human nature and its roots in the interest in satisfying one’s own physical and emotional needs. According to this narrative, people are self-centered, competitive, cunning, and addicted to pleasure and strive to maximize their own profit without regard for the general welfare. This narrative includes the tendency to put self-interest first, to compete with the goal of winning, and to strive to accumulate and increase personal benefits such as wealth, power, pleasure, and status. Therefore, according to conceptions of leadership that are based on this narrative, principals, teachers, and students must be constrained in order to overcome their natural selfish and violent impulses. Without such constraints, they will not tend to do the right thing. Educational approaches based on this perspective on human nature emphasize accountability, close supervision by principals and teachers, and high-stakes testing. According to this approach, the only way to regulate interpersonal relationships in a school or an educational system is through a strict contract. Only a contract that clarifies the rights and obligations of each individual in the system, including detailed descriptions of the penalties to be enforced if the obligations are not fulfilled, will give people the motivation to work diligently and collaboratively.

In contrast, the “unconstrained narrative” relates to the altruistic aspects of human nature and its roots in moral perceptions of the good. It emphasizes people’s ability to act based on moral considerations and to collaborate with the aim of increasing the general good, even if it is sometimes necessary to sacrifice one’s own personal benefit. Instead of seeing humans as driven exclusively by self-interest, the unconstrained narrative considers the establishment of interpersonal relationships as a significant component of human motivation. Policy-makers and school leaders who believe in this narrative think that principals and teachers can be trusted to behave morally and can be given the freedom and autonomy to do the right thing. For example, when trying to promote issues in which they believe, principals and teachers are seen as having the desire and ability to sacrifice their own personal interests for the benefit of the public. As professionals, they will willingly take responsibility for their educational work and commit themselves, first and foremost, to their students’ educational needs. The same applies to students. According to this

approach, the correct strategy is to allow greater freedom and autonomy at all levels of the educational system and to avoid accountability, tight supervision, and high-stakes testing. This narrative supports the creation of a community based on a voluntary covenant among its members, rather than on a contract (see Zohar, 2013, Chapter 2).

A community whose members have a covenant among them is a key concept in Sergiovanni's theory of pedagogical leadership. Sergiovanni (1998) raises the central question that guides the current discussion and concerns educational policy-makers and school leaders around the world: Why are educational systems unable to improve in ways that make significant changes for prospective school graduates? Sergiovanni suggests that the reason lies in unsatisfactory educational leadership styles. According to him, commonly accepted educational leadership styles, such as bureaucratic leadership or entrepreneurial leadership, are based on the constrained narrative and therefore require social contracts. The only way to improve education, Sergiovanni asserts, is by changing the educational leadership style to that of pedagogical leadership based on a model of covenant. In schools based on this leadership style, human nature is understood through the unconstrained narrative, and interpersonal relationships are structured as a social covenant. Only under such conditions can a school develop intellectual capital and become a learning community. Pedagogical leaders understand that there is a direct connection between the experiences of teachers and those of their students. They know that inquiry and critical thinking cannot thrive in classrooms if the school culture does not approve of, and support, inquiry and questioning among teachers. It is difficult to cultivate commitment to a culture of problem-solving among students whose teachers rarely solve problems. When dialogue among teachers is limited, dialogue among students becomes difficult as well. The aspiration to transform classrooms into learning communities for students will remain a cliché until schools become learning communities for teachers.

This argument applies also to the relationship between principals and officials in the Ministry of Education or the District: if the relationship between principals and the system in which they work is based on the constrained narrative and on the model of contract, it will be difficult for the principals to create a school culture based on a model of covenant and a community of learning among teachers.

Having clearly delineated the two extremes, that is, leadership based on a model of covenant versus one based on contract, Sergiovanni concludes that the approach to be adopted in educational systems lies somewhere between these two extremes. However, it is clear from his critique that he believes that the prevalent situation in most educational systems today is too close to the pole of the contract model. According to him, developing a model of pedagogical leadership based on a covenant and greater autonomy for principals and teachers is a necessary condition for the improvement of the school system.

## Relevant Aspects of Pedagogical Leadership According to Additional Researchers

Cuban (1990) too illustrates his model of pedagogical leadership by using two contrasting images: the technician and the artist. He argues that people's image of their role greatly influences how they fulfill it. The image of a technician invokes obedience to instructions from higher authorities, establishing binding rules and procedures, and using technical expertise to efficiently and effectively communicate knowledge to students. Since the early days of public education, this image has guided teachers and principals, leading them to promote order, routine tasks, and pedagogies that require minimal investment.

However, during the same period, some leaders have held a radically different image of their role: that of an artist. Although this image also requires some technical professional expertise, it calls for far more: it requires diverse knowledge and skills that enable independent judgment, autonomy, creativity, and imagination. Principals acting according to the artist image emphasize the creation and maintenance of conditions that would improve the curriculum and the pedagogy. The image of the technician promotes bureaucratic management, while the image of the artist facilitates instructional (or pedagogical) leadership. Principals working according to the artist image lead and improve the school curriculum and the improvement of teachers' instructional processes.

Cuban summarizes research findings spanning seven decades, from the 1920s to the 1990s. The studies he reviewed cover various types of professional activities carried out by principals. He divides these activities into two main categories: directing and guiding. The "directing" category consists of activities related to maintenance of organizational stability, such as writing reports, developing timetables, solving problems not directly related to learning and instruction, dealing with discipline problems, meeting with parents, budgeting, and decision-making regarding human resources and maintenance of the school buildings. The "guiding" category consists of activities that focus on improving processes of learning and instruction: monitoring the quality of instruction through classroom observations and teacher evaluation, coordinating and evaluating the curriculum, analyzing test results, reviewing students' report cards, modeling instruction, and guiding workshops for teachers.

The studies Cuban reviewed include data collected from over 8300 school principals. When asked how they would have liked to spend their time, many principals said they would prefer to devote most of it to activities related to leading learning and instruction processes. However, when asked how they actually spend their time, the majority said that most of their time was devoted to administrative tasks and that leading learning and instruction processes in their school takes second place. Nevertheless, the findings also reveal a great deal of variation among principals, so that some did say they devoted much of their time to pedagogical leadership.

More recent studies suggest that principals who function as instructional leaders are more likely to influence students' achievements. For example, a comprehensive review of studies concludes that the influence of instructional leadership on

students' achievement is three to four times larger than that of transformational leadership (Robinson, 2010). Elmore (2004) finds that principals can improve learning and instruction by concentrating on instructional issues and harnessing many of the managerial resources at their disposal toward this goal. Researchers present a clear and practical picture of the main dimensions and activities that principals who function as pedagogical or instructional leaders address. These activities may be divided into two main categories:

*Leadership activities that improve learning and instruction* (Elmore, 2004; Hallinger & Heck, 1996; Marzano, 2009, Murphy et al., 2006; Robinson, 2010):

- Being familiar with multiple teaching approaches and practices, principals give priority to understanding prevalent classroom practices.
- Assessing the pedagogical state of their school at the whole school (macro) and classroom (micro) levels.
- Building a comprehensive pedagogical program to promote the school's vision, based on empirical evidence.
- Developing mechanisms to monitor learning, instruction, and classroom activities.
- Observing lessons and providing feedback to teachers.
- Conducting teachers' evaluation to improve learning and instruction.

*Leadership activities related to guidance and professional development (PD) of teachers* (Hallinger & Heck, 2003; Leithwood et al., 2004; Robinson, 2010; Southworth, 2002):

- Verifying that the learning goals of the PD are clear and directed toward improving teachers' instructional capabilities
- Focusing teachers' learning processes on practices of learning and instruction
- Focusing PD on analyzing examples of students' work
- Creating an atmosphere of trust and collegiality for teachers' PD
- Leading school-based PD processes and taking an active part in them by planning, facilitating, and guiding teachers' learning

The literature offers various definitions of the terms "instructional leadership" or "pedagogical leadership," which are sometimes used to delineate the same thing. For example, Hallinger et al. (2020) defined instructional leadership as 'school leadership intended to influence school and classroom teaching and learning processes with the goal of improving learning for all students'. Shaked et al. (2019) summarize five core dimensions of instructional leadership activities:

- (a) Building and sustaining a school vision that includes clear learning goals
- (b) Sharing the school leadership with experienced leading teachers to improve school effectiveness
- (c) Creating a community of learners that provides meaningful PD
- (d) Collecting data to guide instructional decision-making
- (e) Spending time in classrooms to monitor curriculum and instruction and to support their high quality

It is important to emphasize that the instructional leader in a school is not necessarily the principal. The key point is that this person actively engages in leadership and focuses on substantive pedagogy. This leader, who perceives instructional leadership as a top personal priority, may be another figure within the school to whom the principal delegates authority (Cuban, 1990). Thus, pedagogical leaders may be vice-principals, directors of pedagogy, coordinators or chairs for a subject area or grade level, or even teachers who hold no official leadership position in the school. Instructional leaders can also be people from outside the school such as mentors, teacher educators, superintendents, or other officials in a school network or local education councils. Neumerski (2013) notes that research in this field is still at its infancy and has not yet recognized that instructional leadership is a distinct phenomenon that we need to study across standard organizational positions. The fact that researchers have not yet looked at instructional leadership as a function performed by people holding diverse roles hinders our ability to fully understand it and to apply relevant research findings to improve practice. In order to improve theory and practice in this field, Neumerski calls for integrating the research on instructional leadership across different organizational levels.

## **Pedagogical Leadership in the Israeli Educational System**

In 2008, the Israeli Institute for the Development of School Principals (Avney Rosh), initiated a survey of principals in primary and secondary schools (Katz et al., 2008). The survey provided vital demographic data on principals, described their positions and preferences regarding several key issues, and outlined the major leadership patterns emerging from their work.

One survey item gave the principals a list of potential goals for their school and asked them to select the one that they considered the most important. The most frequently selected goal (although indicated as a priority by only 20% of the principals) was to improve students' achievements. Improving students' learning and thinking abilities was chosen by 13.8% of the principals. Only 3% selected teachers' PD as their primary goal. From this, we can conclude that goals focusing on substantive pedagogy are not the top priority of the principals who participated in the survey.

Another item asked the principals to rate different images of an ideal principal on a 6-point scale (with 6 as the highest rating). The highest-rated image (with an average rating of 4.18) was being a leader and decision-maker. The image of the principal as a pedagogical leader was ranked fourth (average score of 3.58). The image of being an organizational leader was ranked even lower, in fifth place (average rating of 2.61).

The findings also indicate diversity among principals according to school level. For example, high school principals indicated less engagement with developing students' learning and thinking skills than did their peers in primary schools (7% of high school principals versus 13.8%, respectively). This finding is supported by a

more recent study on gender differences in pedagogical leadership (Shaked et al., 2019). The study found that males constitute a majority of principals in Israeli secondary schools (61% of the sample), and females constitute the majority of principals in the primary schools (92%). The data show that female principals relied in the course of their work more heavily on teaching experience and pedagogical knowledge and were more involved with improving teaching and learning in their school, as compared with male principals. Male principals had, on average, less teaching experience and were more likely to delegate tasks related to improving learning and instruction to others (Shaked et al., 2019).

Since the 2008 Avney Rosha survey, there has been an increasing emphasis on pedagogical leadership, both in research and in the practice of developing school leadership in Israel. In 2009, Avney Rosha announced its first “call for proposals” for Israeli academic institutions to offer PD courses for school principals. Evaluation of the first two cohorts of these programs indicated a need for an increased emphasis on instructional leadership and on the knowledge it involves. As a result, in 2012, Avney Rosha announced a subsequent call for a second round of PD courses for principals, emphasizing instructional leadership. In particular, the call for proposals noted the need to provide up-to-date and practical knowledge in areas of learning and instruction in order to improve student achievements (Israel Institute for School Leadership, 2012). In fact, instructional leadership and school improvement were the main focus for the new programs. The text of the second call for proposals clarified that the next round of PD courses for principals would need to provide prospective principals with up-to-date and practical knowledge in the area of substantive pedagogy. Nevertheless, it is important to ask critically whether this second round of PD programs indeed provided principals with the relevant practical knowledge required to implement advanced pedagogies, such as teaching HOT. In addition, it should be noted that because of a severe shortage of school principals, many individuals who recently took positions as school principals did not take part in Avney Rosha’s PD program for prospective principals (Detel, 2018). These individuals thus clearly did not have the opportunity to enjoy the new curriculum of the principal development program, making it less likely that they will center on instructional leadership as an important part of their job.

## **A View from the Field: M.’s Search for Substantive Pedagogy**

When I met M., she was about to begin her term as the principal of a new elementary school just built in a new middle-class suburb. She had recently taken a study leave, following successful completion of her first position as the principal of an elementary school in a high-risk neighborhood, at which she had earned a prestigious educational award. M. requested an informal consultation with me to discuss the educational policy she would like to implement at her new school. A core aspect of her educational vision related to implementing innovative pedagogies, focused on inquiry learning and HOT. During our conversation, she described her work plan

in detail. The entire school would devote time to studying one common subject, which would change each semester. Working in multiage groups, students would explore this subject according to their individual interests. At the peak of the program, the normal class schedules would be suspended for one week, and the entire school would be involved in inquiry-based learning and in working on the final products of their projects that would later be presented to the parents.

M. was concerned that this process would result in gimmicks or, as she put it, “a lot of bells and whistles.” M. noted that she believes in the potential of such programs to promote inquiry, thinking, and learning but had already seen how all too often they become superficial and detached from what she called “real learning.” According to M., such activities tend to emphasize creative products, such as student performances or works of art (exhibits, videos, etc.) that receive praise, but she wondered to what extent they are related to deep cognitive processes that would significantly develop students’ knowledge and skills. It is easy to understand M.’s concern in light of the picture I portrayed at the beginning of Chap. 2. She did not want to find herself in a similar situation.

I asked her to explain the specific learning goals for students within the framework she described and what PD the teachers would receive to guide their students toward these goals. She replied honestly that she had not yet thought about these questions and did not know how to develop a detailed and structured work plan to address them. Additionally, she did not know what to do so that the desired inquiry-based approach to learning would affect the whole school. Particularly, she did not know how the desired approach could be integrated with routine learning of the “regular” school subjects, rather than remain limited to the one special week.

In light of the conceptual framework presented at the beginning of this chapter, M. was undoubtedly a pedagogical leader because her vision addressed the improvement of learning and instruction at her school. However, she lacked the practical knowledge necessary to lead this change. Although she aspired for a profound change in learning, the plan she developed for her first year at the new school operated at the level of structural pedagogy (e.g., devoting a whole week to inquiry-based learning, or having a public event in which students will present the products of their work). She explained the lack of planning at the level of substantive pedagogy, primarily by saying she did not feel she had the necessary knowledge and tools. She approached me for advice because she was justifiably worried that changes made at the level of structural pedagogy would not impact learning and instruction processes in a deep way and would therefore fail to bring about the desired pedagogical change.

The advice she received consisted of three stages:

- (1) To initiate a long-term, collaborative learning process for herself and a group of leading teachers, led by pedagogical experts. This would help identify the core elements necessary for deep and meaningful inquiry-based learning and to construct teachers’ knowledge of pertinent teaching strategies.
- (2) To call upon this group of leading teachers to collaboratively design a detailed pedagogical plan for learning and instruction in the school.

(3) To gradually extend the PD processes to growing numbers of teachers.

Thus, by developing the capabilities of the principal and a gradually expanding group of teachers, it would be possible to plan and implement a profound change in the substantive pedagogy of a school.

## **Challenges in Addressing Substantive Pedagogy at the School Level**

PD is a necessary condition for principals to be able to lead change in substantive pedagogy. However, PD alone is not sufficient to make such a change in a successful way. In order for principals to be able to focus on deep improvements in learning and instruction in their schools, they need a supportive environment. One relevant question is the extent to which the Ministry of Education provides such an environment.

In the summer of 2015, a comprehensive survey of school principals in Israel was commissioned by the Principals' Union in cooperation with the Association of Secondary School Teachers (Kashti, 2016). The survey population included about 300 out of a total of 700 principals of secondary schools in Israel. The findings reveal deep mistrust between high school principals and officials at all levels of the Israeli Ministry of Education. According to the principals, the senior officials are unfamiliar with the reality in the schools and preoccupied with rolling out reforms, while the direct supervisors and representatives of units in the Ministry are mainly concerned with shunning responsibility. According to a veteran principal from Israel's northern region, "The role of the principal is one of the most lonely and isolated within the educational system. The principal has to deal with the sometimes-conflicting demands of students, parents, teachers, the local authority, and the Ministry of Education. Unfortunately, I do not feel that the Ministry of Education is helping me with this complex task."

According to the survey, the vast majority of principals—between 80% and 90%—feel the Ministry is imposing on them ever-increasing responsibility. A similar percentage of principals feel that they spend too much time on mundane, mandatory bureaucratic tasks. The principals note that the Ministry has two main types of responses to problems. The first is delegating growing responsibility to the principals for a long list of issues, from students with learning disabilities to problems generated by the socioeconomic gaps in Israeli society. The second is a growing demand for writing reports, filling out forms, and other bureaucratic tasks. The principals feel that the Ministry officials distrust them and do not appreciate them. Moreover, 75% of the principals said that at Ministry-sponsored conferences, they are reluctant to express their true opinions and therefore the Ministry officials think everyone is happy. The principals' responses contradict recent statements by officials in the Israeli Ministry of Education, who proclaim their trust and faith in teachers and principals. According to one principal, the Ministry cannot claim to trust



principals and at the same time closely monitor everything they do. Having to constantly protect themselves against potential complains from the Ministry prevents principals from developing their leadership capabilities.

The principals' views regarding the pedagogical component of their work are similarly discouraging. As a principal from a school in Israel's central region explained, "The pedagogical component of the principal's work is steadily eroding. No one cares anymore about the school's vision, let alone about how it can be achieved and realized. All the emphasis is on mechanical management. There are principals who are interested in and committed to pedagogy, but they are few" (Kashti, 2016). In other words, this survey indicates that most principals of secondary schools in Israel feel that their relationship with the educational authorities is built on the contract model rather than the covenant model. It is hard to believe that in such a work environment, many high school principals would be able to focus on substantive pedagogy, even if they learn about it in PD processes.

It should be noted that the Ministry's most recent official policy is to increase principal's autonomy. It is therefore interesting to see whether and to what extent this policy will indeed result in changes in principals' attitudes.

In summary, principals' engagement with substantive pedagogy is crucial for their ability to lead change processes that deeply affect learning and instruction at their school. Only a minority of principals see this as their main role. Even these principals, however, often work at the level of structural pedagogy, because they often lack the knowledge needed to lead changes at the level of substantive pedagogy and lack the supportive work environment that must be provided by the Ministry of Education.

## **Challenges in Addressing Substantive Pedagogy at the Level of Large Educational Systems**

The challenges involved in implementing changes in substantive pedagogy with regards to the individual school, are intensified at the level of larger systems. To illustrate this, I draw on analyses of two cases. The first is based on a fascinating article exploring the knowledge of change leaders as part of a reform in mathematics instruction in the United States. The second is based on analysis of an information and communications technology (ICT) program implemented in Israel beginning in 2009.

## US Mathematics Instruction Reform Circumvents Substantive Pedagogy

In the first study, Spillane (2000) employs a cognitive lens to explore perceptions held by district leaders following a reform in learning and instruction initiated by the US National Council of Teachers of Mathematics. The goal of the reform was to move instruction away from a focus on procedural knowledge, computation, memorization and following algorithmic steps for solving problems. Instead, instruction would be geared toward constructing knowledge of mathematical principles by emphasizing ideas, concepts, and mathematical thinking. That is, the goal of the reform was to change substantive pedagogy.

Spillane's main goal was to investigate district leaders' understanding of the mathematics reform, that is, the ideas and perceptions they constructed following their involvement in the reform's implementation. According to Spillane, these leaders understood that the reform represented a change in policies and curricula for mathematics instruction, but their understanding was partial and tended to overlook the full significance of the reform.

In analyzing his findings, Spillane draws on concepts that parallel those of substantive pedagogy and structural pedagogy, as defined earlier in this chapter. He cites previous research that differentiates between form-focused and function-focused understandings in mathematics instruction (Gearhart et al., 1997; Saxe et al., 1999). Form-focused understandings refer to learning activities, educational materials, and various arrangements for individual and group student work. Function-focused understandings refer to activities such as collaborative learning, problem-solving, and visualization, which enable students to develop understandings of mathematical functions, principles, concepts, and patterns of thought. The concept of form-focused understandings parallels that of structural pedagogy, while the concept of function-focused understandings parallels substantive pedagogy. Therefore, from here on, I will use these latter terms to describe the findings of Spillane's research.

Through a series of in-depth interviews, Spillane shows that 62 of the 82 change leaders participating in the study perceived the reform they led as related to structural rather than substantive pedagogy. In their view, the reform focused on using demonstrations, changing the structure of group work in mathematics classes, and more frequent use of examples of mathematical problems relevant to daily life. But these strategies preserved old conceptions of mathematics instruction, such as transmitting procedural knowledge, rather than bringing about a new type of learning focused on deep understanding of mathematical principles. Many of these leaders drew on their own initial knowledge and concepts regarding the goals of mathematics instruction as an interpretative framework through which they understood the reform. Innovations in structural pedagogy (such as changes in group work, demonstrations, or increasing the role of everyday problems in the teaching of mathematics) were perceived as ends in themselves rather than as vehicles designed to create a fundamental change in substantive pedagogy (such as changes in class discourse

and engaging with new ideas designed to deepen the understandings of mathematical principles). This study demonstrates that although changes in structural pedagogy do have the potential to influence substantive pedagogy, this potential was not realized in the case of most of the leaders who participated in the study. Consequently, the reform missed the opportunity to implement deep changes in substantive pedagogy.

## **Lost Substantive Pedagogy in the Initial Stages of a National ICT Program**

Implementation of a new national information communications technologies (ICT) program was one of the goals for the Israeli educational system in the years 2009–2013. As explained previously, the use of ICT in schools can bring about a change in substantive pedagogy. For example, computerized animations and simulations may help improve understanding. Interactive software can increase students' motivation and support them in active construction of knowledge. Real-time tracking of each student's progress and providing immediate feedback can facilitate personalized instruction. Searching the Internet calls for establishing connections with the real world outside school, which can make learning more relevant.

Substantive changes, however, do not occur incidentally, as by-products of technological changes at the administrative and structural levels. To achieve substantive changes, we need to define them as central and explicit goals and to focus much of our implementation efforts and attention on making them happen. The use of ICT is neither a sufficient nor even a necessary condition for accomplishing a change in substantive pedagogy. Indeed, previous experience from similar ICT programs in Israel and other countries has shown that new technologies alone are insufficient to improve learning and instruction. To achieve such improvement, it is necessary that teachers will be able to fulfill the pedagogical potential embedded in the new technologies. There is little value in upgrading the technology unless there is a corresponding upgrading of the pedagogy (Salomon, 2000). The success of an ICT program should not be measured mainly by the number of teachers and students using it (a change in structural pedagogy), but more importantly by the quality of learning and instruction it produces (changes in substantive pedagogy). In a study examining these issues, I asked the following research question: In the early years of its implementation, did this national ICT program address aspects of substantive pedagogy?

In order to answer this question, I analyzed public documents published 2 years after the launch of the program and uploaded on the Internet. The analysis revealed that, in terms of its vision, the program went beyond administrative and structural goals, offering an educational vision that recognizes the challenges and needs of twenty-first-century school graduates (Israel Ministry of Education, 2012). The section entitled Vision and Perception noted that in preparing future school graduates

for life in the twenty-first century, it must be recognized that the skills they need differ from those needed in previous times. The document continued by saying that the school system must adapt itself to these demands, clarifying that in a rapidly changing world, which requires innovation, critical thinking, and analysis, students must be taught to be creative entrepreneurs, to draw on multiple sources of information, use ICT tools, information literacy, communication skills, critical thinking, and problem-solving skills. The document also states that students must be able to recognize and understand the connections between concepts and to identify various strategies for accomplishing tasks. Students must be aware of differing attitudes and opinions, capable of making predictions, be intuitive, be skeptical, and be able to think critically, know how to do research, make decisions, and have metacognitive thinking skills (Israel Ministry of Education, 2012).

Thus, the stated objectives of this national ICT program do address deep learning goals whose development is related to substantive pedagogy. But is substantive pedagogy also reflected in the practical applications of the program, as described in the detailed instructions for implementation and in the indices for assessing outputs? Analysis of the ICT program documents indicates that the implementation was planned carefully, especially in terms of indices measuring performance and outputs. However, while multiple sections refer to structural or administrative pedagogy, there is little reference to substantive pedagogy. The program implementation documents deal with strict technical specifications and detailed work plans. These cover the main activities that the schools must perform. There are explicit statements regarding the expected outputs at the level of administrative pedagogy, such as reporting on attendance, disciplinary events, the subjects of lessons, and homework.

There are also many statements that address the level of structural pedagogy. For example, in each of five core school subjects, there must be one weekly ICT lesson during the first semester and two weekly ICT lessons during the second semester of the first year of implementing the program. However, the long list of outputs does not include any relating to substantive pedagogy. The published documents include numerous forms for reporting on various details of the implementation, but most of these relate to administrative or structural pedagogy. An individual work plan for teachers includes one limited reference to substantive pedagogy, found in a small section on twenty-first-century skills such as critical thinking and problem-solving (pp. 22–23). However, this reference gets lost among the long list of bureaucratic items on which the teacher is required to report.

It therefore seems that the national ICT program did not devote adequate attention, at least in its early stages, to innovative instruction of HOT thinking and deep understanding in a digital learning environment. It should be noted, however, that some of the schools that implemented this ICT program did an impressive job and did improve various aspects of substantive pedagogy. These schools are “islands” of pedagogical excellence, led by determined principals who acted as pedagogical leaders. They confirm that it is indeed possible to change the substantive pedagogy of a school by implementing an ICT program in an appropriate way. Unfortunately, they are exceptions to the rule.

In summary, the goal related to substantive pedagogy is indeed detailed on the declarative level in the policy documents stating the program's master plan. Unfortunately, it is then lost among countless sections addressing administrative and structural pedagogy. Consequently, the national ICT program exhibits a gap between the stated goal addressing substantive pedagogy (developing understanding, thinking, creativity, entrepreneurship, etc.) and the implementation of this goal. There is no detailed and organized work plan concerning substantive changes in learning and instruction. Therefore, even if the program succeeded in implementing its administrative and structural goals, it was unlikely to succeed in making a deep change in the core of learning and instruction.

## Discussion and Conclusions

In this chapter, I defined the concepts of administrative, structural, and substantive pedagogy. Further, I outlined one of the main arguments of the book: in order to achieve optimal outcomes in connecting the isolated islands of pedagogical excellence into a continent, changes must be made in substantive pedagogy, rather than only in administrative and structural pedagogy. Instructional leadership is a necessary condition for such changes. It can enable educational change leaders to tackle the essence of instruction, rather than deal only with the external structures that surround it. Because this challenge is nested in various educational levels (Elmore, 2004), this statement is relevant to leaders across all the administrative levels of the educational system: from subject coordinators or chairs, department coordinators, pedagogical coordinators, school principals, and teacher educators up through change leaders at the level of the whole school system. The only way to enable pedagogical leaders to make the necessary changes that would facilitate teaching for deep learning is by fostering their personal professional development and deep commitment, and this in turn requires a culture of covenant rather than of contract.

It may seem obvious that in order to bring about a profound change in the quality of learning and instruction, educational processes must focus on substantive pedagogy. However, this basic insight is far from simple to apply. The studies described in this chapter discuss various attempts to implement system-wide changes which failed to address substantive pedagogy, thereby limiting the possibility of achieving the desired profound improvement in processes of learning and instruction.

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# Chapter 4

## Teachers' Knowledge: The Most Central Link in Substantive Pedagogy Change Processes



**Abstract** This chapter discusses the implications of teachers' knowledge and professional development (PD) for planning and enacting large-scale change processes in substantive pedagogy in general and in the area of higher-order thinking (HOT) in particular. The required teachers' knowledge is rich and complex, consisting of the following components: knowledge of HOT, knowledge of metacognition, pedagogical knowledge in the context of teaching HOT, epistemic knowledge, and general knowledge concerning pedagogies of knowledge construction. The chapter asks to what extent we can expect that teachers would master that knowledge when they participate in large-scale efforts to implement HOT. Supported by empirical findings from previous studies, the chapter argues that teachers' intuitive knowledge (i.e., their initial knowledge before they had participated in formal PD) is lacking. In addition, the scope of typical PD programs in large-scale implementation processes is often limited and is insufficient for facilitating the development of the complex required knowledge. This conclusion is supported by data from interviews conducted with eight instructional leaders who had prominent roles in change processes designed to implement teaching-rich instruction on the national level. The meaning of this conclusion is that *large-scale efforts to implement HOT often take place while teachers' knowledge is too fragile to support the change*. This notion is often the main cause for the superficiality of large-scale efforts to implement changes in substantive pedagogy. The chapter ends with the implications of that notion for large-scale implementation of HOT.

**Keywords** Teachers' knowledge · Teachers' professional development (PD) · Higher-order thinking (HOT) · Teachers' knowledge for instruction of HOT · Scaling up instructional reforms

### Teachers' Knowledge

The most challenging aspect in the success of implementing innovative pedagogies relates to teachers' knowledge. In order to shift to new instructional methods, it is essential to support the construction of teachers' professional capabilities and to



provide school-based support. Educational policies aiming to foster students' thinking and understanding present teachers with enormous challenges requiring careful preparations. This chapter examines wide-scale implementation of thinking-rich instruction from the perspective of teachers' knowledge. The chapter's main research question is what can we learn about the implementation of programs aiming to foster students' higher-order thinking (HOT) by considering teachers' knowledge and professional development (PD). Throughout this chapter, I use the term "teachers" to describe both pre-service and in-service teachers. When I refer to only one of the two groups, I will note it explicitly.

## **Teachers' Knowledge in the Context of Teaching HOT**

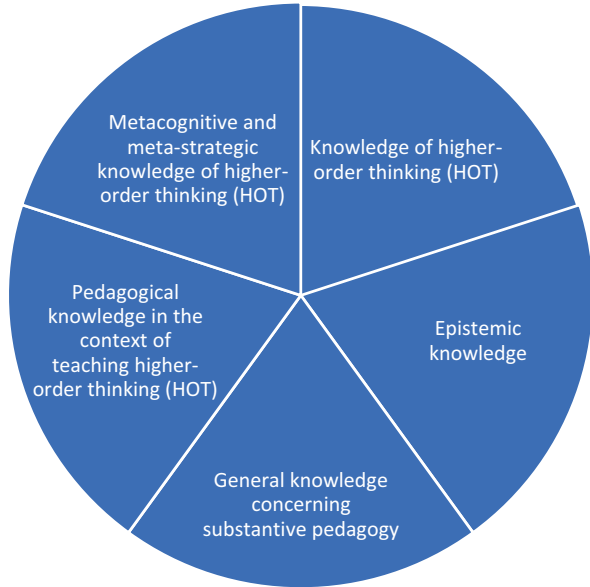
The first step toward answering this question is to understand what teachers need to know in order to teach their students to think. Like other reforms pertaining to deep elements of instruction, teaching HOT poses considerable challenges that require teachers to extend the limits of their knowledge and skills (Fishman et al., 2003). In order to be able to respond to the mass of unexpected events characterizing thinking-rich instruction, teachers must be able to apply flexible, intelligent, and creative methods. In order to do so, teachers need knowledge that extends beyond fixed skills and practices. Pre-prepared learning materials and set guidelines for instruction cannot possibly address the full scope of activities a teacher would need in order to teach HOT (Carpenter et al., 2004). For implementation processes to be successful, teachers must have deep knowledge of the principles of a good thinking lesson (Loef-Frank et al., 1998). When teachers fail to grasp the intentions embedded in the materials created for a particular reform, it is likely that the core of that reform will be lost in the implementation process (Spillane et al., 2002). Thus, implementing HOT in traditional classrooms requires far more than the adoption of new subject matter. It involves a deep pedagogical change that includes at least five elements of teachers' knowledge. These elements are discussed in the following sections (see Fig. 4.1).

### ***Knowledge of HOT***

Many studies have shown that a necessary precondition for effective teaching is familiarity with the subject being taught. This is often referred to as "content knowledge" (Cocharn & Jones, 1998; Shulman, 1986, 1987; Wilson et al., 1987). However, when the focus is on teaching thinking strategies rather than on teaching facts and concepts, the term "content knowledge" is not suitable due to the unique nature of thinking strategies.

To avoid confusion and to denote the unique nature of teaching HOT, I have suggested in this context substituting the term "content knowledge" with the term

**Fig. 4.1** The knowledge teachers need for teaching higher-order thinking (HOT)



“knowledge of HOT.” This type of knowledge includes the ability to think while applying various thinking strategies (for more elaborations, please see Chap. 1). It is intuitively clear that teachers will be unable to teach HOT without such knowledge. Additionally, teachers need knowledge of other essential aspects of good thinking, such as knowledge regarding thinking dispositions and knowledge regarding the characteristics of a culture of thinking (Newton, 2015; Perkins et al., 1993; Swartz et al., 2008).

***Metacognitive and Meta-strategic Knowledge of HOT***

A second component of relevant teachers’ knowledge concerns metacognition. Multiple studies have shown that the use of metacognition in class improves learning in general (Veenman, 2015) and learning of HOT in particular (Zohar & Barzilai, 2015). Both metacognitive skills (i.e., planning, monitoring, and evaluating) and metacognitive knowledge are essential to achieving this goal. The most significant component of metacognitive knowledge in this context is meta-strategic knowledge (MSK). It consists of general knowledge about each thinking strategy: what strategy is being used (i.e., naming the strategy), as well as knowledge of when, why, and how to use it. Teachers need MSK not only to improve their own thinking but also in order to teach HOT. This point will be clarified in the next section.

## *Pedagogical Knowledge in the Context of Teaching Higher-Order Thinking*

A third important component of teachers' knowledge relates to the pedagogy of teaching HOT. Knowledge about how to teach a particular subject is termed "pedagogical content knowledge" (PCK, Shulman, 1986, 1987). However, I suggest to avoid this term in discussions of teaching HOT due to difficulty in understanding the term "content" in this context. The literature on the pedagogy of teaching HOT does not make a clear conceptual statement regarding whether it consists of PCK or general pedagogic knowledge (Zohar, 2004a, b, 2008). This lack of clarity stems, in part, from a debate among researchers about whether thinking strategies are general or content-dependent. The assumption is that teaching HOT takes place according to the infusion approach that integrates instruction of HOT with teaching specific content, such as segments of the curriculum. Accordingly, thinking strategies have both general and content-dependent components (Abrami et al., 2008, 2015; Perkins & Salomon, 1989; Swartz et al., 2008). Such an approach prevents us from addressing teachers' pedagogical knowledge in this area either as pedagogical content knowledge (which tends to be related to specific content areas) or as general pedagogic knowledge (which tends to be independent of specific content areas). Therefore, the term PCK (which is content-dependent) is not suitable in this context. Instead, I suggest to adopt the term "pedagogical knowledge in the context of teaching HOT." This term covers knowledge of a large number of instructional practices, some of which are general, some of which are specific to teaching HOT, and some of which are both (e.g., Swartz et al., 2008; Tishman et al., 1995).

Pedagogical knowledge for teaching HOT includes, among other things, knowledge of appropriate instructional strategies, knowledge of students' intuitive (i.e., pre-instructional) thinking abilities, and common difficulties experienced by students engaged in HOT learning tasks. It also consists of believing that teaching HOT is an appropriate educational goal for the entire student population, low-achievers and high achievers alike (Resnick, 2010; Zohar et al., 2001). In addition, this knowledge includes ways of developing students' thinking dispositions and creating a culture of thinking in the classroom (Perkins et al., 1993; Swartz et al., 2008).

Pedagogical knowledge related to teaching metacognition is also relevant. Metastategic knowledge enables teachers to think clearly about the thinking strategies embedded in their lessons, even when they teach rich and complex conceptual frameworks (Zohar & Barzilai, 2015). Awareness of the metacognitive knowledge and skills embedded in their teaching contributes to teachers' ability to teach HOT in a deliberate and planned way, rather than relying on intuition. In addition, teachers need a wide range of relevant teaching practices, such as:

- Using metacognitive cues
- Modeling thinking strategies in a variety of topics

- Providing students with opportunities to verbalize the thinking strategies they apply while learning
- Applying the “language of thinking” in classroom discourse
- Planning and teaching learning activities with explicit references to thinking goals
- Leading metacognitive discussions
- Leading activities of reflective writing
- Long-term and systematic planning of integrating instruction of HOT into the curriculum

### *Epistemic Knowledge*

The field of personal epistemology investigates how people think about knowledge and knowing (Hofer & Bendixen, 2012; Hofer & Pintrich, 1997; Kuhn, 2001). Researchers argue that models of personal epistemology have metacognitive components (Barzilai & Zohar, 2014; Bromme et al., 2010; Kuhn, 2001) and that personal epistemology has a large influence on thinking processes (Hofer & Pintrich, 1997; Kuhn, 1999). More specifically, studies show that personal epistemology influences how people think in areas such as argumentation (Duschl, 2007; Mason & Scirica, 2006; Nussbaum et al., 2008; Tabak & Weinstock, 2011), critical thinking, and inquiry-based learning (IBL) (Kuhn, 1999; Siegel, 1988; Stoddard, 2010; Ten Dam & Volman, 2004).

Studies of epistemic thinking among teachers generally make one of the following claims:

- (a) Teachers tend to be unaware of their own personal epistemology (Shulman, 1987).
- (b) Teachers tend not to have a unified epistemic perception (Ryder et al., 1999; Stoddard, 2010).
- (c) Teachers' personal epistemology is shaped by the learning processes they experienced during their own education and professional development (Luft & Roehrig, 2007).

Research shows that teachers' epistemic beliefs affect the decisions they make while teaching and interacting with students (Brickhouse, 1990; Hofer & Pintrich, 1997; Richardson, 1996). Teachers' personal epistemology is related to their own critical thinking and to their instructional goals regarding their students' critical thinking (Stoddard, 2010). Studies show that teachers' personal epistemology affects the level at which they apply inquiry in their lessons (Wallace & Kang, 2004), the nature of the inquiry processes they choose to teach (Chinn & Malhotra, 2002), and the depth of the HOT skills they address in their lessons and encourage their students to use during inquiry-based learning (IBL) (Maor & Taylor, 1995).

The way teachers interact with and relate to knowledge and knowledge acquisition processes serves as a model for their students (Hofer & Pintrich, 1997). Students who observe their teacher considering multiple possible answers to an open-ended

question and reflecting on processes of knowledge construction may develop a different epistemology than students whose teacher expects one “correct” answer and presents authoritative perceptions of knowledge. Research also shows that teachers’ explicit and implicit epistemic beliefs determine how they assess their students’ learning (Tabak & Weinstock, 2011). All these factors affect how students utilize HOT strategies (Maor & Taylor, 1995). Therefore, epistemic knowledge is an essential element in the teaching of HOT.

### ***General Knowledge Concerning Pedagogies of Knowledge Construction and Substantive Pedagogy***

When teaching concepts, a pedagogy based on transmission of information may encourage rote learning and passive acquisition of meaningless facts. When teaching thinking, a transmission of information pedagogy has unique characteristics. Studies examining teachers’ knowledge and beliefs about teaching HOT show that those who hold a transmission of knowledge view about teaching generally believe that it means transmission of rules for thinking and algorithms for problem-solving (for more details, see Chap. 8). Presenting students with problems that require independent thinking is often viewed by teachers working according to this approach as an inappropriate method, because it may confuse or frustrate students. Teachers who hold these views therefore tend to lower the cognitive demands of thinking tasks by “spoon-feeding” students with correct answers, or by providing recipes for solving problems. Therefore, although teachers may use learning activities that were originally designed to teach students to think, such teaching practices actually prevent students from actively engaging in active and independent thinking. On the other hand, teachers who view instruction of HOT from the perspective of knowledge construction tend to preserve the high level of cognitive demands embedded in thinking tasks (Zohar, 2004a, b). Thus, pedagogical knowledge in the context of teaching HOT is closely related to teachers’ implicit theories of learning and instruction in general. Consequently, PD programs in this field cannot ignore general theories of instruction and must address them along with the other components of teachers’ knowledge mentioned earlier. The bottom of Fig. 4.1 presents this knowledge as “General knowledge concerning substantive pedagogy”.

In summary, this section explained that the knowledge teachers need to teach HOT is indeed complex and multifaceted. Therefore, a most pressing question in the current discussion is as follows: To what extent can we expect that teachers would possess this knowledge following participation in large-scale implementation processes for teaching HOT? The subsequent sections address this question and present empirical evidence from three areas of research. The first area relates to teachers’ relevant knowledge on an intuitive level and its development in small-scale interventions. The second area discusses the likelihood that the scope of PD programs

that are part of large-scale implementations would address all, or at least most, of the knowledge that teachers need to teach HOT in a sound way. The third area is based on interviews with pedagogical leaders who describe challenges related to teachers' PD in large-scale implementations of HOT.

## **Empirical Findings Regarding Teachers' Intuitive Knowledge of HOT and Its Development Following PD**

How sound is teachers' initial, intuitive knowledge about teaching HOT, that is, their knowledge prior to participating in formal learning on this subject? According to previous research, many teachers' intuitive knowledge of this subject is limited and is insufficient for supporting sound instruction in this field (Bransky et al., 1992; Jungwirth, 1994). For example, research shows that teachers have varying degrees of knowledge about different components of scientific thinking (Zohar, 2004a, b). Additionally, teachers are rarely able to explain clearly what is critical thinking, to explain key concepts related to thinking (such as assumption, conclusion, or argument), or to explain which critical thinking strategies are most important for their students (Paul et al., 1997). Further, teachers' intuitive knowledge regarding the thinking strategies related to inquiry-based learning (IBL) is also limited (Crawford, 2014).

Since the research on teachers' intuitive knowledge and PD in the field of HOT is too broad for a systematic review, I will focus here on one area of research that will demonstrate research findings in this area. I chose to focus on argumentation in science education because of the central role argumentation had played in recent policy documents and of its central role in IBL. Additionally, there is a relatively large body of recent research on teachers' knowledge regarding teaching argumentation.

Studies examining teachers' knowledge regarding the components of argumentation reveal a complex picture. For example, a study conducted by Zembal-Saul and her colleagues (2002) found that four teachers participating in a PD program consistently succeeded in offering evidence for their claims, but their arguments were limited by oversimplifications, using evidence-based or inappropriate sampling methods, hasty conclusions, overgeneralizations, and severe misunderstandings of what constitutes evidence. Similarly, in a case study by Beyer and Davis (2008), the observed teacher demonstrated inaccurate understanding of scientific explanations and of the role of evidence. This teacher's self-reports about teaching argumentation to elementary school students indicate that she instructed students to support their claims by describing a variety of details rather than using research-based data. Similarly, Sampson and Blanchard (2012) interviewed 30 teachers and found that they struggled with various issues related to argumentation. In assessing the validity of a claim, they relied primarily on their previous knowledge of the subject, rather

than on data. Most of the interviewed teachers formulated arguments that provided explanations, but they did not support them with evidence. In Crippen's (2012) study, the surveyed teachers used evidence to support their claims, but seldom explained explicitly *why* the evidence supported these claims. They also demonstrated a lack of understanding of the very idea of justification. The teachers who participated in Sadler's (2006) study were generally proficient in the construction and analysis of arguments but found it difficult to distinguish between data and justifications. Ozdem and his colleagues (2013) found that elementary school science teachers tend to base their claims on prior assumptions rather than on data collected through observation or from other reliable sources (Ozdem et al., 2013).

Overall, these studies point to teachers' inconsistent knowledge of the components of argumentation. Teachers are able to construct simple arguments but often encounter difficulties in constructing and analyzing complex ones. These studies reveal that the greatest weakness in teachers' thinking is their limited understanding of the nature of evidence and justification. This weakness refers to the element "knowledge of HOT" in Fig. 4.1.

Some of the studies on teachers' pedagogical knowledge in the context of argumentation indicate that the primary barrier to the routine application of reasoning in science education is teachers' lack of awareness of instructional strategies that can support students' argumentative reasoning (Driver et al., 2000; Zeidler, 1997; Zembal-Saul et al., 2002). For example, Simon et al. (2006) assert that most science teachers lack the pedagogical knowledge necessary to plan lessons for developing students' argumentative reasoning and have only limited resources to assist them in teaching argumentation. Additional findings related to limitations in teachers' pedagogical knowledge in the context of argumentation are found in the studies of Beyer and Davis (2008) and Sampson and Blanchard (2012).

Studies also examined whether targeted interventions succeeded to improve teachers' knowledge of the components of an argument and of their pedagogical knowledge pertaining to argumentation and if so in what ways (Crippen, 2012; Dawson & Venville, 2013; McNeill & Knight, 2013; Osana & Seymour, 2004; Venville & Dawson, 2010). For example, a year-long series of workshops conducted with 12 post-elementary teachers offered concrete strategies designed to help them improve students' written and oral argumentation skills (Simon et al., 2006). The findings indicate that the teachers' level of argumentation improved during the year, but this was inconsistent because the patterns of argumentation and the nature of the change process were unique to each individual teacher. In addition, not all teachers used metacognition while teaching argumentation.

Another study examined an intervention focusing on the development of teachers' knowledge by assessing its effects on students' thinking. The students in the experimental group ( $n = 133$ ) improved their reasoning skills, ability to use informal rational thinking, and understanding of the content (genetics). However, only a few students demonstrated sophisticated forms of argumentation (Dawson & Venville, 2013; Venville & Dawson, 2010). The findings indicate that the teachers' knowledge developed within this intervention was insufficient for improving

complex argumentative thinking among their students. Findings from additional studies on developing the knowledge needed for teaching argumentation in pre-service teacher education also showed a certain level of improvement, but pre-service teachers continued to demonstrate limits in the relevant knowledge and had considerable difficulties in applying this knowledge during classroom teaching (Sadler, 2006; Zembal-Saul, 2009).

Taken together, these studies indicate that small-scale experimental programs for PD aiming to improve the knowledge teachers need to teach argumentation are able to improve that knowledge. At the same time, the course of knowledge development varied among individual teachers, and by the end of the intervention, many important components were still absent.

At this point, it is important to note that my emphasis on the need for more extensive PD is not intended to show any disrespect to teachers. On the contrary, confirming that teachers cannot be expected to teach in ways for which they were not properly prepared reflects respect for the teaching profession and for teachers' professional integrity.

With respect to the more general discussion of teaching HOT, we need to remember that argumentation is only one of many aspects. The call for developing students' HOT therefore requires the expansion of teachers' knowledge in multiple areas of thinking. Such an expansion will obviously require teachers' participation in PD on a significantly larger scale than that described in the studies reviewed earlier. It is difficult enough to achieve the desired results in PD in the field of argumentation. It becomes much more difficult when addressing the body of knowledge necessary to teach diverse aspects of thinking.

It is also important to remember that all the studies cited earlier were conducted under the optimal conditions characterizing small-scale interventions. The results of large-scale interventions in this field are likely to be more limited, due to the "ripple effect" (Fullan, 2007). Dede (2004, 2006) refers to this issue as throwing the components of a change process "out the window" and claims that this trend is typical of system-wide implementation efforts (for more elaboration, see Chap. 1).

One of the research teams cited earlier, who developed professional development methods proven to be effective on a small scale (Simon et al. (2006), confirmed this assertion in an empirical way. In a follow-up study, Osborne et al. (2013) examined the issue of scaling up assuming that in most real-life circumstances the available resources for this endeavor are less than optimal. They therefore investigated whether it is possible to succeed in implementing argumentation into the routine work of science teachers with a limited investment of resources for supporting this process. In this follow-up study, a relatively small number of hours (likely to represent the typical conditions of scaling up processes) had been dedicated to professional development, as compared with the initial study (which demonstrated the conditions of a small-scale intervention). Another difference between the two studies was that all the teachers who participated in the first study were volunteers who represented a self-selected sample likely to have a positive attitude toward the intervention. In the subsequent study, however, the research population consisted of the



entire school staff. Thus, the second study examined the program's impact under conditions that are more common to system-wide implementation of educational programs than the optimal conditions typical of small projects. The results of the second study indicated that when the educational intervention was carried out under these more common conditions, it had no effect. That is, the same principles underlying the successful small-scale intervention had no effect when the intervention was conducted under conditions that are similar to those of the real educational world.

These findings raise a crucial question regarding the feasibility of successful efforts geared toward large-scale PD in the area of teaching HOT: How reasonable is it to expect that such efforts will devote sufficient resources for teachers' learning, so that they will be able to construct the complex knowledge teachers would need to teach HOT in a sound way? This question is explored in the following sections.

## **Large-Scale Implementation Programs and the Knowledge Teachers Need for Instruction of HOT**

Researchers disagree as to whether teachers' PD programs affect student learning, even when it takes place under the optimal conditions of small-scale interventions. The issue is even more controversial in the case of system-wide implementation. This is particularly true when considering a subject requiring complex teachers' knowledge, such as instruction of HOT (Grigg et al., 2013; Lotter et al., 2007).

Research on large-scale PD programs in the field of teaching HOT is quite limited. One example of such a study, conducted among teachers in 15 European countries, is described in a report on the status of teaching argumentation (Jimenez-Aleixandre et al., 2010). According to this report, the subject of argumentation has recently been integrated into professional development programs for pre-service and in-service teachers in European countries. The study found that the number of hours allocated to argumentation has been very limited. For example, teacher education programs rarely address argumentation for more than 6 h. In addition, the study noted a large variety in the depth of discussion addressing this subject. In some countries, discussion of argumentation is an explicit goal of the PD program, while others address it only implicitly, as part of addressing other educational goals such as IBL.

Studies from other parts of the world also find that teachers' learning about HOT is limited, in terms of both scope and outcomes. In the absence of systemic studies addressing large-scale implementation of PD in the area of teaching HOT, this conclusion is based on extrapolation from studies of PD programs in other fields. The data indicate that the number of hours dedicated to PD at large, is fairly limited and that the programs' effectivity tends to be low. For example, in the international Talis study (OECD 2014), the vast majority of teachers (about 88%) reported participating in some form of PD during the 12 months preceding the survey. About 75% of

these teachers reported that their PD addressed capabilities related to teaching content. Although it covers many topics unrelated to the development of HOT, teaching content was the survey category most relevant to the current discussion. Only 20% of these teachers reported that they felt the training had a major impact on their teaching (OECD, 2014).

According to the 2012 US National Science and Mathematics Education Survey, over 80% of secondary school teachers and over 50% of primary school teachers participated in PD on content areas relevant to their teaching during the 3 years preceding the study. Only about 30% of the secondary school teachers and 4% of the primary school teachers received more than 35 h of PD during this period (Banilower et al., 2013). Similarly, in Israel, the “New Horizon” agreement between the Ministry of Education and the national teachers’ union limits the number of hours a teacher can participate in PD to 30 h annually. Since this pertains to PD on a variety of subjects, we can conclude that the number of hours devoted specifically to teaching HOT across the school system is far lower.

In summary, the data from these studies confirm the claim that large systems in many countries support teachers’ PD in the field of teaching HOT in an extremely limited way.

## Interviews with Pedagogical Leaders

The conclusion stated in the previous paragraph is also supported by a study based on interviews with 12 pedagogical leaders in Israel. Each of these leaders played an active role in system-wide change processes related to instruction of HOT. The interviewees were senior officials, including supervisors in the national education system, leaders of pedagogical change at the level of the local authority, heads of major centers for teachers’ PD, and leaders of educational programs in school networks. The semi-structured individual interviews lasted between 1 h and 2.5 hours. The interview protocol asked the leaders to describe the plan of the change process they were involved in and to identify the challenges they encountered in terms of PD, assessment, and development of learning materials (Zohar, 2013a; Zohar & Lustov, 2018). Interviews were analyzed using the pragmatic approach to qualitative data analysis (Savin-Baden & Howell-Major, 2013). Of the many topics that emerged from the interviews, two are relevant to this chapter. The first pertains to the gap between the breadth and complexity of the knowledge teachers need to teach higher-order thinking and the duration of PD programs included in large-scale change processes. The second relates to the lack of skilled instructors to lead high-quality programs for teachers’ PD.

The following sections provide excerpts from the interviews that illustrate how the theoretical issues discussed in the previous sections are reflected in the real-world conditions characterizing implementation of system-wide change processes. In order to preserve the anonymity of the interviewees, no personal details are provided.

### ***Gaps Between the Scope and Complexity of the Knowledge Teachers Need to Teach HOT and the Duration of PD Programs in Large-Scale Change Processes***

Participants view the knowledge teachers need to teach HOT as extremely complex. An example of this view was pronounced by one of the participants who had led a system-wide change process, aimed at implementing IBL learning and HOT in a central school subject in high schools across the whole county. This leader asserts that it is much more complex to integrate thinking and inquiry into routine learning and instruction than simply changing the list of topics in the curriculum:

*The change itself is a highly complex task. It's not that instead of teaching about ancient times, we will teach about the Middle Ages ... in that case, there is a topic that we had not been teaching until now and now we need to start teaching it. Here, the change itself is extremely complex in terms of the level of skills that teachers need.*

In another section of the interview, this participant explains precisely what new knowledge and skills teachers need to be able to support the change process. He covers most of the components of teachers' knowledge that were mentioned in the previous sections of this chapter and in Fig. 4.1. For example, he speaks about the shift from a teacher-centered to a student-centered pedagogy and about the complexity of the thinking strategies teachers need to learn in order to support thinking-rich instruction.

Another interviewee, who had led system-wide PD programs for many years, also notes the need to develop teachers' knowledge regarding all the components mentioned earlier: thinking strategies, meta-strategic knowledge, and pedagogical knowledge. She elaborates on the complexity of the necessary pedagogical knowledge, explaining that it is difficult to address all of it within the limited time allocated for PD. According to her, restricting teachers to 30 h of PD per year, as stipulated in the agreement signed between the teachers' union and the Israeli Ministry of Education, impairs teachers' PD in general and in the area of teaching HOT in particular:

*There has been some damage to teachers' PD. For example, science teachers receive 30 hours of training. In those 30 hours, according to the requirements set by their National Subject Superintendent, they must study astronomy, because this year astronomy is included in the state-wide schools' official assessment. Teachers don't know enough about astronomy, because they don't teach astronomy in teachers' colleges. So, what can we do? They must study astronomy. Thirty hours represent seven or eight meetings, tops. You cannot expect that any significant learning process will take place within 30 hours. Not in terms of knowledge construction and not in terms of constructing thinking skills.*

Teachers' learning is, for all intents and purposes, learning. Therefore, the three levels of pedagogy described in previous chapters may also apply to learning and instruction taking place in teachers' PD. At the level of structural pedagogy, the interviewee noted a significant gap between the goals of the PD and the number of hours offered. In 30 h, distributed across seven or eight learning sessions, it is not possible to cover, in any significant way, both thinking goals and content goals (in

this case, astronomy). Later, the interviewee focuses on aspects of substantive pedagogy. She explains how this gap becomes more acute when one examines the deep change processes that are taking place as part of teachers' learning:

*[Teaching] thinking skills does not mean delivering a lecture about skills. Teachers' educators must model these skills. Teachers must first experience these skills themselves, as learners, including all the metacognitive processes involved. The PD must construct two types of knowledge... First, the knowledge of the thinking skill itself, which teachers are not familiar with, then the meta-level knowledge of how to teach it...the pedagogy... [pause] I often ask the teachers simple questions: How do we compare? Let's make a comparison between A and B. [pause] They jump straight to the level of thinking about what is similar and what is different. They ignore the previous stages, such as: what is the purpose of the comparison? According to what criteria will I make the comparison? What conclusion can I draw from the comparison? The thinking maps we are talking about [i.e., meta-strategic knowledge about the skills] ... they are not familiar with them, or at least, they don't know them well... If a teacher is not familiar with the meta-strategic knowledge of a thinking map, it will also be very difficult for her to construct a teaching strategy, because the teaching strategy goes with knowing the thinking map.*

These remarks address deep processes of teachers' learning. They focus on the interrelationships between the deep instructional goals of the PD course, methods of learning and instruction used in the course, teachers' knowledge prior to and after the course, and typical thinking difficulties that teachers experience prior to and after the course. In order to achieve teachers' meaningful learning during PD, it is not enough to transmit information. Rather, instruction in the PD course must apply methods of knowledge construction that include experiences of active learning. Such experiences are essential for meaningful construction of the knowledge teachers need for teaching HOT. According to this interviewee, three kinds of knowledge need to be addressed for each thinking strategy: knowledge of the strategy (or "skill"); the thinking map, which is a visual means of representing MSK; and pedagogical knowledge. The interviewee's example of teaching how to make a comparison demonstrates the gap between teachers' initial knowledge and the knowledge they will need in the classroom. She explains that a teacher who lacks the MSK addressing general aspects of a thinking strategy will not be able to teach that strategy successfully. In other words, the pedagogical knowledge necessary for teaching purposes will also be lacking. This interviewee's description demonstrates the extent of the gap between the needs of the PD in terms of deep, or substantive pedagogy, and the 30-h limitation established in the agreement with the Teacher Union. The terms of this agreement were determined by negotiating teachers' labor rights rather than by discussing the pedagogical needs inherent to reforms. The gap between the desired and the actual, in terms of the resources of time allocated to PD, is exacerbated by the Israeli Ministry of Education's frequently changing policies, which generate multiple competing goals:

*We don't have enough time. ... It is impossible to do it in 30 hours. Because each time, there is some new policy. This year, the superintendent announced that we will need to teach IBL. But along with IBL, we will also need to teach the new topic of health. So they must leave the course with scientific knowledge about health. It is impossible to do everything ... In many PD courses this year we have been working with teachers on how to conduct an*

*entire inquiry process from start to finish. In other words, from first encountering a given phenomenon, to framing the questions to [...]. This is a very, very difficult process ... It is impossible to do it in 30 hours. Because each time, there is a new policy ... They come to the workshops and they learn, but I don't know exactly what they absorb. The fact that they smile at me and say how wonderful it was... I don't know ... What exactly did they get from it? There is a large gap here.*

The interviewee then continues to elaborate the difficulties of implementation. She explains that in order to make the transition to a thinking-rich instruction, teachers must not only teach thinking strategies but also make a comprehensive change in the classroom culture. Accordingly, the content of the teachers' PD must be expanded to many new areas:

*We need a paradigm shift. [In addition to developing thinking strategies] ... the issue here is the culture of teaching, and thinking as part of the culture of teaching. We encounter this everywhere. This issue... of the culture of thinking, the language of thinking, classroom discourse... implementing a culture of thinking means working on thinking habits and thinking dispositions, so that they become part of the classroom culture. This is essential.*

Other interviewees also raised similar concerns related to the limit of 30 annual hours of PD and to the large number of goals competing for these hours. For example:

*This is a problem [...] The PD course is 30 hours long. Very few things can be achieved. And there is so much you have to teach in order to be able to do this process ... I am saying again that the PD is not long enough.*

The idea of an insufficient number of hours allocated for PD is also evident in the words of the next interviewee who was responsible for implementing a nationwide reform in a mandatory school subject taught in all schools. She clearly understands the tension between “depth” and “breadth” in PD. She notes the difference between a change process at the organizational level and a change at the level of teachers' knowledge. She explicitly notes that the learning processes in which teachers must participate are extremely complex and therefore take time. She explains that in order to bring about a profound change in teachers' knowledge, it is not enough for teachers to take part in a PD course, but it is also necessary to support them in their classroom practice. According to her, a profound change is possible only through working with teachers at the micro-level, including precise feedback to teachers regarding specific classroom interactions, such as how to formulate questions to be asked during instruction. She expresses concern that the current conditions consisting of a brief PD with no support for classroom instruction, will inevitably lead to instruction of HOT as a purely mechanical activity that will not be worth the effort:

*Changing a teacher's mind is extremely difficult, even if he really wants to make the change. And I am talking about people who seriously want this. The ability to make a deep change is very, very slow. It's not just an organizational matter, it's a matter of awareness...First of all, awareness, and second, a matter of support. Teachers should be provided with mentors in the field. It is not enough for a teacher to listen to an excellent lecture and attend a wonderful workshop about teaching thinking. If no one observes him in class and then says, 'You asked this question – how could you ask it differently?' then it is hard to believe that we will succeed in reaching that teacher... I'm afraid the teacher will only half-understand, and then will teach it in a mechanical way. And to teach think-*

*ing in a mechanical way...it is better not to teach thinking at all. Don't say you are teaching thinking if it becomes [here the interviewee drops her strong, clear voice and imitates a tired teacher repeating a memorized text in a nasal voice] 'Now wait a minute, at this point I am supposed to ask you a thought-provoking question. Open your notebooks, here comes a thought-provoking question.' It's terrible! And it happens all the time in this system, whenever you try to introduce new ideas.*

In sum, this section shows a severe gap between elements of the reform related to the levels of substantive and administrative pedagogy addressing teachers' knowledge and PD.

### ***Lack of Skilled Instructors to Lead PD Programs***

The interviews with the pedagogical leaders also reveal a second gap between the feasibility of addressing the substantive and structural levels of implementing a reform. The interviews highlight the role of PD and particularly the role of instructors and leading teachers who can escort teachers through the change process. Instructors, who in effect act as teacher educators, are an important link in the chain of transferring professional knowledge in a reliable way from the policy documents that define a reform to the teachers who will execute it. The interviewees describe a wide variety of roles carried out by instructors in reform processes: teaching PD workshops; participating in teams that develop educational and assessment materials; and visiting schools to meet teachers, observe lessons, and provide teachers with constructive feedback. Thus, the quality of instructors' knowledge about teaching HOT is essential for the reliability of the implementation process (Spillane, 2000).

The interviewees confirmed that they indeed view instructors as a crucial link in the wide-scale implementation of the reform but emphasized that the issue of teacher educators raises distinct challenges. One of these challenges concerns PD for instructors. For example, one interviewee who strongly believes in the role of instructors in the implementation of educational programs for teaching HOT, stresses that to succeed, they must undergo a comprehensive PD process. Instructors and leading teachers tend to be outstanding "star" teachers, because they are chosen on the basis of their strong pedagogical capabilities. Nevertheless, because teaching HOT requires specific and complex knowledge, the PD needed for their job requires considerable resources and usually takes several years:

*In order to implement this policy document [on teaching HOT] in the field, we must first train instructors. We had a series of PD sessions ... We trained a whole group of instructors to teach HOT.*

Another interviewee further elaborates this point:

*Some groups of instructors met regularly for six or seven years, other groups met for three or four years ... We also had a number of courses for leading teachers. We saw positive development. It is not true that you can't help teachers make progress in this area. But we learned that it is very difficult to do this on a large scale.*

Many interviewees note that the programs they lead face a severe shortage of instructors who have the necessary relevant knowledge. As seen earlier in the quotes pertaining to teachers, the interviewees repeatedly emphasize the depth and complexity of the knowledge that instructors need in order to work with teachers on instruction of HOT:

*We do not have enough pedagogical experts who do not only talk on the level of declarations and slogans, but who can actually follow this path to the level of the specific questions to be asked [in the classroom] and who can analyze, critique, improve the work, and make it reflect HOT in the best possible way. We don't have these people.*

Another interviewee says there is a lack of instructors with sufficient pedagogical expertise across the school system. The problem, in her opinion, is that the role of instructors requires extensive experience in the field, in addition to theoretical knowledge. Too often, instructors without such experience speak theoretically about teaching HOT but are unable to move beyond the declarative level:

*You should understand that there are not enough pedagogues in the Ministry [of Education] ... When they talk "about" things [i.e., on the declarative level], but nothing happens- it is useless ... For example, the Ministry is promoting the issue of inquiry-based learning. But how many teachers know how to guide their students in asking a proper research question?*

In other words, the shortage in pedagogical knowledge enables instructors and leading teachers to teach thinking and inquiry according to fixed patterns they had acquired during Pd. However, when they need to move beyond the surface toward a deeper level of pedagogy, it becomes clear that their knowledge is insufficient. Here, too, there is a connection to substantive pedagogy. The problem, in this interviewee's opinion, is that teachers often lack the knowledge they need to guide their students through the detailed micro-level of thinking processes, such as framing a proper research question. Such gaps in teachers' knowledge make inquiry teaching merely mechanical. How is it possible—asks one of the interviewees—to lead a meaningful process of IBL if teachers do not know what is a proper research question, or how to guide their students in framing one? She cynically recounts a time when the Ministry of Education suddenly increased the budget for recruiting instructors to support the implementation of HOT. Due to the chronic shortage of instructors with adequate pedagogical knowledge, instead of being glad about getting more instructors, she describes this decision as “a minor disaster”. She explains this attitude by referring to her frustration at not being able to find personnel who has the necessary pedagogical knowledge:

*Last summer, they announced ... that because of the Meaningful Learning reform they would provide more resources for PD. Usually when they increase the PD, it is a minor disaster. It is a great joy, but also a minor disaster ... because we don't have qualified people who can do this job.*

Another interviewee serves as the pedagogical director of an initiative to develop inquiry-based learning (IBL) and HOT in a particular school district. She reports that a major barrier to the development of that initiative is the serious shortage of qualified instructors capable of carrying out the deep and profound work that needs

to be done with teachers. In her opinion, this shortage is particularly severe in her region, because of its remoteness. After describing the good work being done with teachers via the regional center for teachers' PD, she adds:

*There is a serious shortage of teachers' educators who are experts in instruction. If we would have had more experts who understand what we mean when we talk about HOT and how to prepare teachers for it, things would have been much easier for us. There is a real shortage, especially here, because of the geographic remoteness. Because we are in the periphery. Something I see as really problematic is that most experts on this subject don't live in our region. Inviting them to a single event is not what we are looking for. That might be nice, but it's not what we need... We must have enough people who can do the training...people whose academic specialization is in the area of developing students' HOT.*

*Unless we would have people with strong pedagogical abilities within our region, we would never be able to really make the changes we are talking about. These are topics that constantly change and must be updated. You always have to be on top of them. There is a need to create a high-profile pedagogical forum that will create concentric circles of impact, gradually reaching further out into the field. We started to create these circles... but they need to be led by a strong core of seven or eight people. We don't have them. We only have two or three...I am well aware of this shortage...I look at learning tasks that teachers write, tasks that relate to HOT, and I see their level. We have so few instructors that can really analyze such tasks in depth [in order to give teachers constructive feedback]... Until I would have a broad forum of people who know how to do this, it won't be possible to raise this whole business to a higher level...That will always be our glass ceiling.*

This interviewee is speaking on the level of substantive pedagogy. She notes the lack of qualified people for working at this level as a primary reason for the inability to break through the glass ceiling and achieve system-wide implementation of HOT. She recognizes the need for a minimum number of people with adequate knowledge for leading an implementation process and for imparting this knowledge to expanding circles of educators. The absence of such knowledgeable people hinders a system-wide implementation.

Interviewees from more central regions also mention similar difficulties. The lack of high-quality instructors is therefore not unique to remote areas. An interviewee who leads a reform in one of the mandatory school subjects expresses similar feelings. She uses the terms "bottleneck" to explain how this shortage impairs the implementation of the program for which she is responsible:

*I feel that... there is a bottleneck. When there is a desire and a need in the field, we don't have anybody to send to them.*

The quotes presented in this section illustrate how various aspects of substantive pedagogy are integrated with various aspects of structural pedagogy. The lack of skilled instructors, which was similarly highlighted in previous research (Zohar, 2013a), is a recurring theme. First, the frequent shifts in the Ministry's policy cause frequent changes in the nature of the tasks assigned to instructors. Thus, after considerable investment in developing instructors' knowledge about teaching HOT, the instructors were often sent to perform other tasks, such as working with teachers on the integration of digital technology or implementing various content-related goals.

Second, there is rapid turnover among instructors. They tend to leave their positions after a short time, mainly due to the significant difficulties they encounter in



working with teachers and because of poor financial compensation. These findings demonstrate how in the context of the instructors' work, administrative and organizational problems interfere with implementation of HOT on the level of substantive pedagogy, because these problems inhibit the flow of knowledge that needs to reach the teachers.

It should be noted that the State Comptroller also sharply criticized the Israeli Ministry of Education about the way it took care of training instructors and its potential damage to the implementation of the Meaningful Learning reform (for further elaboration, see Chap. 7). The comptroller cites a 2016 evaluation report issued by the Planning and Strategy Division of the Ministry of Education, according to which the lack of professional guidance for schools is one of the main obstacles to implementing the reform. The report also notes the difficulty in recruiting qualified instructors and the rapid turnover among instructors, which interferes with continuity. The report emphasizes that these difficulties are also apparent in the most central districts. The State Comptroller's Office informed the Ministry of Education that implementation of the Meaningful Learning reform is extremely complex. It therefore requires effective and systematic PD addressing the needs of professionals working with all age levels, in all subject areas, and in all sectors of the population. In the first year of implementing the reform, the Ministry of Education did increase the resources made available to national subjects' supervisors for hiring additional instructors. In subsequent years, however, these resources were gradually reduced until they returned to their original level prior to the launching of the reform. This is despite the fact that, according to the work schedule presented by the Ministry's own planning, preparations for implementing the Meaningful Learning reform are still in the early stages and far from conclusion. The comptrollers' comments support the findings presented here regarding the importance of instructors in processes of system-wide implementation, as well as the challenges involved in strengthening this crucial link.

## Summary and Conclusions

Educational researchers agree on the importance of thorough and meticulous development of the human capacity of those involved in change processes in the area of learning and instruction (Elmore, 2004; Fullan, 2007; Levin, 2008). Nevertheless, educators are still struggling with the question of how to develop such capacities, especially on a system-wide scale. Luft and Hewson (2014) assert that while the idea of scaling up is tempting and sounds promising, it is not clear how to realize it or if it is even possible to do so. They suggest that due to the nature of teacher PD, scaling up may be an elusive construct (Luft & Hewson, 2014). They conclude by arguing that there will never be simple solutions to this complex problem.

This chapter focuses on teachers' learning processes. By analyzing the specific case of teachers' learning in the context of teaching HOT, I emphasize the necessity for intensive work with both teachers and instructors on all the knowledge components teachers need, as described in Fig. 4.1. The chapter emphasizes that an

important part of scaling up is to construct a pedagogical toolbox that will attend to the smallest details of the pertinent substantive pedagogy. This includes tools addressing issues such as how to teach students to construct and analyze complex arguments based on reliable evidence, how to guide students in constructing a fruitful research question, and how to help teachers develop criteria for analyzing and evaluating thinking tasks so that they would be able to reflect upon them, improve them, and adapt them to the specific educational context they work in.

The interviews with change leaders indicate that making such efforts on the micro-level of substantive pedagogy is an essential component of any successful scaling up process. Without detailed work on issues such as the specific details of classroom discourse or the development of appropriate learning materials and evaluation tools, any implementation will be mechanical and superficial. Therefore, the literature review and the interviews with change leaders both indicate that the implementation process may succeed or fail based on the quality of the PD for teachers and instructors, especially at the level of substantive pedagogy.

This indicates the need for a close correlation between administrative pedagogy and substantive pedagogy in the context of teachers' PD. Even when an organizational structure enables and provides budget for PD, the learning processes may prove useless if they do not address substantive pedagogy at a detailed and practical level. The interview data show that a lack of mid-level leaders (whose role is to guide leading teachers and instructors) who have the deep pedagogical knowledge necessary to put theory into practice is a serious bottleneck, hindering successful implementation. There is a need for more instructors who can work at the micro-level required for operating successfully on the level of substantive pedagogy, addressing even the smallest details of teaching HOT in the classroom. Spillane (2000) notes that this knowledge is essential in order to convey reliably the fundamental purpose of a system-wide reform, and not dilute the message during the transition between organizational levels. Preparing change leaders to operate on this level poses a difficult challenge. It requires a combination of theoretical and practical knowledge and ongoing teachers' learning.

In the absence of such knowledge, any organizational infrastructure designed to scale up a pedagogical reform may become devoid of content. The leaders of the reform may invest vast resources in planning, budgeting, and building the organizational infrastructure that may include recruiting instructors and allocating times and places for PD courses. Yet, such organizational structures cannot bring about the desired changes without explicit planning at the level of substantive pedagogy. Indeed, the required planning must consist of a detailed design of exactly what will be taught in the PD course, by whom it will be taught, and what learning materials and curriculum will be used. Neumerski (2013) also indicates the need for closer coordination between various levels of pedagogical leadership within the system. She claims that a lack of such coordination limits the ability to utilize the pedagogical leadership resources that do exist in a system for improving instruction.

The analysis presented in this chapter provides further insights about scaling up from the point of view of teachers' knowledge and its impact on strategic planning of large-scale implementation. The history of education is full of failures regarding the implementation of large-scale progressive pedagogical reforms. Although there

is still no solution to the “elusive problem” described by Luft and Hewson (2014), many current policy papers, curricula, and standards around the world strongly affirm the importance of teaching HOT to the entire student population, across all age groups, and for all subjects of study. Recognizing the scope of the challenge involved in meaningful implementation of this idea as it pertains to the development of teachers' knowledge raises an important question: Do policy documents often set goals that require educators to do too much too quickly? I will address this general question in detail in Chap. 9, but the next paragraphs discuss the more specific implications of this question within the case of wide-scale implementations of teaching HOT.

One of the most widely quoted comments in the field of education comes from the McKinsey report: “The quality of an education system cannot exceed the quality of its teachers” (Barber & Mourshed, 2007). The findings presented in this chapter offer a paraphrase extending this statement. If we are indeed interested in making a major change in the field of teaching HOT, the depth of this change cannot exceed the depth of the knowledge provided to teachers via PD. Therefore, the main conclusion of this chapter is that if we want to avoid making merely superficial and mechanical changes, then we must seriously consider teachers' knowledge and view it as a central factor in planning the scope of the educational reform. A realistic assessment of the knowledge that teachers will need to support a meaningful change, along with a critical assessment of the scope of the PD courses to be offered, may indicate a need to compromise on the scope of the planned change.

The implication of this conclusion for the field of teaching HOT is that the sweeping and broad statements that appear in multiple policy and curriculum documents should be viewed with some suspicion. Often, such statements are too ambitious to be applied in a reliable way, given the limitations of teachers' knowledge, especially when the goal is quick changes. Often, politicians' intentions stem, in part, from their desire to make their mark rapidly, during their brief terms in office. One of the problems is the lag between rapid political changes and the slow schedule required to enact deep pedagogical changes. This difference in schedule exacerbates the problem described above. In order to avoid superficial and mechanical implementation, policymakers and politicians need to rephrase their statements in a more modest and realistic manner that reflects teachers' initial knowledge and the scope of the PD processes that can be reasonably expected. In order to discourage false promises about “quick fixes”, the public should be particularly critical of politicians' statements regarding the scope of promised educational reforms. Yet, it is possible to retain an ambitious vision as a long-term final goal while maintaining a strategic plan with realistic goals that distinguishes between this “big” long-term dream and short-term, more realistic goals and actions that support high-quality learning.

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## Chapter 5

# It's Not All or Nothing: System-Wide Implementation of Inquiry-Based Teaching and Learning



**Abstract** This chapter provides a critical examination of the specific case of inquiry learning, as one example of scaling up instruction of HOT. It describes multiple pathways of IBL and discusses disagreements among researchers about its value. It also highlights the concern that when IBL learning is scaled up, it often tends to be superficial and “mechanical,” failing to employ thinking strategies that are the essence of inquiry practices. The analysis suggests a direction for dealing with this problem. Rather than looking at inquiry learning as an “all-or-nothing” approach, it is possible to work in a partial, modular way. For example, teachers may focus on one or several parts of the whole inquiry process and/or use varying degrees of guidance and scaffolding. An informed choice regarding the precise scope of IBL that is most suited for a particular large-scale change process is complex, requiring a combination of knowledge about general organizational and administrative planning with considerable knowledge at the level of substantive pedagogy. This finding illustrates and explicates one of the main ideas of this book, according to which large-scale implementation of a pedagogical innovation combines aspects of general strategic planning with deep understanding of substantive pedagogy regarding a specific instructional innovation. These ideas have far-reaching implications for system-wide implementation of IBL. They are relevant for all organizational levels of the school system: the single school, the school district, and the entire educational system.

**Keywords** Inquiry-based learning (IBL) · Inquiry levels · Higher-order thinking (HOT) · Wide-scale implementation of instructional innovations · Mechanical, superficial implementation

## Introduction

Thirty students attend a history lesson. Instead of the traditional seating arrangement, instead of passively listening to the teacher while taking notes, the students sit in a computer room, busily searching the web, reading, interpreting, and integrating sources of information. In a civics class, as part of their work on a performance

assessment inquiry task, students collect data on manufacturers of playground equipment and on their cost in order to propose an informed plan for a neighborhood playground, where there used to be a neglected plot. In a science lesson, elementary school children are busy dipping objects made of various materials in a water tub, to inquire what floats and what sinks. In a math class, students measure an area in the courtyard to calculate the number of tiles needed to pave it. Finally, in a geography lesson, the students survey neighborhood residents to find out why they chose to live there.

All these are examples for inquiry-based learning (IBL). In recent years, the terms inquiry-based teaching and learning are frequently heard in educational discourse in many countries. Policy documents recommend IBL, educational leaders talk about it, researchers support it, and many teachers adopt it wholeheartedly. Other teachers, however, are averse to it and sigh from the bottom of their heart when required to apply it, mainly because of the workload involved. Students are also unhappy: I frequently hear from my university students that they recall IBL as an empowering experience from their school days, while others talk about a frustrating and annoying experience. IBL has met with great successes together with significant failures.

System-wide implementation of IBL is particularly challenging. The transition from traditional teaching and learning to inquiry-based teaching and learning represents a full-blown pedagogical revolution. It involves a fundamental revision in the perception and goals of learning, in teachers' and students' roles, in the design of lessons and of the learning environment, in the curricula, in the use of technologies, in evaluation methods, and more. Thus, together with the prestige and positive attitudes that accompany IBL, there is also the danger typical to every attempt at broad implementation of a complex pedagogical reform: superficial and mechanical implementation of IBL that would undermine its true spirit.

I am one of the avid supporters of IBL, in its finest. However, when I look at current educational systems in a disenchanted glance, I often see the disappointing outcomes of its system-wide implementation. A father whose son studies in an elementary school that emphasizes scientific excellence told me, with great frustration, about his son's inquiry-based science assignment. The class was studying the conditions for growing plants on other planets. After the boy and his team members considered several issues but failed to develop them into a research question, they decided to examine how plants can grow in waterless conditions. They decided to conduct an experiment and water plants with coke, bleach, and coffee. The teacher was happy that the children finally had come up with a plan for their experiment and was full of their praises. When the father asked about the rationale for choosing these particular fluids or where would water be found outside Earth to make coke or coffee, the child did not answer. He considered these questions irrelevant, since the teacher was pleased with the research plan. The father thought the teacher was mainly interested in having the children prepare their presentation for a parent-student meeting. She devoted considerable teaching time to preparing the students' presentations and refining their aesthetic appearance, at the expense of deep learning. The father emphasized that the level of the inquiry-based learning processes

and the fact that there were no criteria for evaluating them, pointed to superficial learning.

Looking at particular cases, one can certainly find fascinating examples for inquiry- and project-based learning, but these are often the exceptions rather than the rule. In a broader view, it seems that when the concept of IBL is examined in cases of large-scale, system-wide implementation, something in this important concept often gets lost. This is not the first time in history that implementing an inquiry approach runs into difficulties. The history of education offers several precedents (e.g., the progressive movement of the 20th century; see Zohar, 2013, Ch. 9). The problem is that if the implementation of IBL would fail again, the critics would not conclude that this is a great idea whose realization has failed. Instead, failed implementation might make the educational pendulum shift again to the opposite end—away from progressive pedagogies and back toward more traditional ones. Because IBL is tightly related to the development of students' thinking, the unique challenges involved in expanding its scope make it relevant for the main theme of this book. The discussion of IBL in this chapter is relevant to various types of education professionals, including teachers, pedagogical coordinators, subject coordinators (department chairs), principals, superintendents, and policymakers.

## **Inquiry-Based Teaching and Learning: A Review**

Dewey (1938) was the first to introduce the concept of inquiry to the educational field. He explained that inquiry is a process where the undefined and unknown become, in a deliberate and controlled process, a uniform and clear whole. Inquiry in education is currently considered a meta-concept for a set of educational approaches that share a common denominator, including IBL, project-based learning (PBL), and problem-solving. These approaches place the student at the center and encourage meaningful learning characterized by active knowledge construction through seeking solutions to problems or questions (Loyens & Rickers, 2011). Inquiry-based teaching offers an intellectual challenge. It develops curiosity and involves active, experiential, thought-oriented, and deep learning related to issues the students are interested in.

IBL has numerous definitions. For example, “In inquiry-based learning, students are encouraged to pose questions, to formulate assumptions and hypotheses, to gather and analyze data and to construct evidence-based arguments” (Maaß & Artigue, 2013). Linn et al. (2004) view IBL as engaging students in the intentional process of diagnosing and formulating problems, criticizing experiments, distinguishing among alternative solutions (hypothesizing), planning investigations, searching for information and processing it, constructing models, debating with peers, communicating to diverse audiences, and forming coherent arguments (Linn et al., 2004). One of the most commonly cited definitions was formulated by the US National Research Council (1996, 23):

Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry requires identification of assumptions, use of critical and logical thinking, and consideration of alternative explanations.

These definitions point out the tight relationship between IBL and higher-order thinking (HOT). To pursue a meaningful process of IBL, it is necessary to apply a variety of cognitive strategies, including posing questions, hypothesizing, planning, analyzing information or data sources, interpreting and integrating information, making comparisons, isolating variables, evaluating, and forming arguments. Forming evidence-based arguments is particularly critical to inquiry processes. In fact, every inquiry process includes a stage of drawing conclusions (whether based on an empirical experiment or on text analysis), and every process of drawing conclusions involves the forming of one or more reasoned arguments. The strong relationship between drawing conclusions and argumentation is one of the reasons for the central role of argumentation in policy documents and research addressing IBL (National Research Council, 2000, 2012b). As argued in detail below, one of the explanations for IBL often being so superficial is that students (and often also their teachers) are unable to use the thinking strategies involved in inquiry processes. Only when students master these strategies can they perform quality inquiry.

As suggested above, the concept of IBL is not new. It may be traced back to the writings of leading twentieth-century thinkers, such as Dewey, Piaget, Vygotsky, and Bruner (Maaß & Artigue, 2013). In the course of the century, extensive attempts have been made to implement IBL in schools, and the proverbial pendulum swung back and forth between them and more traditional approaches. Over the past few years, IBL learning has been widely adopted in education systems worldwide (for a review of select examples, see Crawford, 2014; Maaß and Artigue, 2013). This wide distribution has several reasons, including the search for student-centered learning approaches, the belief that IBL helps develop 21st century skills, the search for constructivist instructional practices and for relevant learning environments, the search for ways to develop epistemic understanding of the way knowledge is constructed in various disciplines, and research findings showing that IBL helps develop deep, transferable knowledge (Barron & Darling-Hammond, 2008; Bransford et al., 2000; Loyens & Rikers, 2011; Maaß & Artigue, 2013; National Research Council, 2012a; Zohar, 2013). Since, at its best, IBL can serve all these ends, it is currently popular.

In Israel, IBL has played a key role in recent pedagogical reforms—the Pedagogic Horizon Reform and the Meaningful Learning Reform (Israel Ministry of Education, 2009, 2015). As shown in Chap. 7, many high schools currently adopt IBL as part of a reform in the matriculation exams. Many elementary and junior high schools also engage intensively with IBL. Accordingly, in tens of thousands of classes, students experience varying doses of inquiry-based learning, with varying degrees of success.

## The Debate About Teaching IBL

Despite the multiple reasons supporting IBL, its implementation is complex, involving hot debates (Barron & Darling-Hammond, 2008). To understand this issue, I will describe the controversies around it and explain the conditions for the success or failure of some of the relevant instructional methods.

Multiple studies that have tried to assess the effectiveness of IBL report mixed results: some of them indicate a positive influence on conceptual knowledge, thinking skills, and learning motivation, whereas others show no such effects (Barron & Darling-Hammond, 2008; Coburn, 2003; Crawford, 2014; Loyens & Rikers, 2011). For example, Minner et al. (2010) reviewed 138 studies about IBL and reported an obvious tendency supporting its effectiveness. They found that teaching strategies that engage students in scientific inquiry involving active thinking, particularly drawing conclusions from data, have a positive impact on the understanding of scientific concepts compared to teaching strategies that rely mainly on passive learning. Conversely, McConney et al. (McConney et al., 2014) refuted the assumption that IBL facilitates knowledge construction. They used data from the 2006 PISA tests to examine patterns of reports by students from Australia, Canada, and New Zealand on their degree of engagement in IBL. Then they compared them to the achievements of the same students in scientific literacy and their attitudes toward science. The findings from all three countries were consistent: students who reported a low level of IBL showed higher-than-average levels of scientific literacy and lower-than-average levels of interest in science studies.

The contradictions between the findings of the various studies assessing the contribution of IBL may be explained in several ways. First, IBL is multifaceted, and the different studies addressing it actually examined significantly different teaching and learning methods. Second, most of the research in this area was based on standardized tests. These often examine basic knowledge and skills, rather than the profound knowledge and complex skills IBL is supposed to develop. Therefore, when the effects of IBL are compared to those of traditional learning, there is a lack of appropriate instruments for assessing the advantages of IBL. Third, large-scale controlled experiments comparing inquiry-based and traditional learning involve methodological difficulties. And finally, implementation processes of IBL suffer from inherent difficulties, so that some of the studies have addressed educational processes that have actually implemented a pale, diluted version of IBL. The final reason leads us to the main subject of this chapter, and I will elaborate on it in the following section. Please note that the scope of the current chapter does not enable a systematic review of the many studies evaluating IBL, and it will therefore concentrate on some select studies whose findings contribute to clarifying the main idea of this chapter.

## **IBL: Strengths and Weaknesses**

One of the sharpest criticisms against IBL has been offered by Kirschner et al. (2006), who argued that guided teaching is preferable to the open-ended teaching that usually characterizes inquiry-based learning. They support their argument with studies on the structure of human thought, difference between experts and laypersons, and the theory of cognitive overload. According to Kirschner et al., approaches to IBL that are characterized by minimal or no guidance are highly attractive intuitively, and therefore very popular, but also ignore theories about the structure of human cognition, as well as the findings of empirical studies in this area. As opposed to this intuitive appeal, these researchers argue that theories and studies over the past 50 years consistently show that minimal guidance approaches to teaching, such as IBL, are less effective than teaching approaches with a strong emphasis on guiding the students in their learning processes. Their clear-cut conclusion from a review of multiple studies is that after half a century in which education systems have experimented with minimal guidance instruction, it appears there is no research body that supports IBL. To the extent that research evidence has been founded on controlled experiments, it supports instruction with direct and intensive guidance almost without exception. At the same time, this research evidence objects to teaching based on constructivist principles with minimal guidance, particularly among students with little or only some initial knowledge of the content under consideration.

This sharp criticism of applying IBL in the classroom was countered by a forceful response article by Hmelo-Silver et al. (2007). They argued that Kirschner et al. wrongly identified inquiry-based learning and teaching with minimal guidance and that in fact the opposite was true. At its best, IBL makes extensive use of diverse guidance strategies, mainly based on mediation. They also offered extensive research evidence for the effectiveness of IBL. Since the issue of guidance in IBL is fundamental to the main argument brought later in this chapter, I will elaborate on the two sides to this controversy.

Hmelo-Silver et al. affirm that every learning involves some kind of knowledge construction. The fundamental question in the current debate is which teaching methods can support knowledge construction. They argue that Kirschner et al. oppose minimal guidance instruction approaches such as IBL claiming they are ineffective and inefficient while preferring approaches that provide direct guided teaching. According to Hmelo-Silver et al., Kirschner et al.'s definition for minimal guidance pertains to learning where the learners must discover essential information by themselves and use it to construct knowledge without any guidance. They argue that the definition of Kirschner et al. for instruction with direct guidance pertains to teaching that provides complete explanations for the concepts and processes students are supposed to learn.

Hmelo-Silver et al. argue that Kirschner et al.'s definitions suffer from two severe failures. The first failure is pedagogical. Under "minimal guidance learning," Kirschner et al. have grouped together several different pedagogical approaches,

without making the obvious distinctions between them: constructivism, discovery learning, problem-based learning, experiential learning, and IBL. This lack of distinction is misguided, as it ignores the fact that at least some of these pedagogical approaches, particularly problem- and inquiry-based learning, are not characterized by minimal guidance. On the contrary, at their best, these approaches support students' learning processes by providing extensive mediation and guidance. In their article, Hmelo-Silver et al. discuss a variety of guidance and mediation approaches that support IBL and quote multiple studies suggesting that applying them to teach IBL does result in significant improvement in learning outcomes. In fact, the improvement is achieved even when student outcomes were measured in standardized tests, which usually measure relatively simple learning goals. The improvements were even more salient when student outcomes were measured using assessment that is more appropriate for measuring the complex learning goals consistent with IBL, such as thinking skills, problem-solving skills, the ability to provide complex explanations, teamwork, and interpersonal communication skills.

According to Hmelo-Silver et al., there are a variety of successful approaches for guiding IBL: first, combining spells of direct teaching in an inquiry-based lesson, such as a short lecture that presents vital information for students' inquiry process; second, mediation by restructuring the assignment and providing clues, but without explicitly revealing the final answer; and third, directing the students to address relevant key concepts in the content area under consideration. Such guidance prevents students from wasting time and energy on aimless rambling, directing their attention to important learning goals. Mediation could be assisted by digital tools, but even when using them, teachers must play a key role. Teachers can guide their students to think deeply and model deep thinking processes. Explicit teaching of thinking strategies is essential to these moves. Such explicit teaching deals, in fact, with metacognitive knowledge and particularly with meta-strategic knowledge pertaining to the thinking strategies used in the course of IBL. Note that the comprehensive meta-analysis conducted by Hattie (2012) supports Hmelo-Silver et al. because according to Hattie's data, guided inquiry produces better results than open-ended inquiry.

This debate on the degree of openness as opposed to guidance in IBL processes is central to the argument made in this book. Common problems in large-scale implementation of IBL result from a lack of clarity regarding the required degree of guidance. Another relevant issue has to do with the depth of implementation and the quality of learning and teaching that are part of this implementation. It is easy for the teacher to tell her students to perform an inquiry task on a certain subject, with little or no guidance, expecting them to manage on their own. Often, however, this expectation is not met, and the students perform superficial and low-quality inquiry, as in the example at the opening of this chapter.

Profound and high-quality inquiry requires support with precise and professional guidance and mediation. Such guidance is challenging for teachers. They must possess deep knowledge of inquiry processes, devote time to preparing appropriate materials and to repeatedly read students' essays, talk to them, provide feedback, and evaluate the quality not only of the product but also of students' learning

process. Although such guidance is supposed to guarantee the quality of students' inquiry processes, it is difficult to meet its requirements when it comes to large-scale implementation (see also below and in Chap. 7).

These considerations directly affect the issue of scaling up: it is very easy to implement superficial IBL in many classes, with little teachers' mediation—when students are given inquiry assignments and expected to figure them out on their own (or with their parents' help, etc.). However, implementing inquiry processes that include appropriate teacher guidance and mediation requires extensive and methodical preparations in terms of developing learning materials, professional development, and appropriate evaluation methods (see also Chaps. 4 and 7). When attempting to do this on a large scale, it is essential to invest considerably in detailed pedagogical and strategic planning, as well as in the actual implementation. Such an investment is essential for attaining meaningful inquiry learning processes that will lead to constructing deep knowledge, rather than to superficial learning.

## Difficulties in System-Wide Implementation of IBL

The main theme of this book is highly relevant to IBL. Although the literature offers literally thousands of examples for successful, *small-scale* inquiry projects, attempts to implement IBL on a large-scale run into difficulties worldwide. One source of difficulties is the competition for resources in terms of time for learning. As suggested in Chap. 2, IBL requires time, but schools suffer from a chronic shortage of learning hours, and they constantly struggle to “cover the curriculum.” Sometimes, inquiry-based teaching does not even make it across the classroom door. Apparently, however, even when inquiry does enter the classroom and students are engaged in IBL, large-scale implementation often means that the learning that actually occurs is far from that envisioned by reformists.

It appears that inquiry approach to instruction is successful with teachers who are early adopters. These teachers are highly motivated to quickly adopt innovative instructional approaches and tend to participate in profound professional development (PD) processes. Research shows, however, that the effects of this success usually fade away when moving to wider implementation (Barron et al., 2008). Accordingly, studies on small-scale programs of IBL, with enthusiastic teachers and substantial investment in PD, demonstrate positive results. These disappear, however, when the studies examine the results of the same programs under conditions of system-wide implementation. The main reason lies in the complexity of open-ended IBL, including the complexity inherent to guidance mentioned earlier. This complexity requires a set of conditions, including the development of appropriate knowledge for teachers. It also requires extra budget to support additional time to enable teachers to construct new lesson plans, to guide students individually or in



small groups, and to devote more time for assessment. When the scope of implementation is widened, it usually becomes apparent that at least one of these conditions is not met. The result is inappropriate implementation, with the students receiving only a pale shadow of the original concept of IBL.

Due to the difficulties in implementation, teachers often adopt the façade of IBL, such as writing a research paper, but give up on the deep elements of the process. Too often, the thinking strategies involved in IBL are forgotten. In the current digital age, this state of affairs is often evident when students search the Internet for materials and then cut and paste pieces of information without having understood them in depth. If students decorate their work using animation and graphic features found on the web and submit some kind of “cool” creative product, their work might make a good impression. This is an illusion, however, because their learning has absolutely nothing to do with the profound thinking processes that are at the heart of IBL.

This state of affairs was indeed observed in an evaluation study of large-scale implementation of IBL (Gordon et al., 2003). The 1990s saw a system-wide process of implementing IBL in Israeli elementary schools. The study examined the effects of this process several years later. Its findings indicate that following the implementation, learning and teaching by inquiry were indeed very common. Out of the schools randomly sampled for the study, 75% were found to be engaged in IBL, and in most, this engagement comprised a significant part of the curriculum. Teachers reported that they considered inquiry to be an important element in their work, because it enabled them to fulfill multiple educational objectives that were important to them. In other words, in terms of their scope and the importance attributed to them, it appears that the system-wide implementation processes were successful. Nevertheless, serious problems were found with the substantive pedagogy of the process—that is, with the core of the relevant teaching and learning processes. The study found that the IBL often became a routine and uniform process with a standard pattern, at the end of which a uniformly shaped product was expected. The emphasis in teaching was on the end product, i.e., the written paper, rather than on the process leading to it. The emphasis on the end product also led to the intensive use of tools that highlights its external appearance, such as power point presentations, graphic programs, or photos downloaded from the Internet. In many cases, the investment in external appearance came at the expense of deep learning. The report stated that very little use was made of data and evidence that should lie at the very core of the argumentation constituting the conclusions of any inquiry process. Gordon et al. (2003) concluded that one of the main reasons for these findings is that teachers do not have sound understanding of inquiry processes and therefore cling to routine blueprints of writing and shallow aesthetic aspects that help them manage IBL in the classroom.

## **Mechanical and Superficial IBL and Inadequate Thinking Abilities**

As mentioned, at least when implemented on a broad scale, IBL is too often mechanical and superficial. A significant contributing factor is students' and teachers' level of knowledge of the thinking strategies required for conducting sound inquiry. In this context, two catchphrases have been coined in the literature: "learning by doing, not learning by thinking" (Barron & Darling-Hammond, 2008), which applies to all disciplines, and "hands on but not minds on" (Crawford, 2014), coined in relation to science education, to convey criticism against routine lab studies. At least part of the implementation problem of IBL is, therefore, the lack of systematic development of thinking skills that should have been the very cornerstones of inquiry.

To illustrate this point, let us examine the conclusion stage. In all disciplines, the conclusion of inquiry processes must include a reasoned argument, because the conclusion is in fact an argument that needs to be supported by reasons based on evidence or explanations. The quality of a conclusion increases when the argument is supported by evidence that are more numerous, relevant, and logically related to the conclusion. The conclusion becomes even stronger if it also refers to potential counterarguments and refutations.

If student have not mastered these aspects of argumentative thinking (as the literature consistently shows), how can they write conclusions at a high level? Moreover, if the teachers themselves do not master argumentative thinking, how can they guide their students in writing their conclusion, and how can they provide them with thoughtful feedback on its quality?

Obviously, similar questions might be asked about additional thinking strategies related to other inquiry stages, such as formulating research questions, planning investigations, thinking critically about information sources, integrating information sources, and analyzing data. This demonstrates the relationship between inquiry-based teaching and thinking strategies, without discounting the affective experiential value of IBL. Experiences of curiosity and discovery that often accompany IBL, especially in young children, are invaluable. The development of thinking skills can and should improve and refine discovery learning rather than suppress children's curiosity and enthusiasm while they are engaging with IBL.

Observing IBL from the perspective of its underlying thinking strategies shows why large-scale implementation often results in superficiality. Clearly, students who do not master the necessary thinking strategies and are not used to applying them in their routine learning would not suddenly begin to use them, out of the blue, when they move to IBL. Similarly, teachers who do not use these strategies in their own thinking, nor master the pedagogical principles for using them in class, would not suddenly start to apply them during instruction. Thus, part of the problem with the wide-scale implementation of inquiry in schools is the lack of system-wide engagement with thinking skills.

As we have seen in previous chapters, wide-scale implementation of thinking skills requires in-depth work on teachers' PD, as well as on developing students'

thinking strategies. Hence, the expectation of achieving profound inquiry processes without investing in constructing students' and teachers' thinking skills, as well as relevant teaching strategies, is hopelessly naïve.

A recent review of 25 international studies on teachers' PD in preparation for inquiry-based teaching (Zohar & Resnick, 2021) found that all studies but one referred in their theoretical section to the importance of the thinking skills students need in order to engage in IBL. It could therefore be expected that the PD programs would devote considerable efforts to developing teachers' ability to cultivate their students' reasoning. Only three studies, however, reported activities designed to work with teachers on developing relevant thinking strategies. If the goal is to develop teachers' ability to support their students in thinking-rich inquiry processes rather than conduct superficial, "mechanical" inquiry, then PD settings need to foster inquiry-related instruction of HOT proactively and methodically.

## **Educators' Beliefs About the Implementation of IBL**

Prevalent educators' beliefs on IBL also prevent broad and profound implementation. In what follows, I will examine these beliefs and assess their implications.

### ***IBL as a Fixed Linear Process***

The first belief considers IBL as a linear process that follows fixed stages. These may vary somewhat across disciplines but generally have a standard sequence:

1. Selecting a topic.
2. Formulating a research question.
3. Searching and collecting background information for constructing a theoretical review of the literature.
4. Deciding on the appropriate methodologies for answering the research question.
5. Collecting, processing, analyzing, and presenting the data. In the humanities, this usually involves working with texts: analysis, interpretation, comparative evaluation of primary sources, comparison, and synthesis. In the natural and social sciences, this involves collecting and analyzing empirical quantitative and qualitative data (through observations, experiments, questionnaires, surveys, interviews, etc.).
6. Summary, conclusions, and discussion—at this point, it is essential to verify that: (a) the conclusions are related to the research question and provide an answer to that question; and, (b) the discussion integrates the findings with various aspects of the literature review.
7. Bibliography.

The view of inquiry as consisting of fixed, linear stages has grown out of the conventional descriptions, in the 1960s and 1970s, of the processes scientists allegedly follow in their work. Accordingly, many textbooks on IBL described the stages of inquiry in terms of a rigid sequence and taught them accordingly. In the meantime, however, studies of how authentic scientific research is actually conducted found that in the real world researchers operate differently (Knorr-Cetina, 1983). It turned out that the work of researchers does not follow the orderly sequence of these stages. Although it usually consists of all these stages, it often skips back and forth and reiterates certain stages. For example, a researcher may formulate a research question and search for relevant background materials. After reading these materials, however, she might realize that previous studies had already answered her research question and that it is therefore not interesting enough for further study. The literature search can therefore lead her back to the stage of asking a research question and to the need to reformulate it. The new question can lead to a renewed and more focused literature search, and so on. Likewise, unexpected findings can take a researcher back to the literature and then result in a new or more refined research question. These examples indicate that scientists' work is more similar to free floating across the various stages of inquiry than to an orderly and linear transition from one stage to the next. The educational implication of this means that even in the classroom, teachers and students may float freely across the stages of inquiry, without having to cling to them rigidly.

### *IBL and the Writing of Inquiry Essays*

Another common conception identifies IBL with its end product: a written essay. Moreover, the common conception implies that the essay must consist of all the inquiry stages noted earlier. Writing such an essay requires significant investment of time and energy. Many teachers I have met over the years told me that facilitating IBL in their classroom was an amazing experience, and many even said it was their best experience in many years of teaching. At the same breath, they swore they would never do it again. Many teachers reported a uniform reason for that reluctance: the amount of work it required, particularly in guiding students through the process of writing an inquiry paper.

Parents are often also reluctant to repeat the ordeal. They argue that when their children are required to write an inquiry paper, the task is actually theirs. The school does not provide appropriate support and infrastructure, and the parents find themselves involved, willingly or less so, often writing the essay themselves. This obviously results in gaps between students whose parents can help them write the essay and students whose parents cannot.

Importantly, however, facilitating a complete inquiry process whose product is a written essay is only one possible model for IBL that can be applied in the classroom. Other models include:

- *Integrating selected inquiry stages in individual or group work or in class discussions.* In this model, the teacher presents—in the form of texts and films or even by transmission of information—various stages of the inquiry process regarding a certain subject. Then she opens only one or two stages for students' active thinking. For example, the teacher may present a topic and ask students to think about productive inquiry questions. Another possibility is to present a subject, a productive inquiry question, and the relevant theoretical background and ask the students to plan an investigation that would answer the question. Alternatively, the teacher may present research findings and ask the students to analyze the data and draw their own conclusions.
- *Using original (or adapted) research articles.* In this learning model, students follow other people's inquiry (usually that of expert researchers). First, they try to understand the process and the rationale that guided the researchers. Next, the teacher instructs her students to analyze the article and think about it critically. For example, could they improve the research question? Is the research design appropriate? Are the conclusions valid? What future research could be conducted following the findings? Importantly, in this model, students are active thinkers, but they analyze and criticize an inquiry process conducted by others instead of pursuing it themselves.

These two models are less demanding than conducting a whole inquiry process that ends with an essay. Teaching according to these models is less demanding for the teachers, because they may integrate them into a lesson plan that relies mainly on more traditional and familiar instructional methods. Therefore, teachers do not have to abandon methods they are comfortable with, leaping into unfamiliar terrains. This hybrid approach can enable teachers to engage with inquiry in ways that require less time and energy and are less threatening for them. In sum, IBL does not always have to be intense and demanding, but can instead involve a variety of instructional methods and levels of intensity.

## **Inquiry Levels: It's Not All or Nothing**

Unlike the common view relying on a polarized distinction between traditional and inquiry-based teaching, we can talk about *various levels of inquiry*. One manifestation of the varying levels is a sequence of various inquiry stages the teacher presents to her students as a given, as opposed to those she leaves to open-ended, independent thinking. For example, in the spirit of the previous discussion of superficial inquiry ("hands on but not minds on"), the teacher can introduce an activity that may seem as if it involves inquiry, such as a lab experiment in science or a research article in history, and deal with them in a way that leaves nothing for students'

independent thinking. In the case of the lab experiment, the students may be given a “ready-made” problem, clear instructions for conducting the experiment, and systematic instructions on how to process the data and what conclusions to draw. The students are asked to write a lab report based on this information. In the case of the history article, the teacher lectures on the main points in the text. In terms of the level of independent thinking required of students, both these cases may be classified to a very low level. In what follows, I shall call this Inquiry Level 0.

Researchers have proposed four additional inquiry levels, based on the degree to which students are required to think independently, as opposed to being passive learners. Accordingly, Table 5.1 presents five different levels of inquiry (e.g., Tamir, 2006).

Note that there are other possible combinations for inquiry levels, beyond those presented in the table. For example, Inquiry Level 1 can be reached when the teacher invites students to think independently in a different stage of the inquiry process (rather than the conclusions stage as in Table 5.1), such as formulating a question or planning the investigation.

The various inquiry levels have advantages and disadvantages. The advantages of high inquiry levels include the following:

- Students may select a topic and research question that interest them, thereby increasing their motivation for learning.
- The inquiry process is authentic, facilitating an experience of discovery learning driven by curiosity.
- Students gain the opportunity of experiencing a complete inquiry process, from start to finish, and get to understand how inquiry works.
- The process facilitates active and profound knowledge construction of the content under study.
- Going through all the stages of the inquiry process involves the development of a variety of thinking strategies.

At the same time, high inquiry levels also involve significant disadvantages:

- It takes long to complete the process, potentially at the expense of the scope of the contents learned.
- Managing the process can be difficult and even threatening for teachers. First, when teachers engage in traditional teaching, they have a sense of confidence

**Table 5.1** Inquiry levels

Inquiry level	Does the teacher present the:			
	Problem?	Solution plan?	Data?	Conclusions?
0	+	+	+	+
1	+	+	+	–
2	+	+	–	–
3	+	–	–	–
4	–	–	–	–

Yes= +; no = –

and authority generated by their mastery of the knowledge they own. Inquiry-based teaching shatters that confidence and authority. Second, open inquiry makes it likely that the teacher will be challenged by unfamiliar topics that students had chosen to investigate. Third, many teachers lack first-hand knowledge on IBL because they have never experienced it as learners. Fourth, teachers often lack the pedagogical skills required to facilitate IBL. Fifth, as mentioned, IBL often requires teachers to devote extra time and energy in a system that does not reward them for the extra effort.

- Lower levels of inquiry allow teachers to control the knowledge students engage with. Conversely, the more freedom students have to inquire into a topic that interests them and to ask original questions, the more their learning moves away from the formal curriculum, making it harder for teachers to use IBL as a means for teaching the assigned curriculum.

The level of thinking involved in the inquiry process is also influenced by the teacher's mediation. For example, there is a great difference between a student who completes all inquiry stages (Inquiry Level 4) with close guidance by the teacher and one who completes them without any guidance. This issue too, however, is not clear-cut. As we have seen earlier, guidance has been a central issue in the debate between Kirschner et al. (2006) and Hmelo-Silver et al. (2007). Whereas Kirschner et al. argued that IBL is characterized by minimal guidance, Hmelo-Silver et al. objected, arguing that, at its best, inquiry is characterized by intensive guidance by the teacher. However, guidance does not mean that students are spoon-fed by the teacher. Rather, guidance provides students with scaffolding that enables them to perform tasks they are unable to perform on their own but leaves them considerable space for independent thinking. Such guidance is a complex skill demanding knowledge and experience and, accordingly, requires long-term teachers' PD. The extent and nature of the guidance influence the actual level of students' thinking in each inquiry level.

## Conclusions

This chapter emphasized the scope and complexity of teaching inquiry. Implementing open-ended inquiry is a real revolution in terms of conventional teaching methods and school routines. It requires a knowledge infrastructure that many teachers don't have. It also requires school-based support, which is often lacking when inquiry-based teaching is attempted on a large scale. Under these conditions, experience shows that even if IBL is implemented in a large number of schools, there is a real problem with the depth of implementation, often resulting in mechanical and superficial learning processes.

It is easier to implement system-wide IBL with minimal guidance: Students are given an inquiry assignment and expected to figure it out on their own (or with their parents' help). Guidance, on the other hand, requires much more from the teachers

and, in turn, also extensive preparation of suitable materials and PD. Nevertheless, proper teacher guidance and mediation are the key for non-superficial inquiry. The multiple facets of IBL presented earlier provide specific examples for the general argument of this book regarding the difficulty of in-depth implementation of complex pedagogical change on a system-wide scale. They also point to potential ways for addressing the challenges involved: inquiry may be pursued modularly and to different degrees by (a) focusing on one or several parts of the whole process even in lessons that largely maintain more traditional instructional structures, (b) applying varied ways of inquiry-based teaching beyond working toward the demanding product in the form of a written essay, (c) applying the possibility of working on different levels of inquiry, and (d) combining various degrees of guidance and scaffolding. All these offer a variety of ways to engage with IBL.

Nevertheless, at its best, open-ended and complete cycle of IBL—from the stage of defining the problem to finding and presenting the solution—holds significant advantages. This process enables students to learn about topics that interest them and are relevant to their lives, to do so authentically, and to experience a joy of learning that enhances their motivation. Thus, there is reason to support the idea that all students will have opportunities to experience open-ended and complete cycles of IBL at least sometimes during their school years. Such learning has intrinsic value and should therefore be supported at least to some extent, even regardless of the degree to which it fosters the construction of knowledge and skills.

At this point, it is important to mention again the issues of relevance and students' interest discussed in Chap. 2. It is commonly argued that one of the most important advantages of IBL is that students investigate questions they themselves had formulated. Consequently, they feel that learning is interesting and relevant for their lives.

I support relevant learning that engages students and connects learning to their inner world. Yet, I disagree with the assumption that only topics the student themselves generate based on their own interests, can be relevant. Even when the formal curriculum, or the teacher dictate the topic, learning can be significant when teachers use instructional methods that make the topic relevant to students' lives. For example, if the literature teacher manages to initiate an inquiry assignment on a collection of poems that raises existential issues important to the lives of adolescents or if the history teacher initiates inquiry about leadership and manages to connect it to current political dilemmas, learning can be interesting and relevant.

Moreover, the expectation that interest and relevance are determined only according to what initially interests students severely narrows the school's role in expanding students' horizons and providing them with a broad and universal education. If the student has never heard of the Middle Ages, about Shakespeare, or nuclear physics, he is by definition unable to propose them as a topic for investigation. Does that mean that the school should give up on teaching these areas as legitimate subjects for learning in general and for significant IBL in particular? I contend that schools must not narrow the scope of teaching because of exaggerated expectation for relevance. At the same time, the education system should find ways to introduce



students to subjects currently distant from their world, making them relevant and interesting. This can be done in many ways, one of which is IBL.

Another point has to do with learning content knowledge, an issue elaborated on in Chap. 2. Some of the negative criticism of IBL has been influenced by failed attempts to implement such learning in previous reforms worldwide. Claims have been made that IBL has negatively affected the quality of students' knowledge, leading to ignorance. For example, the protest against the progressive movement that spread in the USA under the influence of John Dewey's ideas in the first half of the 20th century focused on the fact that the knowledge level of students who had experienced IBL was lower than that of students who had studied by traditional methods (for elaboration, please see Chap. 2 and Zohar, 2013). In the present chapter, I explained the reasons for the inherent difficulties in attempting to evaluate the contribution of IBL for students' learning. I also explained, however, that the more the inquiry process is open and the more it is dictated by students, the more difficult it is to attain learning of a structured body of knowledge that is included in the curriculum. Conversely, the more guided and closed-ended the inquiry process, the better it is able to encompass a larger number of concepts taken from the curriculum (even if at the cost of a lower degree of relevance and authenticity).

Does the present discussion suggest that IBL, and particularly open-ended IBL, should be recommended as a major approach to school teaching and learning? The answer is complex and depends on multiple factors. The present discussion assumes that IBL holds many advantages but that its mechanical and superficial implementation must be avoided at all costs.

Inquiry-based instruction is multifaceted. It can include many different situations, ranging between open- and closed-ended inquiries and between intensively and minimally guided inquiries. *The idea that IBL can take place in a modular way opens up the possibility that rather than "all or nothing," IBL may be adopted on a partial basis. Under such circumstances, the availability of necessary resources may dictate the extent and depth of implementation.* This idea has far-reaching implications for system-wide implementation of IBL. It is relevant for decisions at all the organizational levels of the school system—from a single school to school districts to the entire educational system. Choosing the best way to pursue IBL in a given level is complex and depends on the multiple factors reviewed earlier. Reflective change leaders may therefore consider the pros and cons of the multiple options for IBL, in order to create the best combinations for the unique needs and objectives of their particular educational setting.

Accordingly, designing IBL is a complex decision-making process involving both considerations of structural and of substantive pedagogy. Structural considerations include the extent of political support for the change process, its duration, budget, technological support, available organizational infrastructure for teachers' PD and for classroom support, incentives offered to teachers, and more. Other important considerations, however, are strictly on the level of substantive pedagogy, such as the following:

- (a) Meticulous choice of teaching objectives, including the decision of whether IBL would be part of learning a specific content or whether its main goal is to provide an empowering learning experience.
- (b) Choosing the most appropriate approach for the specific IBL process, given the unique educational context where it is being implemented. This choice is based on various student-related variables, such as the number of students involved, their level, their prior knowledge and experience with IBL, their age, etc.
- (c) The choice also needs to be based on various teacher-related circumstances, such as the possibilities for PD processes, teachers' knowledge about inquiry processes, and their relevant pedagogical knowledge. The latter consists of knowledge of appropriate teaching strategies—including how to provide students with accurate guidance, feedback and scaffolds.

These considerations can be decisive in choosing whether to support a complete inquiry process, including the writing of a final essay, or to prefer a modular approach focused on smaller, selective parts of the process. Making an informed choice based on these considerations within a given educational context requires a high level of pedagogical knowledge.

The discussion of large-scale implementation of IBL illustrates and explicates one of the main ideas of this book, according to which large-scale implementation of a pedagogical innovation combines aspects of general strategic planning with aspects that require deep understanding of substantive pedagogy. The influence of political and budgetary support on pedagogical considerations in the planning of IBL is an interesting example for the combination of these aspects. When IBL receives broad and long-term support at high political levels and when this support is manifested in large budgets that can enable systematic PD and appropriate conditions for teachers, open-ended IBL has a chance to succeed. Under these conditions, even learning that is *revolutionary* in terms of the extent to which it transforms instruction can succeed.

Conversely, without political support and the resources that enable deep implementation, any attempt for a revolution in learning and instruction is liable to end in superficial and mechanical inquiry. Under these circumstances, instead of giving up on IBL altogether, it is preferable to opt for more modest implementation, in small and gradual steps. This implies *evolutionary* implementation: modular work with a strong element of teachers' guidance focused on only some parts of the complete inquiry process. Such conditions may facilitate IBL that is not superficial and is tightly related to the objectives of both the IBL and the content of the school curriculum. The challenge inherent to taking this path is in how to implement IBL in small, moderate, and guided steps without killing the joy of learning and discovery. At the same time, it is important to make sure that the school curriculum also reserves significant space to more authentic inquiry. The process of deciding on the timing, setting, and “dosage” of authentic IBL also requires comprehensive pedagogical understanding.

The following chapters re-illustrate these general ideas by examining two cases of concrete system-wide implementation of IBL and HOT. Chapter 6 demonstrates

the challenges involved in implementing HOT and IBL in civics. Chapter 7 examines IBL through the implementation of what is known as the “meaningful learning” reform.

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## Chapter 6

# Developing Students' Thinking in Civics Education as an Example of Scaling-Up HOT Across the School System



**Abstract** This chapter describes a large-scale change effort in civics education, aimed at integrating HOT into the curriculum. Following a literature review, the chapter consists of two main parts. Part I provides a historical analysis, showing the bumpy road from policy to practice following rapid political shifts and less than optimal implementation of the desired instructional innovations. The second part discusses a 3-year period when there was an enhanced focus on implementing HOT in civics on a national scale. Some of the measures taken consisted of developing instructional leadership through intense PD on all levels; detailed design of assessment and learning materials; large-scale implementation of project-based learning and assessment; measures to preserve the fidelity of the message across levels of implementation; and sophisticated movement between central control and autonomy of educators on all levels. Together, the two parts of the chapter show the intricate factors that combined to form change in the state of teaching HOT in one school subject. Rather than focusing exclusively on successes, the chapter also gives a realistic sense of barriers and challenges. Although the details may diverge, similar challenges characterize any large-scale educational change process. This account gives an idea of what it takes to induce a system-wide change in substantive pedagogy in general, and in instruction of HOT in particular, across a whole school system. An extrapolation from the data explicates what sort of factors would be involved in scaling-up thinking-rich instruction across all school subjects.

**Keywords** Civics education · Large-scale implementation · Higher-order thinking (HOT) · Scaling-up project-based learning

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## Introduction

Education for citizenship and democracy is increasingly viewed all over the world as an important and central role of education. Even countries that do not offer a long list of mandatory subjects that all students need to learn often define compulsory goals of civic education, based on the view that education for democracy and citizenship is essential for maintaining a democratic state. It consists of three main components: knowledge and understanding of relevant contents, civic dispositions and attitudes, and intellectual skills (Crick, 1998). The latter is closely related to the main topic of this book. Fostering students' intellectual abilities is viewed by many as a crucial factor in preparing future citizens for sound participation in a democracy (Goodlad, 1984; Cogan, 1999; Westheimer & Kahne, 2004; Paul, 1992; Paul & Elder, 2000; Scheffler, 1973; Siegel, 1988; Gutman, 1987; Branson & Quigley, 1998). For instance, the British final report of the advisory group on citizenship ("The Crick Report") stated that "Open and informed debate is vital for a healthy democracy.... Civics education should thus develop skills of reflection, inquiry and debate. It should help young people learn to argue soundly and effectively, think for themselves, solve problems and make decisions effectively" (Crick, 1998). All these elements are of course part of the definitions provided in Chap. 1 for higher-order thinking (HOT).

The literature, however, also points to a probable gap that is being created in many countries between the goals declared in policy documents and the actual situations in many schools. While the intent is to build a more intellectually active and demanding curriculum, the long lists of prescribed content that crowd the curriculum often prevent teachers from engaging students in active thinking. There is in effect an absence of empirical research on the extent to which civic intellectual skills are actually being taught in schools all over the world. There is also no systematic identification of how to overcome the barriers standing in the way of implementation of effective approaches for teaching such intellectual skills (MacKinnon, 2008). The fragmented evidence that does exist indicates that in many countries transmission of facts is more prevalent in civics education than the cultivation of intellectual skills (e.g., Paul & Elder, 2000; Westheimer, 2008; Yang & Chung, 2009; IES, 2007; Davies & Issitt, 2005). For instance, the results from the IEA 1999 Civics Education study conducted across 28 countries showed a gap between the stated curricula in many countries in which long lists of factual knowledge are to be conveyed, but only an hour or two a week of classroom study is allocated to them. This study also showed that the required factual knowledge is often not related to concepts that are meaningful to students (Torney-Purta et al., 1999).

An analysis of the US results from this international study show that the US international standing was stronger in civics HOT skills than in civics content. The performance of US students on the civics HOT skills subscale was higher than that of students in every other country (National Center for Educational Statistics, 2001). Yet, the NAEP 2006 study conducted in the USA showed different outcomes. In this study a larger percentage of students demonstrated basic-level knowledge of civics

than knowledge that requires HOT (i.e., answering civics questions requiring analysis, evaluation, or taking and defending a position, IES, 2007). The disparity between the two tests can be explained by the fact that the IEA Civics Skills items are rather limited in their intellectual demands, while the demands posed by NAEP are more complex. Taken together, these findings show that even the US students who did well on the IEA Civics Skills items compared to students from other countries do not do well in civics test items requiring demanding intellectual abilities.

More recently, the 2009 International Civics and Citizenship Education Study (ICCS) set out to investigate civics knowledge, attitudes, and engagement among lower secondary school students in 38 countries, as well as their teachers' and school principals' beliefs (Schulz et al., 2010). The findings show that most of the teachers and school principals regarded the development of knowledge and skills as the most important aim of civics and citizenship education. This component of knowledge and skills included, among other things, the promotion of students' critical and independent thinking. The students' ICCS assessment of civics knowledge showed that on average, across participating countries, only 28% of students were at Proficiency Level 3, characterized by the application of knowledge and understanding to evaluate or justify policies, practices, and behaviors based on students' understanding of civics and citizenship (Schulz et al., 2010).

In sum, although we do not yet have an accurate picture of how much teaching for thinking actually does take place in civics classes, the data indicate that this issue still requires additional attention from practitioners and researchers.

## Chapter's Goal and Leading Question

The goal of this chapter is to address the issue of large-scale implementation of teaching HOT in high school civics by looking at a specific case of implementing HOT on a national scale in civics education in Israel. The chapter centers on civics studies, i.e., on the part of civic education taught as a formal school subject. The goal is to analyze the implementation process, adopting a dual approach: first, the chapter will provide a historical analysis of relevant policy-making and political transformations. Then, the chapter will zoom in on one specific period in which elaborate efforts took place in order to implement a large-scale change process focusing on instruction and assessment through a civics performance assessment task. The leading question of this paper is: What can we learn from the specific case of large-scale implementation of HOT in civics education in Israel about large-scale implementation of teaching thinking in general?

In order to understand the significance of the processes described in this chapter, I will briefly describe some background information about the educational context within which the large-scale change process has been taking place. At the end of high school, students take matriculation exams in seven mandatory core subjects: language (Hebrew/Arabic), English (as a second language), mathematics, history, bible, literature, and civics. For each subject there is a National Subject's

Superintendent (NSS) who is responsible for policy making and for the practical sides of teaching in this particular subject. The NSS's responsibilities include curriculum development, teachers' professional development (PD), and student assessment. NSSs report to the Director of Pedagogy and work with a team of instructors who are part-time teachers. Instructors are considered "the long arm of the NSS" because they are the means by which the policy formulated by the NSS can actually make its way to individual teachers through school visits and frequent meetings with small groups of teachers to discuss instructional issues.

## Historical Analysis: Civics Education in Israel Between 1995 and 2010 from the Perspective of Teaching Thinking

Figure 6.1 describes major junctions in civics education between 1995 and 2009. In what follows, I will describe each junction from the point of view of teaching HOT.

### *The Kremnitzer Report and Instruction of HOT (1995–1996)*

Until 1995 the civics curriculum in Israel was mostly fact-based (Ichilov, 2013). In 1995, an important policy making event took place in the context of civics education. The Minister of Education appointed a public committee ("The Kremnitzer Committee" – nicknamed after the name of the committee's chair) to suggest a new policy for citizenship education. In those years the Israel Ministry of Education was characterized by liberal views that were expressed by its pedagogical policy on many issues. The murder of Prime Minister Rabin in November 1995 had put civic education at the center of public discourse because of a common feeling that Israeli society needed to enhance education for democracy and tolerance.

The Kremnitzer Committee wrote a detailed report consisting of multiple recommendations in several areas (Israel Ministry of Education, 1996). The report defined the goals of citizenship education as multidimensional, emphasizing the same three dimensions mentioned earlier. This means an emphasis on attitudes, values and skills, rather than only on knowledge, including an emphasis on education for active and responsible citizenship: "acquisition of knowledge, understanding, making judgments, and decision on social and political issues, internalization of the values

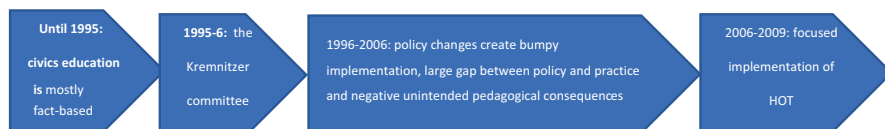


Fig. 6.1 Main events in teaching civics 1995–2009



of the state, the formation of a commitment to a democratic regime and willingness to protect it, the capability and desire to be an active, involved responsible citizen” (Israel Ministry of Education, 1996, section 4, p. 12).

A note about the relationship between facts, values, and critical thinking in civics education is in place here. The purposes of civics education are complex and particularly prone to be influenced by political ideology (Westheimer & Kahne, 2004). This general assertion is particularly true for the Israeli school system that is characterized by diverse ideological groups and sectors. In addition to universal debates about the nature of education for democracy (such as whether the emphasis should be on educating a Personally Responsible Citizen, a Participatory Citizen, or a Justice Oriented Citizen; see Westheimer & Kahne, 2004 for more detail), there is a stormy debate in the Israeli society about the extent to which civics education should reflect universal versus national- particular values. This debate becomes especially turbulent because of the ideological streams that exist in the school system, each with its own notion of citizenship and democracy: secular Jewish, orthodox Jewish, ultra-orthodox Jewish, and Arabic. The Israeli civics curriculum is therefore often at the center of hot public debates characterized by severe value conflicts. A review of the content of these debates and the ways they have been affecting the civics curriculum over the years have been reported elsewhere (e.g., Avnon, 2013). A description and analysis of these debates are well beyond the scope of this paper. Yet, it is important to keep in mind that the focus on the critical component of civics education (Avnon, 2013) that is highlighted in this paper through the notion of HOT, is embedded within rich and quite stormy debates concerning what needs to be taught in terms of values and facts in the civics curriculum. These debates and the politics that surround them have strongly affected civics education over the years. Despite these debates, the Kremnitzer report attempted to capture a consensus that was agreed upon by most sectors for the duration of the period reported here.

The report’s practical recommendations concerning the formal high school civics curriculum included several elements: curricular changes in terms of concepts, facts, and ideas; more hours added to the teaching of civics, adding weight to civics in the matriculation exam (increasing its weight from a “one unit subject” to a subject that is worth “two units”); a requirement to engage students in an active citizenship project whose final grade will be calculated as one third of the final grade; and a requirement that instruction will be organized around a list of thinking goals.

Regarding this last point—education for thinking—which is the core of the present discussion, the report argues that civics education must construct students’ ability to:

- Analyse social or political issues in all their complexity.... This involves encouraging rational and moral thinking ...
- Analyse issues addressing the tension between various human rights or between a human right and a public interest...
- Adopt a position on an issue in a controlled, reasoned, responsible manner...
- Engage in well-based, reasoned criticism....
- Debate issues in a civilized manner. (Israel Ministry of Education, 1996, p. 20)

Each of these points was further elaborated, reflecting the interrelationships between these abilities and HOT. For example, regarding the last point about debate, the report stresses that it requires ability for dialogic conversation, including the ability to justify one's position with diverse justifications and to attend to counter arguments posed by others. Although the report does not use the concept of argumentation, it clearly views the essence of argumentation as a central goal.

### ***The Bumpy Road from Policy to Practice in the Area of Implementing HOT in Face of Political Shifts (1996–2005)***

Subsequent sections of this chapter center on the two latter recommendations of the Kremnitzer report: to engage students in an active citizenship project and to organize instruction around a list of thinking goals. As discussed earlier, policy documents worldwide state the need to foster students' intellectual skills as part of preparing them for participation in a democratic society. However, the road from the policy advocating the implementation of HOT to the daily interactions between students and teachers was extremely bumpy in this context. In addition to common difficulties that always exist while attempting to bridge the gap between policy and practice, two specific factors were at play here. One concerns the inherent difficulties pertaining to any transition from a pedagogy centering on knowledge transmission to a pedagogy centering on fostering students' thinking and deep understanding. The second is that, as explained earlier, policy in civics education may be even more susceptible to political transformations than other subjects (Fischer, 2014).

Immediately after its publication in 1996, the Israel Ministry of Education adopted the Kremnitzer report. It was decided to increase the number of hours for studying civics, to increase the weight of the matriculation exam, to write a new curriculum and a new textbook, to develop a pilot of the active citizenship inquiry project, and to increase the frequency of HOT questions in the matriculation exam. However, as explained in what follows, these decisions were only partially implemented.

The implementation of some of these decisions took a long time. For example, although drafts of the new curriculum had been published earlier, the updated civics curriculum was finally completed and published only in 2002 (Israel Ministry of Education, 2002). Following the report's recommendations, the new curriculum indeed elaborated issues pertaining to teaching thinking strategies. For example, according to the curriculum document, "students should be able to:

- ...Apply the principles and concepts they had learned for examining and evaluating the political and social reality.
- ...Understand and analyze graphs, tables etc., present findings and draw conclusions from data.
- ...Process information, categorize, compare, analyze and find connections.
- ...Distinguish between facts and hypotheses and between facts and positions.
- ...Formulate justified positions based on information.

- ...Formulate supported and justified criticism. (Israel Ministry of Education, 2002, pages 10–11).

The new curriculum and the new textbook were written under the assumption that the increase in number of hours and in the weight of the matriculation exam are guaranteed. The new textbook (based on drafts of the new curriculum) was published in 2000. In order to adapt it to the ideas of the new curriculum, it consisted of a large foundation of facts, but also of a variety of thinking questions, mainly questions requiring students to analyze primary sources in a critical way, application questions (applying civics concept to current events), and questions that require students to make comparisons. The curriculum and textbook (designed for the scope of a “two unit subject” taught over 2 years) were designed in a spiral way. This means that in order to improve students’ deep understanding, complex concepts were re-visited several times in the course of learning. During this period the matriculation exam was indeed changed to include more HOT questions requiring comparisons, as well as analysis of current events and texts taken from daily newspapers.

Political changes are abundant in Israel and took place several times between 1996 and 2006. One of them however was especially crucial for the implementation process described here. In 2001 a new Minister of Education made new policies and announced new priorities that shifted away from civics education and from education for HOT. Consequently, between 2001 and 2006, pedagogy across the curriculum (not specifically civics) explicitly embraced a “back to basics” approach. The regime in which the new curriculum was about to be implemented was therefore quite different from the one in which the report was initially written. This obviously affected the implementation of the report’s recommendations. Although they were never officially rejected, their implementation was at best partial.

The new textbook had been in use since 2000, and new contents, concepts, and ideas were indeed taught in schools. The matriculation exam was indeed changed to include more questions requiring HOT. However, the shifting policies of the Ministry locked the large budget required for doubling the number of hours for civics studies, and it remained a “one unit” subject taught over 1 year only. Also, pedagogical support for the implementation of the new curriculum and for preparing teachers for the changes in the matriculation exam was limited.

## **Pedagogical Difficulties**

These circumstances created major pedagogical difficulties in the schools. One crucial issue was a very “crowded” curriculum. Because the recommended addition of hours was never realized, there was a need to adapt the new curriculum to a smaller number of hours than it was intended. Consequently, the number of chapters of the new curriculum that schools were required to teach was reduced by approximately 50%. However, there was still insufficient time for teaching for deep understanding of many of the concepts in the new intended curriculum which were abstract, complex, and hard to understand. As mentioned earlier, the original curriculum was

(wisely) constructed in a spiral way: many concepts were supposed to be revisited several times. However, in effect, because only half of the intended hours were allocated, the reduction of the number of chapters broke down the sophisticated spiral structure of the intended curriculum. Consequently, it was difficult for students to digest the complex concepts required for the exam. In addition, the budget for PD was cut down and most of the (limited) resources that were allocated to PD were used for developing teachers' content knowledge. The resources addressing the curriculum's HOT thinking goals were scarce, and even those usually did not address ways for teaching HOT in an explicit and systematic way. The pressure on teachers to cover a crowded curriculum while preparing students for the matriculation exam made them feel that they could not afford the time to engage students in deep thinking. Together with teachers' lack of proficiency in teaching thinking, this state of affairs meant that only a few of the thinking goals actually reached the classroom. Yet, it should be noted that during this period, an active citizenship "performance assessment inquiry task" (PAIT) was developed and piloted in 16 schools.

Despite this situation, as mentioned earlier, thinking objectives did make their way into the matriculation exam. The fact that the exam required HOT that was not properly taught, together with the large amount of required content and complex concepts that students did not have enough time to digest, made the exam extremely difficult. As a result, for several years, *the civics matriculation exam had the lowest mean score and highest rate of failure* among all mandatory matriculation exams. Students began to think of civics as a "difficult" and frightening subject. This unintended consequence is clearly not a recommended formula for increasing students' motivation to engage with civics nor for civics to become a popular topic.

In sum, a large gap existed between the intended and enacted curriculum, and little instruction of thinking actually took place in classrooms. Civics was perceived as an extremely "difficult" subject which in turn produced low students' motivation. This state of affairs demonstrates the nature of the gaps between the educational policy that addressed HOT in an explicit way and the actual educational practice that reached the classrooms.

## **New Policies and Focused Implementation of HOT in Civics (2006–2009)**

Then, in 2006, new elections once again brought about a new government and a new Minister of Education. Consequently, two new relevant policy decisions were made: the first pertained to strengthening civics studies and the second to teaching thinking across the curriculum. The new Labor Party Minister of Education decided to strengthen the school discipline of civics. Consequently, the recommendation made 10 years earlier, to increase the number of hours for high school civics, was finally adopted and financed, and a large budget for civics teachers' PD was secured (see below).

The second policy decision consisted of adopting the “Pedagogical Horizon-Teaching for Thinking” across the curriculum. Implementation of pedagogies geared toward developing students’ HOT took place in 20 subjects (Zohar, 2008; Gallagher et al., 2012). In all these subjects, HOT strategies were incorporated into curriculum and learning materials, PD programs, and assessment. In civics this process enjoyed an especially strong momentum because it joined forces with the decision to strengthen the subject. The implementation of the “Pedagogical Horizon” reform could therefore be executed in civics in a particularly comprehensive way due to the extra funding and large-scale PD processes that followed the Minister’s decision.

### **Specific Pedagogical Activities That Took Place as Part of a Large-Scale Implementation Process**

It is important to note that during the relevant period, I had been working as Director of Pedagogy in the Israeli Ministry of Education. In this role, I was involved in leading the system-wide implementation processes of the Pedagogical Horizon reform in general and in civics education in particular. This state of affairs has both an advantage and a disadvantage. The advantage is that my practical experiences allowed me to get hold of information and to gain insights that are rare for academic researchers. The disadvantage is of course the subjectivity of my interpretations of the events I am discussing.

In order to implement the Pedagogical Horizon reform in civics learning and instruction, that is, to enhance the frequency and quality of thinking activities, several specific pedagogical actions took place between 2007 and 2009 (Israel Ministry of Education, Office of Pedagogical Affairs, 2009).

1. Reducing the scope of the curriculum: In order for teachers to be able to devote time for extensive thinking activities in the classroom, there was a need to reduce the substantive scope of the curriculum. Although the number of hours was doubled, the extent of the original curriculum was reduced by 20%.
2. Developing a leadership team: The team consisted of the civics NSS and six senior instructors. That team had led PD for 22 additional instructors, who had in turn led the professional development of all civics teachers in the country and took leading roles in developing new learning materials and assessments.
3. Teachers’ PD: Most high school civics teachers (N = 2200) participated in PD designed to help teachers engage with HOT in their classrooms.
4. Constructing a website: An elaborate website was developed. All the resources developed for the PD courses (the course’s curriculum, lesson plans, and Ppts) were loaded onto the website, along with many additional instructional resources. The website was used for supporting instructors, teachers, and students.
5. Designing model learning activities: The leading team together with external experts, developed a set of learning activities and lesson plans that modeled how

to integrate specific thinking strategies with specific topics in the civics curriculum, according to the infusion approach (Zohar, 2004, 2013). Working as a team, they collaboratively negotiated the form and content of HOT materials for civics studies. The first goal of these materials was to serve as learning materials for the instructors' and teachers' courses. Further goals were to help teachers implement these lessons in their classrooms and learn how to develop similar learning activities and lesson plans for additional topics. The activities surrounding the development of these materials had created a sense of ownership of all those involved as well as the development of a shared "language of thinking" (Tishman et al., 1995).

6. Changes in the written matriculation exams: The leading team analyzed matriculation exams of previous years to determine the cognitive levels of its questions. Following the findings showing that most questions required lower cognitive levels, gradual changes were made in the formulation of questions, in the cognitive level of the questions, and in the rubrics designed for scoring students' replies.
7. Implementing a performance assessment inquiry task (PAIT): One of the most significant changes, however, was the implementation of the PAIT—an inquiry project addressing a practical civic problem that students carry out in small groups. The PAIT is a newer version of the active citizenship project recommended by the Kremnitzer committee. Although it had been piloted in 16 schools for several years, scaling it up to all high schools across the country was a major enterprise.

A detailed description of the implementation of all these activities is beyond the scope of this paper. Yet, in order to get an idea of the main principles of the implementation process, three activities will be described in what follows in more detail: the development of a leadership team, teachers' PD, and the implementation of the PAIT.

## **Developing Instructional Leadership**

### ***The NSS's Workshop***

A significant step in implementing HOT in civics was the development of instructional leadership by creating widening platforms for civics leaders' PD. The first platform consisted of the participation of the civics NSS in a long-term PD workshops designed for NSSs from many subjects. The idea to invest in long-term PD that centers on pedagogy for a group of such senior professionals was new to the system and quite revolutionary. The rationale was to create a group of leaders among those who have already been working in key positions in the MOE, who would become knowledgeable about teaching and learning HOT and would also be motivated to devote time and energy to take on leadership roles during the

implementation process. The workshop consisted of 150 academic hours, spread over three consecutive years. The number of participants in each year was approximately 25. Seven participants held a PhD degree, and all others held a master's degree.

Participants took an active part in shaping the course's curriculum: they brought up topics they wished to learn, shared their own work experiences, and led many of the sessions. This was done in order to accommodate the need of the participants to create a community of learners that have the time and the opportunity to reflect on their own practice and share the insights they had gained from it. Approximately 55% of the course's hours were led by academic experts, and 45% of the hours were led by the participants who presented cases taken from their work, bringing dilemmas from the field to share with their colleagues. The intense discourse that followed had gradually created a shared language and meaning.

The workshop addressed the following main topics: what are HOT strategies, the general versus the infusion approaches to instruction of HOT, thinking and knowledge construction, teaching for understanding, metacognition, practical ways for applying metacognition in the classroom, teaching for transfer, learning about a variety of programs for teaching HOT, fostering specific thinking strategies (such as argumentation, posing questions, making comparisons), instruction of HOT to students with low academic achievements, educational technology and teaching HOT, inquiry learning, assessment of HOT, high stakes testing and teaching HOT, teaching thinking across the curriculum; principles of designing in-service PD for HOT, and finally, a peer workshop in which NSSs presented models that they designed and implemented in their respective school subjects as a means for receiving feedback and for mutual brainstorming (Israel Ministry of Education, Office of Pedagogical Affairs, 2009).

### *A Blend of Tightness and Looseness*

One of the major characteristics of the process was a unique blend of tightness and looseness. Fullan (2007) addresses this issue as he discusses motivation for change (p. 43):

All change solutions... face the too-tight/too loose dilemma. If a situation is loosely formulated... the natural reaction is to tighten things. Command and control strategies do get results in these circumstances, but only for a short time and only to some a degree. If we then say that we need to give people more leeway—give them resources and trust them to do the right thing—the press for change is lost. In general terms, the solution to motivating people is to establish the right blend of tightness and looseness... to build both into the interactive culture of the organization.

In the case of the NSS workshop, the overall goal of the Pedagogical Horizon was presented in a rather tight and non-compromising way: transforming instruction in order to engage less in rote learning and more in tasks requiring thinking and deep understanding. Another aspect of “tightness” and control was that in order to

keep to the stated goal, plans for implementation and requests for funding submitted by the participants were carefully screened. Only plans that aligned well with the overall goal of teaching HOT were funded. Participants received, however, much freedom in three main areas: (a) participation in the workshop was voluntary; (b) they participated in setting the overall goals of later stages of the workshop and in designing specific sessions; and (c), in effect, the specific goals for each school subject were only loosely defined. Consequently, NSSs were free to analyze the initial state of teaching thinking in their subject, to choose among diverse possibilities those thinking goals that they believed to be relevant and suitable to the overall needs of their subject, and to design suitable specific implementation plans (see below). The workshop thus presented a theoretical framework, a general practical orientation and practical skills in a rather tight way. The specific practical orientation and detailed plans, however, were left to the discretion of each participant. This contributed to the participants' overall motivation and in particular to their sense of ownership, as will be demonstrated in more detail in the following sections focusing on civics.

Fullan (2007) and Hargreaves and Fink (2006) argue that most externally imposed reforms never get implemented properly because their designs are too inflexible to accommodate to the specific and varying needs of specific educational circumstances. Another benefit of NSS's freedom to plan their own idiosyncratic implementation plan was the participants' ability to tailor the change process to the multiple, specific contexts characterizing each school subject. According to Hargreaves and Fink, participants' freedom to adapt the change process to their specific needs potentially contributed to the longevity and sustainability of the educational change under consideration.

### ***The Medium Is the Message: Modeling the Culture of Thinking***

Another characteristic of the workshop was that it modeled the culture of thinking. In a "thinking classroom," the teacher's role is less authoritative than in a traditional classroom. Her main goal is to facilitate thinking processes rather than to be the source of knowledge, and she is an active participant in her students' quest for knowledge and understanding. In order for students to feel comfortable to express their views and to experiment with tentative ideas, the class atmosphere must feel "safe." These characteristics of the culture of thinking were modeled during the workshop. This workshop culture served as the model for many additional workshops, including in civics, that NSSs later led for their senior staff and teachers.



### ***Widening Circles: Capacity Building Across Multiple Organizational Levels to Increased Fidelity***

The risk in wide-scale pedagogical change processes is what Spillane (2004) calls “the telephone game,” namely, that until the message travels through the various levels to reach the classroom, it becomes so diffused and distorted that it is no longer useful. The difficulty, then, is how to transport the message of an innovation in learning and instruction through the system with high fidelity. This can be done by leaders who develop other leaders (“the long lever of leadership”, Fullan, 2005, p. 27), i.e., careful attention needs to be paid to developing the leadership of others in the organization. Rather than happening automatically, this process needs careful planning.

Because, as described in other chapters, the Israeli school system is rather centralistic with respect to curricula, policy changes made by NSSs actually reach most schools in some form or other. Yet, in order not to fall into the trap of schools adopting external facets of the change process while abandoning its deep, substantive essence, it was precisely the illusion of a quick and “easy fix” transmitted in a top down authoritarian manner that the Pedagogical Horizon tried to avoid by the careful development of pedagogical leadership. From an organizational point of view, the NSS workshop was not an end in itself but a link in a carefully planned implementation process focused on PD of educators on various levels. This allowed to accurately transmit the messages involved in the PH across the system to increasingly widening circles (Spillane, 2004; Hargreaves and Fink, 2006; Fullan, 2005, 2007). The NSS workshop served as the basis for an “implementation fan” by preparing a group of informed and motivated key leaders (tier 1) of learning and instruction in diverse school subjects. In addition, four other professional development courses (of 56 h) for more junior leaders took place in order to create a pool of approximately 100 potential instructors in diverse school subjects (tier 2). Due to the small number of leaders in tiers 1 and 2, the PD in that level was generic, that is, professionals from diverse disciplines were studying together. However, the ensuing PD courses that were designed for widening circles of educators (tiers 3 and 4) were subject-specific (see below).

In the next implementation phase, each subject’s NSS and the instructors who participated in the 2nd tier workshop (with additional help from external experts) formed a leadership team. This team designed the specific implementation plan for each school subject, including the development of content-specific learning materials and model thinking lessons. Another role of each leadership team was to develop PD for additional instructors and leading teachers who would eventually be able to work with teachers (tier 3). Finally, all those who had participated in the PD of tiers 1, 2, and 3 were responsible for the PD of a large number of teachers (tier 4). Various elements from the NSS workshop (activities, guest lectures, power-point presentations, video clips, and additional learning materials) were passed on to tiers 2–4. In this sense, the “spirit” of the NSSs’ workshop as well as many of its specific activities served as a model that was replicated across the system, thereby contributing to preserving the fidelity of the PH message throughout the system. This

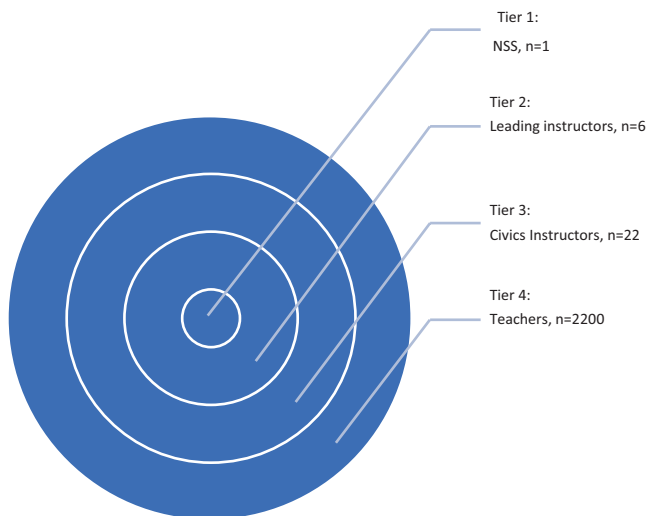
description fits all school subjects, one of which is civics. A more detailed description of the widening platforms for PD of civics leaders is described in the following section.

### *Capacity Building for Civics Pedagogical Leaders on All Levels*

Generation of the widening cycles of implementation through PD described in the previous section took place in all the subjects that had participated in the Pedagogical Horizon reform, including civics. The present section elaborates on how this process was actually carried out in civics (see Fig. 6.2).

The civics NSS had participated in the intensive generic NSS's PD workshop for 3 years (tier 1). In addition, six leading instructors had participated in a generic 1-year-long professional development course that was designed for leading instructors from several school subjects (tier 2). The NSS and the additional six leaders then formed a subject-specific leading team that engaged in developing new learning materials and assessments combining the principles of teaching HOT with the specific contents of the civics curriculum. The civics leading team (with some assistance from external experts) also led a PD workshop for additional 22 civics instructors (tier 3). Units from the PD workshops of tiers 1 and 2, as well as the subject-specific civics learning materials developed by the civics leading team, were applied in the tier 3 PD, thereby "preserving the coherence of the message" across leadership levels.

Following the PD that took place in tiers 1–3, these 29 civics leaders (the NSS, 6 leading instructors, and 22 additional instructors) became qualified to work on



**Fig. 6.2** Widening circles of implementation in civics PD

issues related to teaching HOT in civics studies. As noted earlier, instructors also teach part time. Their practical teaching experiences had contributed to their ability and motivation to adapt the teaching of thinking to diverse school environments in a flexible way. The leaders' PD therefore harnessed pre-existing pedagogical expertise and administrative functions to create a pedagogical leadership infrastructure that would facilitate the scaling-up of PD addressing HOT to all civics high school teachers in the country.

### *Civics Teachers' PD*

As explained in the previous section, the 29 civics leaders formed the pedagogical infrastructure for PD of all high school teachers. In 1 year, a total of 1100 teachers participated in 34 PD courses of 28 academic hours (tier 4) that took place all over the country. In addition, an online course of 56 hours was developed. The instructors also visited schools and supported teachers in their classrooms. In the following years, the same leaders' infrastructure was used for deepening the learning of the first cohort of 1100 teachers as well as to run courses for a new cohort of a similar number of teachers. Following this process, 4 years after the beginning of the development of the leadership team, almost all civics teachers in the country had participated in one of the civics HOT PD courses.

Teachers were motivated to participate in these courses by several incentives: first, participation in PD grants teachers in Israel points which eventually accumulate toward the qualification for pay raise. Second, the PD was part of a more holistic implementation process involving public discussion about the value of teaching thinking for twenty-first-century school graduates. Many teachers felt it was a valuable move and wanted to take part in this process. Third, part of the implementation process consisted of changes in the matriculation exam, including the introduction of the PAIT that consisted of 20% of the final civics grade (see below). Teachers believed that they needed the PD course in order to prepare their students for the new assessment (which was announced to become mandatory in 3 years).

In sum, numerous activities on both the structural-administrative and substantive pedagogical levels took place as part of implementing the HOT curriculum in civics. In terms of PD, a four-tier structure was developed. Rather than bringing in external experts to lead teachers' PD, great care was taken to develop capacities of leaders who had already been in the system. In this sense, the implementation process benefited from pre-existing administrative and pedagogical resources and was able to involve a relatively stable group of leaders from within the system, thereby increasing the sustainability of the change process. Together with the fact that elements from the NSS workshops were reproduced in the PD workshops of tiers 2–4, this detailed plan of four tiers of PD contributed to transporting the message of the HOT innovation in learning and instruction through the various levels of the system with high fidelity. Careful attention to developing the leadership of three levels of leaders (i.e., the NSS, the 6 leading instructors, and the 22 additional instructors) was a

prominent component in this process (Hargreaves & Fink, 2006; Fullan, 2005, 2007). Rather than happening automatically, this process indeed needed careful and detailed planning both in terms of the structural sides of the widening platforms for PD and in terms of the elaborate pedagogical body of knowledge addressed in all levels of the PD. Yet, the careful and detailed planning left plenty of room to the participators' independent initiatives and creativity. Starting from the level of the NSS who led the implementation process, leaders at all levels, as well as teachers, were free to shape thinking-rich learning and instruction in civics as they saw fit. In this sense the implementation process was indeed a blend of tightness and freedom. Another expression of the principle of blending tightness and freedom will be analyzed in the following section describing the implementation of the PAIT.

## **Implementing the PAIT**

### ***General Description***

One of the most significant changes in civics studies was the implementation during 2008–2012 of the “performance assessment inquiry task” (PAIT)—an inquiry project addressing a practical problem that students carry out in small groups. The PAIT needs to address a civic problem that is anchored in real life (taken from either the student's local community or from a wider sphere such as district, town, or state) but also needs to be connected to some of the formal concepts anchored in the civics curriculum. Each group of students is required to define a concrete civic problem, to investigate it by using written sources and by collecting empirical data, to suggest several possible solutions, and to perform a process of decision making to select the best solution. Examples of problems students had investigated in the PAIT are illegal employment conditions of part-time working teenagers, disabled people accessibility to public institutions, or equal gender representation in public positions in local administration. The final grade for this task constitutes 20% of the final civics matriculation score. The scoring is carried out by teachers according to a rubric developed by the civics leadership team. Assessment is therefore school-based, but to maintain quality control, a sample of 5% of the schools is also scored each year by representatives from the MOE.

The goals and characteristics of the PAIT were planned with an eye to transforming the nature of traditional civics learning and instruction in a fundamental way. Rather than transmitting information and drilling students to the matriculation test, the teacher had become an entrepreneur who is leading students' inquiry processes. The PAIT requires a considerable amount of HOT, and students were encouraged to become active and creative learners. Learning and instruction no longer consists of a linear, “one lesson for all,” but of dialogical learning, in which each group of students constructs a unique body of knowledge. The traditional strong control of the MOE with respect to the content of learning and assessment had to give way to a large degree of teachers' and students' autonomy. In order to facilitate such a

transformation on a national scale, it was necessary to carry out detailed pedagogical planning.

### *Detailed Planning*

Many resources and much attention to detailed planning on both the pedagogical and structural level were devoted to generate suitable PD workshops and school-based support for teachers. Deep and time-consuming discussions addressed the knowledge and skills teachers need in order to be able to guide students through the PAIT. Much time was also devoted to discussing issues concerning meaningful teachers' learning. Detailed pedagogical planning was required for additional components of the change process such as crystalizing the guidelines for the PAIT learning process and for its assessment.

Although a pilot project for 16 schools had already been on its way for 5 years, there was still a huge gap between declaring the goals of the PAIT in policy documents, and clarifying the goals on a practical, detailed level that would enable each teacher to know what and how she actually needs to do in her classroom. The process of pedagogical planning required months of intense and detailed efforts, addressing questions such as: What should be the characteristics of the PAIT? What would be considered a desirable end product? What are the criteria for a low-level, medium-level, and high-level product? What is the advisable scale of the project in terms of the literature review and the required empirical work? What should be the length of the written paper? Which thinking strategies should be taught explicitly so that students would be able to apply them in their project? What should be the optimal number of students in each students' group? These questions—all of which are examples of engagement in substantive pedagogy (for definition, please see Chap. 3)—demonstrate the kinds of detailed pedagogical planning that took place within the scaling-up of the PAIT from a pilot in 16 schools to a national scale.

Some of the deepest pedagogical discussions focused around the most appropriate means to assess the PAIT. In particular, much attention was devoted to the structure of the rubrics—to its categories and to the relative weight of the various parts of the project. The adaptation of rubrics was especially challenging to all parties involved in this process due to its level of openness and flexibility which were new to the system. This discussion connected to the previous questions regarding the characteristic of the task and the criteria for its quality, as well as to the planning of the PD (because of the need to prepare teachers for using the rubrics). In addition, it should be noted that planning was an ongoing process, because when the leading team had begun to receive feedback from the field, prior decisions were reconsidered, and plans were changed, sometimes considerably. For example, following the feedback from the field, the official mandatory rubrics has been updated three times in 3 years.

The discussions around these issues took place in several forums. The NSS with the six leading instructors led the process, but involved numerous additional

participants: additional instructors, teachers, the MOE director of pedagogy, representatives from the MOE divisions of curricula and of matriculation exams, representatives from the teachers' union, and representatives from the National Center for Evaluation and Assessment. The NSS and the leading team who were involved in all the discussions devoted much of their time to these discussions.

In sum, the implementation of the PAIT on a national scale required precise and meticulous pedagogical planning down to the smallest details regarding various facets of the task.

### ***“Letting Go”***

Despite the detailed planning, implementation of the PAIT involved a considerable degree of teachers' freedom and autonomy because of the need to interpret the principles presented by the MOE and to adapt them to the context of individual schools in a creative way. Although the education system is quite centralistic, and its administrative culture typically involves strict instructions that teachers are used to obey, it became clear to all those involved that in this case commends and obedience will not work. The instructional goal of teaching for open and free thinking required teachers to let go of their teacher-centered, authoritative routines. Teachers' difficulties and needs required the MOE to free both the ministries' administrators and the teachers from the rigid guidelines and regulations that all those involved had been used to. It turned out that “letting go” was not easy for both sides.

At the beginning, teachers requested clear and detailed guidelines. They had often expressed a need to have clear definitions for what is it exactly that they are expected to teach, how to do it, and how to assess it. When the leading team had published documents that aimed to guide teachers by giving examples of various ideas for instruction, teachers treated them as mandatory ways of teaching and kept coming back to the leading team with questions about how to carry out the details of these ideas. Teachers did not feel confident to interpret the suggestions on their own, to adapt them to their own needs, or to create alternative ideas. As time went by and they had gained experience with the PAIT, they became more relaxed and generated more and more original interpretations and new ideas. For instance, as noted above, model lessons in the PD workshops were developed initially as exemplary models rather than as a mandatory curriculum. Nevertheless, it turned out that at first most teachers adapted them verbatim. Consequently, in the first 2 years, the topic of the PAIT in many classrooms all over the country was the conditions for teenage labor, because this was the topic of a main exemplary PAIT unit developed for the PD workshops. However, after they had taught the PAIT once or twice, teachers had begun to innovate by developing their own independent tasks in a variety of topics or even to encourage students to come up with topics that interest them. At the beginning, instructors and leading teachers had also expressed a wish for clear and detailed guidelines and control. For instance, they expressed a wish for very detailed and binding instructions for assessment, expressing a fear that in the

absence of clear instructions, teachers will not engage in “serious” assessment, thereby compromising the quality of learning. After a while, they too became more relaxed and accepted the need to leave a wider space to teachers’ discretion.

This process was facilitated by a conscious decision of the NSS and the leading team to adopt a supportive rather than the traditional authoritative approach toward teachers in order to help them in the difficult transition they were expected to make. Instructors, school principals, and teachers were invited to participate in “thinking tanks” addressing various issues in the implementation of the PAIT, to express the difficulties they had encountered, as well as the insights they had gained from their field experiences, or to send in their comments in writing. Following dozens of such meetings that took place all over the country, the guidelines were changed considerably. The general direction of all changes was increasing flexibility and allowing teachers growing pedagogical freedom and autonomy.

An examination of the regulations for the PAIT learning process and assessment rubrics provides several examples for this tendency. For instance, following the feedback received from the field, more flexibility was granted to teachers in terms of the number of students in each group or the time and duration of the project. In the rubrics the increased flexibility was expressed by simplifying the criteria and making the rubrics more user-friendly and by issues such as increased teachers’ autonomy to change the relative weight of various criteria, to give students bonuses according to teachers’ judgments, or to allow teachers to increase the differentiation among the final grade of students working in the same group. Three years after the beginning of the PAIT implementation, it became mandatory, and most teachers reported that they had adjusted to leading it.

## **The Threat of Administrative Obstacles**

The implementation principles described in the previous sections may make an impression of an orderly and rational process. In fact, numerous other factors, many of which were chaotic and incidental, had a large influence on the implementation process. These factors were generated by diverse processes (seemingly unrelated) that took place within the school system at the same time. Each of these factors could have been an obstacle that would block the continuation of the implementation process. In the case of implementing the reform in civics education, these barriers were successfully removed due to either hard work or incidental developments. In other scaling-up processes, similar obstacles may prevent successful implementation, despite the considerable amount of resources invested in the change process. In such cases, many of the resources invested in planning and executing a change process are simply wasted.

In the present case, I am personally familiar with the barriers because of my role as Director of Pedagogy in the MOE, who had led the large-scale change processes described in this chapter. It is interesting to note that the amount of time that I needed to invest in order to overcome those barriers was far more than the time I

invested in the detailed pedagogical work of designing the instructional aspects of the implementation. Because of bureaucracy and the organizational culture of the MOE at the relevant period, the implementation would have stopped completely without my personal involvement in many of the details of the work needed to break the barriers. Three relevant examples consist of my involvement in issues pertaining to legal issues related to appointing new senior personnel; to problems that came up with the teachers' union; and to bureaucratic problems created by the need for creating new forms to report students' grades on the PAIT. Clearly, this state of affairs is far from being efficient. Reflecting on these examples, it is clear to me that without solving even one of these barriers, the huge efforts spent on the pedagogical sides of the implementation process would have been useless, bringing the whole process to a halt. Once again, these threats document the tight interrelationships between the instructional and structural aspects of a large-scale reform.

## Discussion and Conclusions

The goal of this chapter is to examine the process of large-scale implementation of HOT in civic education. The first part of the chapter provides a historical analysis, showing the fate of a policy decision to foster HOT across time. The second part of the chapter focuses on one period in which extensive activities to implement that decision took place. Together, the two parts may give a broad perspective of what it takes to actually scale up changes involved in instruction of HOT across a whole school system.

The historical analysis shows that the way from the Kremnitzer report policy declaration to what actually had taken place in classrooms across the system had been long and bumpy. The analysis presented here is a private case showing how political, ideological, cultural, and bureaucratic factors interact in determining an educational policy's short- and long-term sustainability (Ball, 1994; Fullan, 2009; Hargreaves & Fink, 2006; Levin, 2008). In the case of teaching thinking in civics, like in other aspects of this curriculum, political ideologies may play a more prominent role than in other school subjects (Mathias & Sabar, 2014). The policy did cause several practical changes (e.g., a new curriculum, a new textbook, a few changes in PD and in the matriculation exam, a pilot of the PAIT). For more than 10 years however, impacts were slim, sometimes causing unexpected (and undesirable) consequences such as in the case of making civics a difficult and frightening subject. In 2006, two separate policy decisions (intensifying civic studies and the "Pedagogical Horizons- teaching for thinking") supported each other to facilitate increased implementation of HOT in civics education. The decisions were supported by an increased budget for additional hours for PD and for students' learning. If any of these two decisions would not have taken place, it is reasonable to predict that the implementation of the Kremnitzer report's recommendations would have continued to limp, as so often happens to policy decisions regarding instruction of HOT. The intense implementation of the report's recommendation that had taken



place 10 years after it had been published had therefore taken place due to reasons that are quite incidental to the report itself. The strong impact of political and ideological factors does not mean that these factors are deterministic and that hard work on the pedagogical level can or should be ignored. Although in 2006 the political conditions for implementing HOT were favorable, the implementation process did not develop by itself. In addition to the planning of the structural and strategic dimension of the change process that is always needed for the success of any educational enterprise, the implementation of HOT required rigorous and detailed planning and execution on the level of substantive pedagogy level. Scaling-up HOT across the whole school system required specific and elaborate knowledge of HOT, pedagogical knowledge in the context of teaching HOT (Zohar, 2004, 2008) and deep subject matter knowledge (of civics) that needed to be tailored into the implementation design in numerous points. Weaving that sophisticated knowledge into the design of the PD workshops in a detailed way was crucial for generating a focus on coherent teaching of thinking throughout the system.

A fundamental component of the implementation process revolved around the development of instructional leadership through intense PD on all levels. The analysis shows that starting from the NSS, through the leadership team, instructors, leading teachers, and, last but not least, teachers, the PD process provided a focused goal, a theoretical framework, and practical instructional tools that had initiated “top-down” learning processes. Despite these “top-down” processes, the analysis also shows growing freedom and autonomy. A key feature of the implementation was that educators on all levels expressed creativity and generated initiatives in “bottom-up” processes. Increasing the democratic spirit of “teaching for thinking” throughout the organization was crucial. Deep learning combined with a message of autonomy generated intense pedagogical discourse (that was rather new to the culture of the MOE) among educators on all levels. This provided an engine for creating and sharing new teaching ideas. In addition, autonomy was necessary for the ability of civics educators to attend to the context-specific cultural and educational circumstances that were unique to each school and classroom and to adapt the change process to their highly idiosyncratic conditions. Without such adaptation the change process would have collapsed. The blend of “tightness” and increased autonomy were also demonstrated in the analysis of the process of the PAIT implementation.

On the face of it, the tight “top-down” initiative seems to contradict the recommendation for more relaxed “bottom-up” initiatives. But similar to Fullan (2007) and to Hargreaves and Fink (2006), our argument is that in the complex reality of implementing a system-wide pedagogical change, these two seemingly contradictory trends facilitated and supported each other. In effect, the case of implementing HOT in civics studies is a specific example of the general principles put forward by these researchers and argue that these principles are crucial for scaling-up the thinking curriculum: the “top-down” processes are necessary to generate and maintain a coherent message while the “bottom-up” processes are necessary to generate motivation, creativity, adaptation to individual circumstances, and harmony with “the spirit” of teaching thinking. Interestingly, much of the “top-down” component

consisted of the development of human capacity rather than simply of rules and regulations. It shows that endowing teachers more professional knowledge contributes to increasing rather than to undermining teachers' autonomy, even when it is initiated in a "top-down" manner.

Two additional significant hallmarks of the process were an emphasis on developing pedagogical leadership and detailed pedagogical planning.

In sum, this chapter shows the intricate factors that combined to form a change in the state of teaching HOT in one school subject. Rather than focusing exclusively on the successes, the chapter tries to also give a realistic sense of the barriers and challenges, as well as of their development across time. Even though the details may diverge, such challenges are innate to any educational change process. Assessing the depth and sustainability of this change process is still waiting for future research. Yet, this account gives an idea of what it takes to induce a system-wide change in substantive pedagogy in general and more specifically in instruction of HOT, across the whole school system. Although this chapter focuses on civics, one can extrapolate from it to understand what it would take in terms of detailed pedagogical planning and implementation to lead a similar change process in all school subjects.

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## Chapter 7

# Feedback from an Ongoing Reform: Analyzing the Implementation of the Meaningful Learning Reform in High School



**Abstract** This chapter analyzes the implementation of a wide-scale reform in learning and instruction. The “Meaningful Learning” Reform is the largest effort ever conducted in the Israeli school system to change substantive pedagogy (the core of instruction). Some of the major goals of this reform are fostering higher-order thinking (HOT) and inquiry-based learning (IBL). Drawing on interviews with 46 teachers, the chapter portrays the variability in the experiences of teachers in different schools during the first years of this major reform. In some schools the reform facilitated a substantial improvement in the quality of learning and instruction and in teachers’ pedagogical self-efficacy. According to teachers in others schools, the reform created chaos, a decrease in the quality of teaching and learning, and a decrease in teachers’ pedagogical self-efficacy. Teachers in these schools vividly describe the frustrations they have experienced, stressing the absence of practical tools to teach differently and of opportunities to learn how to do so and thus to make the change they were required to execute. Their descriptions provide firsthand evidence for the necessity of the meticulous work required for planning and executing large-scale change in substantive pedagogy.

**Keywords** Meaningful Learning Reform · Higher-order thinking (HOT) · Large-scale implementation · Science education reform · Changing instruction by changing assessment

## Background

In 2013, the Israeli Ministry of Education (thereafter “the Ministry”) issued a national educational reform entitled “Israel Graduates: Transitioning to Meaningful Learning.” The story of this reform offers a fascinating opportunity to examine how many of the ideas discussed throughout the book unfolded in a recent system-wide effort to improve learning and instruction. The reform was aligned with progressive pedagogical approaches and was committed to incorporating 21st century skills into curricula of all school subjects. According to the policy documents outlining the principles of the reform, schools must work toward the goal of meaningful learning

and make sure it happens across all years of schooling. According to the program, "...[in] meaningful learning students raise questions, identify sources of information, process information, and generate new knowledge relevant to their everyday lives and to life in the technological era of the 21st century. The goal of meaningful learning is to develop critical thinking, creativity and independent learning, and to encourage personal growth and social involvement" (Israeli Ministry of Education, 2014). Thus, the program's building blocks are higher-order thinking (HOT), deep learning of topics that interest students and meet their needs, active learning that takes place either individually or in small groups, and experiential learning. The program also emphasizes excellence and the maximizing of individual potential, along with the development of good values and spiritual growth. The Ministry published a master document with the overall policy of the program for all grade levels with reference to different population segments (Israeli Ministry of Education, 2014). Officially, the program's implementation began in September 2014 after the Ministry had undertaken many preparatory steps to facilitate its systematic implementation. In fact, the Education Minister, who initiated and led the program, resigned after only 18 months in office. The next Education Minister preserved most of the program's components, at least at the beginning of his term. Over the next couple of years, however, the new Education Minister replaced the Ministry's Director General and other senior officials who had initially led the reform. At the time of this writing, it is still too early to determine whether and to what extent the program's implementation will continue over the next few years.

As stated, one of the program's building blocks is teaching that fosters independent and active learning involving students' thinking, creativity, and inquiry. Hence, the program is relevant to the overall topic of this book. Another building block refers to assessment. Based on the assumption that in order to change teaching methods, it is necessary to implement concurrent changes in assessment methods, the program also included the implementation of extensive changes in assessment.

The new assessment methods were meant to limit the tendency to rely on high-stakes standardized achievement tests. Instead, they were aimed at testing the outcomes of meaningful learning and at providing greater weight than before to school-based assessment, highlighting teacher's discretion in assessing their students' achievements. In elementary schools, these changes meant the cancellation of the external high-stakes Meitzav<sup>1</sup> examinations, changing them to internal, school-based tests. In high schools, there were even more substantial changes regarding the matriculation certificate. These changes resulted in (a) a reduction in the number of external exams; (b) a cancellation of all matriculation exams in the tenth grade; (c) the introduction of mandatory community service; (d) a reduction in the amount of material covered by the external examinations; and (e) an increase in, and diversification of, school-based assessment methods (Israeli Ministry of

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<sup>1</sup> Hebrew acronym for standardized testing, literally "school efficiency and growth indices," administered (during the relevant period) in the fifth and eighth grades.

Education, 2014). Because the data in this chapter concerns the two latter changes (d and e), I will explain them with some elaboration in what follows.

Deep, active, relevant, and meaningful learning involving HOT takes longer than passive learning focused on rote learning. In order to support teachers in engaging their students in meaningful learning, the Education Minister instructed schools to reduce the amount of content studied in all subjects in about 25%. Afterward, the National Subject Supervisors (who lead instruction and assessment in each school subject) were asked to divide the remaining content into two unequal parts. The larger part consisted of 70% of the material. This part consisted the mandatory knowledge and skills of each discipline that schools needed to teach. This part would also become the target of the external matriculation exam that students would need to take in each school subject. The remaining 30% was taken out of the category of “mandatory studies” and was allocated to a category named “elective and elaboration.” The idea behind the “elective and elaboration” part was to provide schools and teachers with autonomy to select topics, to design methods of learning and instruction, and even to design their own assessment methods. Accordingly, an important innovation of the reform was that 30% of the final grade, which had previously been included in the external matriculation exam (and therefore addressed mandatory, prescribed parts of the curriculum), became an internal grade given by each individual school (and therefore addressed the curriculum in a much more relaxed and flexible way). For this part of the final matriculation grade, the Ministry encouraged schools to develop alternative assessment methods such as inquiry papers, final products of project-based learning, portfolios, etc. (Israeli Ministry of Education, 2016). An analysis of this component of the reform using the model suggested by the Van Leer Education Group (2007) indicates that it is clearly a step toward more pluralistic and thinking-rich learning (see Chap. 2).

When we try to assess the effect of the “Israel Graduates” reform on curricula and on the quality of teaching and learning in the upper grades, it is important to pay close attention to two significant points that, for some reason, have eluded the public discourse regarding the reform. The first one concerns *the scope of the reduction* in the curricula of the various school subjects. In fact, the scope of the mandatory curricula was cut twice: first, as mentioned earlier, only 75% of the original scope of the curricula remained in place. However, at a later stage, this material was further reduced by 30%. Cumulatively, only 52.5% of the initial content that was mandatory before the beginning of the reform’s implementation process still remained. The second significant point concerns the speed of the decision-making on cutting the material and the extent of deliberation that went into that process. In the past, curricula in Israeli schools were the outcome of orderly, profound, and meticulous work conducted by subject-specific curricula committees. Based on long (at times, too long) discussions between subject matter experts and educators, these committees determined what schools needed to teach in each school subject. The committees also determined the learning sequence that schools needed to follow in order to support the construction of students’ coherent knowledge. By contrast, the command to reduce a large part of the curriculum in each subject in order to adapt it to the so-called “70/30 Reform” forced the National Subject Supervisors to work on a

very tight schedule. The outcome was that curricula underwent massive cuts without any systematic discussion on what should stay and what should go. Furthermore, the Ministry conducted no general discussion of the question of what Israeli school-children should know in each of the school subjects in the first third of the twenty-first century and of what are the criteria for high-quality knowledge. I would like to stress that, in writing these words, I do not mean to say that there was no need for dramatic changes in the curricula, on the contrary. As stated in Chap. 2, the current changes regarding knowledge and information along with the ongoing digital revolution definitely require fresh thinking about the goals of education and about what schools need to teach. Such thinking may have resulted in an updated list of school subjects, in an updated scope of what needs to be taught in each school subject, and in defining new learning areas. Accordingly, the Ministry could have conducted an orderly and thorough process of comprehensive thinking which may have led to an improved and updated curricula. Instead, however, the Ministry took the pre-existing curricula, whose rationale was shaped in the second half of the twentieth century and, in order to presumably adapt teaching and learning to the 21st century, quickly chopped them into pieces and threw some of the pieces away. This process dismantled the structures of the old curricula, which, even if they were not up-to-date, at least had an internal logic and coherence. In other words, instead of updated curricula providing a systematic approach to current schools' needs, this process left the school system with piecemeal curricula based on the needs and approaches of the 20th century. These events are significant as they frame the context of the data presented in the next sections. It is important to understand that the data, describing teachers' experiences while implementing the "Meaningful Learning" Reform, were collected in the context of these changes to the curricula.

In 2016, the Israeli National Authority for Measurement and Evaluation in Education published a comprehensive report assessing the first year of the program's implementation (National Authority for Measurement and Evaluation in Education, 2016). Some of the findings are extremely relevant to the data cited in this chapter, and therefore I shall provide the gist of the report below. The report demonstrated that the initiation of the reform had considerable impact on the educational system's interest in pedagogy, and that it provided a new language to discuss learning and instruction. The program introduced the concept "meaningful learning" as well as a whole galaxy of other concepts explaining it. In addition, the program resulted in a focus on implementing meaningful learning and in giving priority to organizational processes that supported it across the system: from the level of the Ministry's headquarters to the level of individual schools and classrooms. Numerous professional meetings discussing meaningful learning took place throughout the school system, attended by senior officials from the Ministry, as well as by district and school leaders. Professional knowledge and instructional tools were developed and disseminated. "Meaningful learning" became a central and prevalent concept in the pedagogical discourse throughout the school system; anyone still unfamiliar with the term was looked upon as a recent arrival from another planet.



At the same time, the report clearly states that the professional development (PD) programs intended to help teachers implement meaningful learning in their classrooms have not yet met needs and that the steps made to train instructors<sup>2</sup> in meaningful learning and alternative teaching methods have been insufficient. By many indices, the assessment findings from high schools were less encouraging than from elementary schools. For example, when it came to teachers' PD, a Likert-type scale concerning teachers' views of the contribution of the PD courses showed an inverse relationship. Scores obtained from teachers in the higher-grade levels were lower than the scores from teachers in the lower-grade levels (from 70% in elementary school, to 64% in junior high school, to 57% in high school). This would seem to indicate the need for more sources of PD and/or improving the quality of existing ones for the upper grades. During the surveyed year (which was the first year of the implementation of the reform), a significant number of teachers participated in various formal PD programs (either at PD centers or online). In addition to positive assessments of these programs, the survey found that more than 80% of the teachers reported a need for additional instructional tools in order to be able to teach according to the principles of the reform. As noted, the study found that the need for PD was greater among teachers in the upper grades. The responses of school principals indicated that they, too, felt there is room for improvement in PD: only 50% of elementary school principals, 41% of junior high school principals, and 27%(!) of high school principals thought that their teachers have the knowledge and tools to teach according to the principles of the Meaningful Learning Reform. Furthermore, the students' own evaluation of the relevance and value of their learning was hardly encouraging: about two-thirds of elementary school children and only one-half of junior high school children (and fewer still high school students) reported that they have a clear sense that their learning is very relevant and highly valuable or that it is challenging.

Regarding the change in assessment methods in the upper grades (the "70/30 Reform") described earlier, most students reported that they do not understand what they are expected to do according to the new guidelines. Based on what they did understand, they did not think the method is appropriate. While the "70/30 Reform" was not met with a great deal of opposition, the principals, teachers, or students also did not greet it enthusiastically. The study found that during the first year of implementation, it was not clear to teachers how exactly they needed to execute the "70/30 Reform." Teachers reported that they needed additional instructional tools and further guidance in order to be able to execute it successfully. In addition, it seemed that this change placed a greater burden than before on teachers and students: the 30% assessed by alternative methods did not reduce the effort needed to prepare for the traditional exams, but rather added to it. Some National Subject Supervisors did not reduce the amount of material the students were expected to know as the

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<sup>2</sup>Instructors are experienced teachers whose role is to guide teachers in using new ways of instruction through PD and school visits. They form an important link in the implementation of policy changes because they are the ones who actually work with teachers on how to apply changes in their practice.

program called for, and this added greatly to teachers' and students' workloads. The quantity of the material was supposed to have been reduced to make room for better quality of learning, but this did not happen. In addition, the implementation process failed to reduce the pressure issued by various entities (such as districts) to raise test scores.

Many researchers agree that PD is the most important component in a pedagogical reform. It is therefore important to listen to what the report has to say about PD:

Research findings indicate a wide gap between the ideal and the real in the most important resource of all, i.e. PD (workshop sessions, seminars, and so on). The PD programs in the various school subjects for all grades are still failing to meet schools' needs regarding how to translate the ideas of meaningful learning and alternative assessment into classroom practice. The reform expects teachers to demonstrate creativity and to develop new instructional materials and approaches. Yet, some teachers need guidance, mentoring, and more formal and intensive processes of acquiring new teaching strategies. A significant number of teachers does not participate in any PD program. While those who do participate usually express satisfaction with their programs, many of the participants as well as non-participants explicitly say that they still lack sufficient instructional tools to promote meaningful learning. The opinion of school principals regarding this issue is truly negative. It seems that the issue of PD needs special attention and substantially greater resources. (National Authority for Measurement and Evaluation in Education, 2016, pp. 12–13)

In the summer of 2018, the National Authority for Measurement and Evaluation in Education published a more updated study on the same topic. Several paragraphs in the section summarizing the findings of the new study (“conclusions and implications”) are also highly relevant for the present discussion (emphases appear in the original document):

Four years after the National Authority for Measurement and Evaluation in Education had begun to collect data and three years after launching the Meaningful Learning reform, **no indications were found for an increase in students' evaluations regarding most of the result indices**- relevance of studies and how valuable they are to the students; students' involvement in their studies; emotional-motivational aspects of learning; students' ability to execute learning strategies; and more. (National Authority for Measurement and Evaluation in Education, 2018, p. 137)

During the first three years of the evaluation study, patterns of a slight decrease were found in most indices. In the fourth year, slight increases were recorded, but in most cases, they marked a return to the levels measured before the beginning of the reform. In general, it seemed that more meaningful learning took place in elementary schools than in high schools. This pattern is similar to the one recorded before the reform, when, according to teachers' reports, an invert relationship was found between students' age level and the amount of meaningful learning and the school conditions that supported it.

Data from the higher grades pointed to another invert relationship: a considerable **increase in practices of diverse alternative assessment methods, together with a decrease in the various indices representing meaningful learning**. Indeed, without necessarily pointing to a causal relationship, it seems that like the findings from previous years, findings from the fourth year of the implementation support

the claim that the crucial issue is the **quality of teaching-learning-assessment processes**, rather than their prevalence or level of diversity.

A recurrent pattern in the data points to gaps between the prevalence of deep and complex elements of the reform and more superficial elements that are easier to apply. For example, teachers' reports about the frequency of inquiry learning among students are much higher than their reports about teachers' own learning of how to support students' inquiry processes. Likewise, students' reports about diverse learning and assessment methods indicate that teachers applied more often instructional methods requiring a relatively small investment in time or in other resources (such as individual learning, learning in pairs or in small groups) compared to instructional methods requiring more time and resources (such as writing research papers, preparing portfolios, or project-based learning). In addition, a gap was found between teachers' general awareness of the reform and their awareness of its deeper dimensions. An analysis of open-ended questions indicated that teachers viewed the reform mainly as a means to implement diverse assessment methods or as a way to eliminate traditional instructional means such as teacher-centered instruction. Both teachers and principals wrote more about the more apparent dimensions of diverse instructional and assessment methods than about deeper dimensions such as students' understanding, values, or self-regulated learning (National Authority for Measurement and Evaluation in Education, 2018).

In summary, the 2018 report indicated that the reform was indeed widely implemented throughout the school system, but with no dramatic improvements in the indices that were measured. In addition, the report indicated that deep elements of the reform were less prevalent in teachers' practice than superficial ones. In the following sections of the chapter, I will try to explain these findings by analyzing a series of interviews with teachers.

In summer 2018, the State Comptroller also published a comprehensive report about the implementation of the Meaningful Learning Reform, finding severe flaws (State Comptroller, 2018). The report addressed four main problems: (a) absence of planning deemed necessary for the success of the reform; (b) flaws in the ways the Ministry managed the reform and carried out its implementation; (c) difficulties in implementing meaningful learning in schools; and (d) deficiencies in teacher education and PD aimed at preparing teachers for the reform.

## **Descriptions from the Field: What Do Teachers Say About the Implementation of the “70/30 Reform” in Its First Years?**

Thus far, I have described the general features of the Meaningful Learning Reform and, in particular, the part that relates to the changes in assessment methods in the upper grades. The reform, which is one of the most comprehensive pedagogical reforms ever carried out in Israeli schools, is related to the key subject of this book, i.e., the transition to progressive teaching and learning methods in general and the

development of HOT in particular. It is therefore worth examining the reform in light of the issues discussed throughout the book. In the subsequent sections of this chapter, I shall try to trace how these issues were played out during the implementation process by means of a series of semi-structured, informal interviews with teachers. The interviews took place at the end of the program's second year. All the participating teachers worked in the upper grades and experienced the implementation of the "70/30" assessment reform.

These interviews can be divided into two groups. The first consists of interviews with 34 teachers of various school disciplines held in the summer of 2016 after the teachers had taught two cohorts and prepared them for the matriculation exams under the new guidelines. The second consists of 12 interviews with chemistry teachers held in the winter of 2017. The overarching goal of the interviews was to learn what the teachers thought about the implementation of the reform. The interviewees represented a convenience sampling, i.e., teachers who were accessible to M.A. students at the Hebrew University. This represents a sample of teachers who would tend to be more educated than a random sample of teachers. Because the sampling is selective, it is reasonable to assume that the findings are an underestimation of the difficulties and challenges existing in the system at large. That is to say, we can assume that the challenges and problems described in this chapter exist in all schools at least to the same extent as reported here. In any case, it is necessary to exercise caution and not use the data to generalize about the school system as a whole.

In the following sections, I shall first discuss the data based on the 34 interviews conducted with teachers of different school disciplines. In the first section, I shall sketch a profile of teachers who, throughout the interview, expressed a coherent position either supporting or rejecting the reform. In the ensuing sections, I shall expand on several selected themes and show how the teachers related to them. In the last part of the chapter, I shall analyze the interviews conducted with the chemistry teachers. Because I promised the teachers full anonymity, I avoided any identifying details.

## **Opposing Attitudes Toward the Reform**

The interviews indicate that the reform reached the schools in a hurry, and because there was no sufficient preparation, guidance, or training, it led to uneven implementation. Some schools and teachers were already "on board" in the sense that they had experience and skills in advanced teaching and assessment methods. The teachers who taught in these schools could use the advantage of the relative freedom they received concerning 30% of the material to "take off" and "soar" (citing the teachers themselves) and to apply new and creative methods of teaching, learning, and assessment. Other schools—those lacking the required knowledge and skills—experienced "a mess" and "instability" (again citing the teachers).

The excerpts below represent teachers who hold these two opposing attitudes regarding the reform.

A history teacher describes the positive change she experienced thanks to the reform in the following way:

To begin with, there is much more freedom, much more room to give children the opportunity to express themselves. Learning is more meaningful and less teacher-centered. We don't have that pressure at every given moment, the pressure coming from above, where they tell the kids what to do and how to do it every single moment. It's not that there are no quizzes and assignments to hand in, but the pressure is gone. There is a different kind of pressure generated by the need to write an inquiry paper, but it's not rote learning like it used to be... It created a process. Lessons are calmer, [there is] more profound study of topics we could choose ourselves... It has cons and pros: it's a lot more fun, but there is also the inquiry component. It's hard, and it makes demands, especially of the students, but it contributes to developing students' skills.

Another teacher, who feels the reform has had a positive effect on her work, describes it in the following way:

Yes, [the reform] affected me in that I started to work harder to teach in an interesting way. It forced me to work harder, thinking how I [can] reinvent myself over and over again. I think it had a positive effect on me, because the harder you work, the better you become. The process with the class is better, because... each [child] is capable of expressing himself in his own way and I think that the process that took place was really good...

The same teacher is also very enthusiastic when answering the question whether, and if so how, the reform enhanced her sense of professional capability:

It really enhanced my sense of capability, because if I thought I could [do] X, I proved to myself that I can [do] much more. It affected me in a good way. It made me feel good. For example, I prepare a broadcast with the class. Personally, I always dreamt of doing something related to theater. Suddenly I realized that through the alternative assessment I can bring myself to a point I never dreamt of. Because in traditional instruction you have no way of doing it, but I could do it through the reform.

Another teacher, who had a positive experience with the reform, has been teaching Judaic subjects and social sciences for 4 years in a state religious school in a small city with a relatively low socioeconomic profile. To describe the enthusiasm the reform kindled in her, she was the one who used the verb "to soar":

[The implementation of the reform] really encouraged me to soar, because suddenly you have the opportunity to use diverse instruction and assessment methods. I tried it out on many occasions, and it really works... I am the sort of person who tends to put much work into what I do, so it suits me and I soar with it... From the outset, the teachers at [name of the school] [were] very much into the idea. We've always been very creative, and suddenly you have the opportunity to do something we'd already been doing, and it even reaches the students... They know this is their matriculation assessment. Trying to make a meaningful change we really shifted to more inquiry papers and fewer tests!

This teacher testified that the encouragement and opportunity offered by the reform created a significant change. She and her colleagues are now giving fewer tests and are assigning more inquiry papers. The change allowed the teachers to be creative, affecting both their teaching and assessment methods. Nonetheless, the

quotation makes it clear that, in this specific school, teachers had applied similar methods before the reform, that is, the school already had a previous pedagogical infrastructure for the innovative working methods. This teacher reported that the knowledge she needed to teach differently was constructed at two PD courses she had attended before the reform, addressing instruction and alternative assessment. According to her, both programs were successful and effective. In fact, when describing these programs, she used the words “outstanding PD programs.”

A positive attitude toward the reform was evident also in the answer of one of the participants to the question asking whether the reform affected the way she functioned as homeroom teacher.<sup>3</sup> In her answer, the teacher expressed her feeling that her participation in the reform, and especially her close work with students on alternative assessment assignments, had improved the way she had functioned as a homeroom teacher. She thought the main reason for this improvement was that the reform enabled her to get to know her students better:

Q: Did the change affect your function as a homeroom teacher, and if so – how?

A: In a certain sense, yes... The alternative assessment makes me, as a teacher, go through a very close process with the students. I get to know them from different angles, from a much more creative place, and get to know what they are interested in and how they incorporate those things into their work. I think that the process added an important dimension to my recognition of the girls’ capabilities, talents, and strengths.

Toward the end of the conversation, the teacher explained that the reform had a positive effect also on her own sense of professional capability and on her understanding of her professional role:

It is very empowering. It gives teachers the opportunity to express themselves. It enhances my creativity in teaching.

In contrast to the positive picture painted by the teachers in the previous paragraphs, other teachers portray a much bleaker reality. The first teacher in this category teaches history and is also a homeroom teacher; she has been teaching for 11 years. In response to the question “What happened in your school following the alternative assessment reform?” she said that what happened was “a mess.” Regarding the first cohort that went through the reform, she describes the implementation of the reform as a “commandment” imposed from the top down. She reports that she was “shocked” by the power-point presentations shown at the beginning-of-year conference to introduce the 70/30 Reform. She notes that although she was told to start teaching according to the program, she was confused, saying that “personally, I didn’t understand a thing.” To her disappointment, the details of the program she was supposed to teach were decided without consulting with her. She was not invited to have a voice in the planning

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<sup>3</sup>In Israel, the homeroom teacher fulfills a more essential function than the purely technical one common in the United States (taking attendance, collecting lunch orders, making announcements, and performing other administrative tasks). Here, the homeroom teacher is expected to monitor student’ work, give them individual attention, and instill values by leading discussions of hot-button topics. His/her role is much more significant for students’ development than is common in US schools. In Hebrew, the name for this role is “educator” rather than “teacher.”

processes. She underscores the fact that, had she been asked to be involved, she would have suggested fundamental changes. According to her, the resources and tools placed at her disposal were unsuited for implementing the reform. In particular, she highlighted the lack of time: much of what was planned could not be executed, and the lack of time made creative work impossible. She did not take part in any PD that could have prepared her for the new program. She stressed that she felt the lack of appropriate PD preparing her for the changes she was supposed to implement:

I am missing PD... I would very much like to see the leaders and developers of the reform come to the classrooms and model what they mean, so we could observe their lessons. That it [i.e., the reform's principles] would not be so disconnected from practice... Such PD could have been extremely relevant.

As noted earlier, this teacher did not participate in any PD. It is therefore not surprising that although the reform was manifested in structural pedagogy (in this case, the 30/70 change in the final exam that also affected the chapters of the curriculum to be taught each year), it had no effect on her teaching methods. She reported that the style of teaching for the 70% part of the curriculum is still aimed at drill and practice for test preparation. The style of teaching for the remaining 30%—which was supposed to be taught in innovative ways—was affected by lack of time to teach in a meaningful manner:

Other than the technical part of allocating what content we would teach each year—the reform did not affect me. I still teach to the matriculation exam, and aim at the questions likely to appear on it. Due to lack of time, we taught the 30% part (which, according to the instructions we received from above consisted of the unit about World War 2 and the Holocaust) very fast, without any depth; and there's no way to know if all the topics were covered... My teaching methods didn't change.

Unfortunately, this teacher states that the reform also had a negative impact on her role as homeroom teacher. In response to the question “Did the change affect your function as homeroom teacher, and if so – how?” she answered:

It only added to my workload on the technical level. I cancelled discussions of prominent issues to make time to cover the material I needed to teach. It significantly reduced the quality time I had with my students as a homeroom teacher.

Another teacher frustrated by the reform has 15 years of experience and an M.A., and she teaches Hebrew Bible and another Humanities class in addition to being a homeroom teacher. According to her, the school announced the change as “major.” She admits that following the reform, there were, in fact, changes in the structure of teaching, especially a change in the allocation of the content taught in different grades. But, she maintains, there were still no real changes in the quality of classroom instruction, i.e., in substantive pedagogy:

Q: What happened in your school following the alternative assessments reform?

A: What happened...? They simply switched the curricula. What we used to teach in the 12th grade, we are now teaching in the 10th, and that's, like, the 30%. In addition, we also have now alternative teaching methods and alternative assessment, and this is done

through a written paper, or a power point presentation and inquiry. This was, like, a big change, sure, when they told us [about it]. But, at the end of the day, everything is the same... The teaching itself, in the classroom –it certainly didn't change.

Later on, this teacher adds that the reform was imposed on her from the top down and that she was not involved at all in creating it. Similarly, she did not acquire any new teaching and assessment methods as part of her professional development:

Q: Were you involved in writing the curriculum?

A: No... They just told us. I was not involved... In reality nothing really changed. It's still new. Nobody really knows what to do with it, and we don't even have time to write anything new – like lesson plans. So the tools we had before are the same ones we have now.

Q: Did you participate in a PD process that prepared you for the program?

A: PD? No, what are you talking about?! They did not explain. They dumped it. Like, at the beginning of the year they said, "From now on, do A, B, C..." and we just do it.

The teacher complains that the resource she lacks most for optimal implementation of the reform is time, because her contract does not include any hours to prepare and develop new teaching materials:

Q: Are there any tools or knowledge resources to implement the reform that you think you are missing?

A: I think that what is missing here is time. Time to develop plans. I don't have any hours to do it. Whatever we prepare, we do it at home, in our own free time, and it shows. Teachers don't actually do it; they prefer the practices they are already familiar with, which is a shame. ... They generated this reform, but they didn't go all the way, and they expect that suddenly everyone will get it, right away. But the time to really understand it, or to plan, comes at the expense of our own time; ... Who has energy left when you finally get to go home to sit down and develop something new? It's sad that that's the way it is. They forgot all about giving us time.

Considering this sentiment, it is hardly surprising that she repeats the convictions that the reform did not affect her, either in terms of her classroom teaching, which remained the same as before, or in terms of her function as a homeroom teacher. Neither did it affect her sense of self-efficacy:

Q: Did the change affect you, and if so – how?

A: Hmm... No. It did not affect me, no. I told you, like, the way we teach in class is the same.

Q: Did the change affect your sense of professional capability and your understanding of your professional function, and if so – how?

A: Umm... I don't think it made a difference. I really, I think that it's not yet "there," this reform.... It feels just like any other reform that is very soon going to be turned into the next thing.

To conclude this section, I would like to quote some distressing excerpts from the end of the conversation with a different teacher, who explains that, from her school's perspective, the reform was a "curse" that undermined the quality of her teaching:

A: From the school's point of view, this is a curse. The teachers are not overjoyed by too many reforms. It was imposed on us too quickly and there was no time to find a way to manage all of these changes.

Q: Did the change affect your sense of professional capability and your understanding of your professional function, and if so – how?



A: It undermined it a bit. The quality of my teaching is much worse. I was not prepared for all the changes and the attempt to stitch it all together with so many information gaps and on such a short notice – it was simply bad.

## Do Teachers Think That the Reform Affected Classroom Teaching and Learning?

In the following sections, I shall address some of the common themes that emerged from the interviews and what teachers thought of them. I shall begin with the theme of the reform's effects on classroom learning and instruction methods. Some teachers say that the reform did have an effect, explaining that it generated significant improvements in their instructional methods and in their students' ways of learning. For example, one teacher explains that, in her discipline (geography), many changes had been made [before the reform] to improve teaching and learning methods. These changes included PD courses that provided her with advanced pedagogical tools. She says that the regulations published as part of the reform made her think in new ways, which allowed her to use knowledge resources she had acquired before the reform to change and improve her pedagogical work:

Q: Did the reform affect you, and if so – how?

A: It really forced me to rethink things. Just this year, in the 10th grade, they're not doing their regular inquiry project, so I have to develop a program that is not aimed at a matriculation exam [and therefore] I will create assignments in a completely different way. How do I create such learning? Obviously, all the materials I have are aimed at the exam... I tried to get help from teams of teachers outside my own school. It really forced me to try and think.

According to this teacher, taking a fresh look at designing new materials and the outcomes of this process led to a significant and positive change in her teaching. At a later point in the conversation, she describes that positive change from the perspective of her students who gained a more relevant learning experience, one more closely related to the world outside of school:

...But, based on what I heard from students, they went through a meaningful process. I think it affected them in a positive way. If you do it right and you are serious about it, and if there is appropriate support for teachers and students, they can experience something really meaningful. For our inquiry project, we picked a topic that is relevant to them and affects them directly. The inquiry question was: what factors affect the decision made by young people in Jerusalem -whether to stay in the city or leave it? So, here, [students get to think about] what interests **me**, what issues do **I have** with the city? What do people think, what do young people think, what do older people think? [emphases in the voice of the teacher]

On the other hand, a large group of teachers reports a lack of change in learning and instruction methods following the reform. A close reading of the interview transcripts shows that this group is divided into two sub-groups. One sub-group, which included the teacher described earlier (on pp. 144–145), reports that, despite the changes that had taken place in structural pedagogy, the substantive pedagogy had

not changed at all. Due to the absence of PD, these teachers feel they did not acquire any new teaching strategies, and therefore, necessarily, they continue to rely on the old familiar methods. The second sub-group also reports a lack of changes in substantive pedagogy. The reason for this, however, was that they had already had the chance to explore the teaching and learning methods promoted by the program before the beginning of the reform. The teachers in this sub-group report that, in their classrooms, they have been applying innovative instructional methods all along. They had encountered these methods either through large-scale implementation activities that took place in the discipline they teach or through implementation activities that took place within their school. For example, civics teachers report that, in their subject, the relevant changes had taken place before the 70/30 assessment reform came into being:

Q: What, if anything, occurred in your school as a consequence of the alternative assessment reform? For example, were there any changes in teaching and learning?

A: In the context of civics, there were no changes at our school, because we had already started with the alternative assessment earlier... so for us this did not cause any problem.... We were, in fact, the first to do alternative assessment. And we continue to do almost the same even now... We do a performance assessment task.

Similar to civics, science teachers also report that there were no fundamental changes following the reform, because they had already been teaching through inquiry for a number of years. For example, one science teacher reports that long before the beginning of the reform, she studied innovative teaching methods in the National Science Teaching Center:

The school made no changes in teaching or learning following the alternative assessment reform... There was no [implementation] program and what I am doing is mine as a veteran teacher... I use inquiry learning and teach in an inquiry lab, and I use methods of alternative assessment – a portfolio... I have been participating in PD processes that prepared me for this for the past 21 years.

These excerpts confirm that both the civics and the science teacher have been using advanced pedagogies in their classrooms, but this is not a consequence of the reform; rather, they use knowledge they had acquired over the years from other sources, such as specific PD programs for civics or science teachers.

In other cases, teachers report that the reform made no difference because the transition to innovative teaching, learning, and assessment methods started as a process of a school-based change predating the reform:

The truth is that there were no changes [in our school] because of the reform. We've always done alternative assessments and projects based learning. Now, maybe, it has this name – "alternative assessment" – but we've always done it. The change is in name and in the percentage of the assessment. It used to be 15 percent, and now it's 30...

In such cases too, the implementation of the reform relies on knowledge that existed before its launch:

I think I have the knowledge and tools to construct appropriate lesson plans and to plan and assess assignments. This is how I've worked at the school ever since I started teaching here.

When responding to a question about what PD she would like to receive for implementing the reform, the same teacher responds by supporting the idea that she already had the relevant knowledge before the reform came into existence:

No... Not that I'm bragging or anything, but... I don't feel that I need to learn how to do this. [Another PD course] for me is unnecessary, because, as I said, we have always worked and taught this way at this school; There is really nothing new for us.

In response to the explicit question "Did the reform affect you?" this last teacher gave a one-word answer: "No." And when asked "Were you introduced to new teaching methods as part of the reform?" she grew irritated by the pretense that the reform innovated anything. She felt that the question's implicit assumption was that before the reform, teachers at her school did not engage in meaningful teaching and resented this notion:

Not really [i.e. the reform did not really affect her]. We've been teaching meaningfully all the time; that's what's sometimes so annoying. In this reform, there is this sense that, until the Minister came along and launched this reform, we didn't engage in meaningful teaching. I have no doubt that for many teachers it did not bring anything new. Our classes always consisted of discussions, presentations, analyses of events, and visual contents. As far as I am concerned, the lessons did not change at all.

Another teacher who describes in detail how the pedagogies in her school are focused on project-based teaching and assessment provides one more interesting example of a school change that took place before the initiation of the reform:

Q: In your school, were there changes in teaching and learning as a result of the alternative assessment reform? If so, please describe these changes.

A: The prevalent pedagogy in our school is that of alternative assessment which is part of project-based teaching. This pedagogy has been used at our school for several years in the junior high school classes.<sup>4</sup> Every year, new teachers join the circle of project-based teaching. The teaching methods vary and are matched to the projects' final products. Also, in projects that require specific expertise, the teacher leads the project under the supervision of an expert. Teachers who are part of the project-based instruction initiative, submit at the outset, a blueprint organizing their work. It refers to the contents, skills, teaching methods, didactic processing of contents, learning objectives, and community objectives related to the project. The school also runs its own PD for teachers doing project-based teaching. In the PD we discuss and analyze the pedagogical questions involved, as well as share classroom practices. Teachers from within the school are leading this PD. In addition, teachers receive individual guidance regarding the supervision of students' projects.

In the last two years, the school has begun to incorporate this method into the upper grades too. As part of a pilot program in history,<sup>5</sup> students are now studying for the matriculation exam using diverse teaching and assessment methods. The alternative assessment is adapted to the topics we teach and to the methods we use. It includes performance assessment tasks, a middle of the year examination, and guidance in how

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<sup>4</sup>This school, like many schools in Israel, runs from 7th to 12th grade. The junior high school classes are grades seven, eight, and nine.

<sup>5</sup>Here the teacher is referring to another small program initiated by the Ministry in parallel with the Piron Reform called "Pioneers in Assessment."

to write an inquiry paper. At staff meetings, we discuss contents, teaching methods, and the performance assessment tasks... The school supports teachers by placing all necessary resources at their disposal.

Not only does this description provide a glimpse of teaching and learning methods used in that school; it also sheds light on the thorough and orderly processes that took place in order to implement new pedagogies in both the junior high and high school levels. These processes included comprehensive PD, consisting of a school-based teachers' course, peer learning, and individual professional support. The teacher describes in detail how the school developed issues pertaining to substantive pedagogy as part of a systematic implementation processes. Each cycle of instruction begins with a planning phase, in which teachers submit an organizing plan referring to objectives at different levels, to the contents, to skills, to teaching methods, and to knowledge goals. Because this sort of planning requires quite a bit of pedagogical knowledge, it is evident that the implementation process did not begin with the planning phase noted by the teacher. Rather, it was preceded by a prior stage of PD not mentioned here. Later on, there is another stage of PD that consists of peer learning, including the sharing of classroom experiences, and a group analysis of relevant instructional issues. These processes are ongoing. They take place in the school with ever-growing circles of teachers. Although the implementation processes had begun before the reform, the teacher does give the reform its due, because she sees it as enabling the use of innovative pedagogies in a better and more profound manner:

I've been waiting for this reform for years! It gives [us] an opportunity for creative thinking and doing, both on the part of teachers and on the part of students. In alternative teaching and alternative assessment, there is a blending of process and goals, and that makes all the difference in the world!

The last quotation then demonstrates that the policy involved in the reform may create a change for the better even in schools that had previously been "on board" and transitioned to advanced pedagogies prior to the reform. The quotations indicate that the teacher sees a difference between working on advanced pedagogies when the Ministry's official policy supports traditional teaching, as compared to working on them when the official policy supports advanced pedagogies. The policy supported by the reform aligns innovative teaching processes with the new alternative assessment methods. The teacher therefore sees the reform as encouraging creative work and critical thinking on the part of both teachers and students. The difference the reform makes for this teacher is noticeably welcome, making her state that "I've been waiting for this reform for years!" Hence, it confirms that the reform made a difference even for the schools that had already "been on board," in the sense that they had adapted innovative teaching methods prior to the reform. Processes taking place within an isolated school are affected by the system's general educational climate and by regulations concerning assessment. It may well be that, like in the case of this particular teacher, the reform's changes to the overall policy, climate, and regulations (especially those having to do with assessment) supported

many additional teachers in using the innovative pedagogies they had applied all along at a higher level and/or quality.

On the other hand, a rather large group of teachers reports a lack of change following the reform, stating that it did not produce any progress toward more innovative pedagogies. Examples of this stance are obvious in the following quotations (each quotation in the next section represents a different teacher):

[The reform] is not serious enough or strong enough to amaze me or make me change direction. We just get through it to get along. The reform does not cross the classroom's door. The dogs bark, but the caravan keeps going... I am not against alternative assessment, but I don't like the way it's being done. It's being dumped on us from above!!!

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Q: What took place in your school following the alternative assessment reform?

A: I don't think any fundamental changes were made. We decided that we would do the alternative assessment at the beginning of the year and then continue teaching for the matriculation exam [just like we did before].

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Q: Were any new teaching methods added to your pedagogical "tool-kit" following the reform?

A: I don't think so... Classroom teaching stayed more or less the same...

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A: [The reform] did not affect me in any deep way. Maybe it gave me a little more room to maneuver.

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They dumped it on us again. But after a while we saw that, all in all, at least with us in history, it didn't make such a big difference on how we actually teach, or are told to teach. They made a change in how we need to distribute the materials between 10th and 12th grade so that now we do not teach all of it in the 12th grade. In practical terms, how we teach is pretty much the same.

## Detailed Pedagogical Planning

In schools where the reform worked well, especially when teachers had already had the pedagogical knowledge required to teach for meaningful learning, teachers provided some fine examples of detailed pedagogical planning. Such examples demonstrate what such planning actually involves. In response to the question: "Were you involved in writing the program? If so, describe the process," a Hebrew Bible teacher, who also happened to be the subject coordinator at her school, stated the following:

Not only was I involved in writing the program, but I actually wrote it together with the other Hebrew Bible teachers on my team. Planning the program started out as raising various ideas regarding what we want our students to do in order to fulfill their obligation for the 30% alternative assessment, according to the instructions of the National Subject Superintendent. At the next stage, we searched the web, looking at ideas other schools had uploaded, so it was possible to "sneak a peek" and get ideas about the assessment we ought to construct, the scope of each project, the rubrics, and so on. At the same time, we asked ourselves what objectives did we want to attain by using the alternative assessment? In what grades will it work best? Should the entire cohort get the same alternative assessment, or

should underachieving classes, for example, get a different task than high-achieving classes? And so on. The next stage was selecting the topic to focus on and developing it, in other words – building a blueprint for our work. Another stage was finding enrichment materials for the topic we selected. The next-to-last stage was writing the assessment assignment with guiding questions, and the final one was constructing the rubrics.

This excerpt describes the meticulous planning needed to introduce changes in substantive pedagogy. The description pertains to the alternative assessment reform in one school subject, in one particular school in one particular grade level. Thus, the citation demonstrates the type of issues and the level of detail that teachers must engage with while working on the improvement of substantive pedagogy. There are no shortcuts. It is obvious that, without paying careful attention to all the practical components the teacher mentioned, the implementation of the alternative assessment reform could not possibly work.

A teacher who teaches civics and history makes another interesting comment on the importance of detailed pedagogical planning. She highlights her main points by contrasting the reforms that took place in both subjects. In civics a similar reform took place several years earlier (see Chap. 6). According to this teacher, the civics reform consisted of an orderly, system-wide pedagogical planning process, followed by systematic implementation of a civics performance assessment task. The teacher reports that in history, there was no similar planning. The teachers at the school were left to fend for themselves, and no attention was paid to the details of the change on the level of substantive pedagogy. The teacher complains that, in history, teachers were given too much freedom regarding the details of the process, because the leaders of the change at the Ministry of Education had no idea how to direct it. She is especially critical of the lack of planning of the details of the rubrics, which inform the entire process of learning and assessment:

The fact that there was no rubrics... They said: "We'll let you do what you want." What – are you stupid or something?! If you let people do what they want, they won't do anything, they'll think small. I'm not saying you should reduce the scope of [teachers'] thinking, but there has to be a limit... I come back to the comparison with civics, because in civics all this was well organized. In civics, they informed us already at the beginning of the year of the days we had to set aside for the external evaluation, and these days were registered on the test calendar. And we received specific instructions for the external evaluation, based on the desire that there will be a framework and structure that must be maintained. This is all true of civics, but not of the history [Meaningful Learning] reform. So that's the problem [with history]. Also, it's not clear what the goal is; it's like endlessly feeling your way in the dark where you have to find your own path. In history there is no ground you can lean on; you can drown. You need a framework and a structure in order to get to the wide-open spaces. Therefore, in history I'm not sure what's going to happen... It's a nightmare. My mentor told me: "What?! They, like, gave you freedom, and you're not taking it?!" But it doesn't work that way. Let me go back to the civics performance assessment, because it was the model for the entire Meaningful Learning reform. When we started doing the performance assessment, there was a rubrics, there was a plan. We worked according to the rubrics, otherwise we would have gotten lost... In history, they had no clue. The Ministry of Education has no clue. The only thing they know how to do is to [tell you to] fill out forms.

This teacher, who is experienced enough to be able to compare two reforms, clearly expresses her preference not to be granted unlimited freedom, which she

calls “a nightmare,” but rather to receive an orderly work plan and clear criteria of quality. According to her, in the absence of an organized framework and a clearly articulated direction, people “can drown.” The impression she gives is that she and her colleagues are feeling their way in the dark and are indeed “drowning.” She blames the Ministry in this situation because it imposed the reform without sufficient planning. She does not think they did so for any ideological reason or because they believed this is the proper way to run reforms, but simply because “they had no clue.” She therefore explains the chaos in the implementation process by the fact that the leaders of the reform had no idea where they were going in terms of substantive pedagogy and, consequently, how to support the people who were supposed to implement it.

## Does the Meaningful Learning Reform Improve Student Knowledge?

Another interesting issue emerging from the interviews concerns the quality of students’ knowledge following the reform. One of the reform’s stated goals was to deepen students’ knowledge. In effect, it turned out that teachers are concerned that the reform will *impair* students’ content knowledge. They do not see this concern as a necessary outcome of the reform’s principles, but rather as an outcome of the way it was implemented. They particularly blame the haste of the implementation, which resulted in two problems. One problem, as we saw earlier, was that the new instructions to reduce the scope of the contents taught for the external exam disrupted the sequence of the topics teachers had to teach. This led to a new challenge: creating coherent connections between the various topics left in the truncated curriculum while bridging the gaps and ruptures formed by the deletion of entire sections:

We have to fill many gaps of knowledge. We don’t teach straight sequences. There are information gaps that have to be bridged. In addition, they cut down the number of hours.

Teachers speak of two additional major problems: the lack of systematic plans for how to teach the 30% of the curriculum that was allocated for alternative assessment means and flawed teacher preparation. These two problems caused teachers to report that they are teaching the 30% of the material allocated for the alternative assessment more poorly than in the past:

First of all, I don’t think they prepared the teachers properly for the reform. They said “creative work,” but they didn’t actually fully develop this, and there weren’t clear-enough guidelines on what they want the kids to know. The level of the matriculation exam deteriorated and it became a joke. The 30% in Hebrew bible consists of material that is initially really, really important and really essential in my opinion, but it became a joke. You just fly by the seat of your pants, and it’s because they didn’t develop it fully. What does the Ministry of Education expect? What does “alternative assessment” even mean? Or “creative work”? This wasn’t fully developed. So every teacher did whatever he or she wanted. And it just brought the level down. The teacher preparation wasn’t good enough.

Later on, the same teacher elaborates on the complaint about insufficient PD, both on the part of the Ministry and on the part of her school, and explains that PD is necessary so that students' knowledge will not deteriorate:

[PD is necessary] so as not to lower the level. I think that, let's say, in Hebrew bible, at our school, it simply lowered the level. It degraded the stories [i.e. Biblical narratives]. I mean, the whole of Genesis was moved to the 30%. I think that the stories in Genesis are very, very important, and this simply reduced the level. Devalued Genesis. Made it less important. Because there was no PD. I think that if there had been better PD we would have understood in greater depth what the Ministry expects us to do, and it wouldn't have turned into something so shallow. We would have maintained a high standard... I think that the 30% lowered the level of school learning...

According to this teacher, the major problem in moving sections of the curriculum that were previously taught to prepare students for the external matriculation exam to the unit assessed by alternative methods is that it leads to a deterioration in the quality of teaching. This process took place with regard to sections in the curriculum she considers very important, such as the biblical narratives of Genesis. The problem is not only that these narratives were excised from the mandatory exam contents. Rather, she complains that the outcome, which was supposed to yield "more meaningful learning" of those materials, remained vague and unclear because of the lack of teacher's PD. As a result, these sections all but disappeared from the curriculum:

[I used to teach] everything at a 100-percent level. You teach everything at a very high level. And now I can tell you that I'm teaching very differently. I focus only on very important things. If it's less important, I ignore it. I don't teach everything. And this lowers the level. The focus is only on what's important [for the test], and my agenda is for the students to score high marks... The program isn't developed. They just threw us in the water and told us to swim.

In a similar vein, a history teacher complains that narrowing the scope of the material students needed for the external exam undermined students' learning. There was a reduction of the time devoted to the topics that were no longer assessed by an external exam. Therefore, these topics were taught in less depth. Additional history teachers made similar claims.

## **Teachers Are Eager for Meaningful Professional Development**

It often seems that teachers hold PD programs in disdain, thinking of them as a waste of time. Our interviews would seem to indicate the complete opposite. Due to the profound change process teachers were forced to go through in terms of their teaching methods, those teachers who received PD expressed gratitude and high esteem for the programs they participated in. Some teachers also expressed similar feelings toward PD programs they had participated in prior to the Meaningful



Learning Reform. Teachers reported that they feel the PD processes they participated in were helpful because they provided practical tools to manage the requirements of the reform. By contrast, teachers who did not participate in appropriate PD expressed a strong sense of deficiency. Below are several examples of teachers' description of these conflicting emotions.

One teacher describes her gains from a successful PD program in the following way:

The PD met my needs. It was good. It helped us understand exactly how to teach the material. We were encouraged to ask questions about anything in the new reform that wasn't clear to us. We were also encouraged to ask about the "how", that is, about methods teachers can use to teach the content in the spirit of the reform. At the end, it covered everything, because we could ask about anything that wasn't clear. At the end of the course we went back home with all the answers. It was very good, a very important PD course.

Another teacher who participated in PD programs for geography teachers describes those programs as "outstanding." Although these programs had started before the reform, she thought they had provided appropriate tools for handling the changes it required. Her remarks illustrate the extent to which she believed that a good PD can contribute to a teacher's professional capabilities:

...Outstanding. I would make these courses mandatory for all teachers. I told anybody in my school who was willing to listen: "Go take these courses..." Since I began teaching geography, I have made a habit of going to PD programs, because they really help me to advance my professional skills. I think they are excellent.... I think that those programs related to inquiry learning and alternative assessment in high school need to become mandatory.

Later on in the conversation, she explains the importance of verifying that the PD courses are of a high standard. She also expresses her conviction that they are crucial to the success of the reform, emphasizing that PD and support for teachers "in the trenches" are necessary for the reform's success:

Q: Based on your experience, what suggestions can you make for improving the success of the reform in schools?

A: ...I think that both the National Subject Superintendents and the schools need to pay better attention to instruction and support for teachers during the reform and also during its planning... Not to leave teachers on their own. It would be helpful for turning the reform into something serious and meaningful, rather than... something that is superficial, or improvised. If it will be done properly in schools, whether through an official PD, or through organized meetings with the subject coordinator, or with an instructor, or with the school principal... I think it can turn into something much more meaningful and it would also make life easier for us. Sometimes, we must learn from other people, I mean it's not like we can come up on our own with an endless supply of creative ideas...

Teachers who did not receive adequate PD point to this fact as the major obstacle keeping them from optimal implementation. For example, one teacher reported that during the preparations for the reform, she did not get any guidance. In practice, she therefore relied only on other teachers and on her limited initial knowledge. When asked what she needed in order to be able to implement the reform in an optimal way, she highlighted the role of PD:

PD, maybe examples of things that are already happening... I do think we need more mentors, uh...from the Ministry, to lead the way. And maybe the school should be required to do certain things in order to make it a vital part of it's culture, not something that happens on the fly.

As is evident from the quotations below, many teachers who did not receive PD share similar opinions. For example:

Q: Based on your experience, what would you suggest for improving the reform's success in schools?

A: Providing useful, clear tools for constructing alternative assessments and for using them. Unfortunately, they did not provide us [with such tools].

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Q: Do you think that PD would have been relevant for you? .

A: Very relevant. I missed not having it.

The following quotation is expressed by a teacher who, like several other teachers, also complained of confusion and chaos generated by the reform's implementation (for more on this, see the end of this chapter). This teacher explains that PD in various forms could have contributed to the success of the reform while preventing the sense of helplessness and chaos teachers had experienced:

Q: Do you think that if teachers had been forced to participate in PD there would have been less chaos?

A: For sure. For sure. The chaos was the result of lack of knowledge, lack of understanding of the process, lack of knowledge of how to present [the material] to students, how to make the material accessible to them. Sometimes I read teachers' cries for help that are posted on the website and my heart really aches... especially for the new teachers... It's very, very problematic. Therefore, it is very important to meet the need for teachers' PD and learning. It's a must. From my perspective, what's needed for success is...mandatory teacher PD.

## Chaos at the Outset, Order Later On

Some teachers speak of a trajectory: at the outset, they did not understand the reform and experienced a sense of chaos. Over time, however, following a year or two of experiencing its implementation, things fell into place and became clearer. This happened thanks to PD and to clearer guidelines published by the Ministry and due to teachers' accumulating practices with various elements of the reform while using common sense. One of the teachers complains in several parts of the conversation that, at the moment she has a feeling of chaos, but she has a vague hope that over time things will improve:

It may be that there will be a change and it will improve. For now, everything seems chaotic, just a total mess.

Another teacher, also complaining of the chaos, says:

I have an idea for improvement: that every single National Subject Superintendent will sit down and think long and hard before deciding what she wants out of this 30% program. What she would like to achieve, and what would be the criteria for success. She should clarify it really, really well. Because in this chaos, each school does what it wants, how it wants, when it wants... It's really missing the point.

Other teachers also share the sense that initially they experienced a lot of “uncertainty,” “chaos,” and “mess” that were generated from their lack of prior knowledge, coupled with the Ministry’s vague explanations. However, these teachers report that over time the darkness is dissipating. Thanks to experience and with the help of supportive and helpful settings, they now have a better grasp of what is required of them:

A: Look, at the beginning... True, there was a great deal of fog... In our school subject, many things were not well defined. For example, we have only a general outline of what we were supposed to be doing. You learn with time...

Q: So what happened? How did the situation improve?

A: Look... Every school gets PD courses, guidance, there are answers, people are in touch with their National Subject Superintendent, there are listserves, Facebook groups. People communicate. It is not as if they came and threw each one of us [into the water] separately. It just takes time. Over time, people connected with one another, heard, looked around, asked. I think that’s what settled us down.

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Theoretically, there’s a program; we improve it constantly because we have no choice. There is no prior knowledge. There is a difference between planning and practice. Let me be more precise: there is no prior knowledge, but as we move forward we learn and improve. We learn when to move on and when to stop; based on our experiences, we are more prepared [now].

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Again, no. There were no tools. We learned as we went along.

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Let’s just say that it’s been two years. At the beginning there were many questions. I can say that now we are at 85 percent knowledge. We still have questions, but most of the things – we already know.

To conclude this section, I will cite the opinion of a teacher (quoted earlier) who also thinks the present reform is not “fully baked” and that it was imposed on schools before it was fully formed. She believes, however, that this state of affairs is typical of any reform. According to her, if only there will be stability to allow implementation over a sufficiently long period, it will be possible to fix all that needs fixing. She therefore praises the new Education Minister for not “tossing” his predecessor’s program “in the garbage bin,” but electing instead to support it while allowing its further development. Attaining the full development of the reform will—according to this teacher—only occur over time:

A serious problem with this reform is that it is only half -baked. I believe this is true of every reform. It takes years of implementation, and I actually appreciate the fact that the current Minister of Education didn’t toss it in the garbage bin. This system needs stability, but must not be afraid of innovation. I appreciate the fact that he didn’t cancel the program but rather chose to give it time to fix whatever needs fixing.

## Meaningful Learning Reform in Chemistry and Biology

### *The Reform in Biology*

In a few school subjects, the Meaningful Learning Reform encountered long-standing processes of implementing progressive pedagogies. Teachers in these school subjects had for years been working to implement processes of meaningful learning similar, both in objectives and in methodologies to the new reform. The “70/30 Reform” regulations were issued to one and all, without any distinctions among school subjects. It is therefore interesting to ask what happened when these sweeping regulations encountered teaching and learning methods in school subjects that were already “on board” with the Ministry’s new general policy. In this section, I will address this question by taking a closer look at two of the sciences—biology and chemistry.

Biology was the first subject in Israel to implement inquiry-based learning and assessment across the whole school system. As early as the 1970s, Pinchas Tamir and his colleagues led a system-wide pedagogical change in the teaching of biology by “importing” from the United States the Biological Science Curriculum Studies (BSCS), whose core principle is inquiry-based biology learning (Tamir, 2006). To adapt the new teaching methods to appropriate means of assessment, Tamir and his colleagues implemented two important innovations in the biology matriculation exam, decades ahead of their time. The new exam that they had generated included inquiry and critical thinking questions as part of the written exam (60% of the final grade), a practical exam in a research lab (20% of the final grade), and an inquiry project completed either by each individual student or by groups of students (20% of the final grade). Over the years, the inquiry project underwent several modifications; early on, it was called “Ecology Paper” and “Biotop,” and later it was known as “Bio-Knowledge” or “Bio-inquiry.” The model of the Israeli matriculation exam in biology was one of the first in the world to include a system-wide alternative form of qualitative assessment. It was viewed as a successful model, later becoming an example for developments of similar models both in Israel and in other countries. On a more local note, the ideas about instruction, assessment, and methods of implementation first generated in biology inspired the development and implementation processes applied to all school subjects in the context of the 2006–2009 program—“Pedagogical Horizon: Education for thinking” (Zohar, 2013a, b).

Although biology teaching went through various transformations, the change, first implemented about 50 years ago, proved to be remarkably sustainable. Important aspects of the process were retained in schools for decades (Tamir, 2006; Zohar & Schwartz, 2005). When all school subjects transitioned to alternative assessments within the implementation of the 30/70 component of the Meaningful Learning Reform, one might have expected a process of consultation and lesson learning from biology. After all, biology already had several decades of experience with qualitative alternative assessment, leading to the accumulation of considerable expertise. Unfortunately, this did not happen. Moreover, the rigidity of the Ministry

in applying a “one size fit all” policy actually undermined the biology inquiry learning and assessment processes. Since this case is a good illustration for how system-wide implementation processes focusing on administration and blind bureaucracy can easily injure processes of essential pedagogy, I will describe this case in some detail.

As noted, the new regulations issued by the Israeli Ministry of Education as part of the “70/30 Reform” applied a single model to all school subjects, without exceptions. The regulations did not allow any deviations, even when common sense suggested a different course of action due to unique pedagogical circumstances created by the history of specific school subjects. Because biology education had, in effect, already implemented a significant portion of the reform’s stated objectives, The Ministry could have used the resources created in biology as a model for implementing meaningful learning and alternative teaching and assessment methods. The Ministry, however, did not let that happen. Instead, the rigid 70/30 regulations imposed on all school subjects inflicted a profound sense of regression on biology leaders and teachers.

An individual who held a senior leadership position in biology education when the reform’s implementation was just getting under way shared with me, in an informal conversation, details of the process that are generally hidden from the public’s eye. As noted, in the most advanced, five-unit biology program,<sup>6</sup> two units had for decades used qualitative alternative assessment methods. Neither of these units, however, met the precise 30/70 regulations, particularly the regulations concerning the balance between school-based (“internal”) assessments and external assessments (i.e., assessments that are not entirely school-based).

Over the years, the state supervised and operated the practical lab exam. Operating this exam has been a huge task because a lab exam requires a complicated infrastructure that includes a team of experts working together to write a new lab exam every year. Designing the exam is difficult because it requires to come up with a lab experiment that is complex enough for asking deep questions in the exam, yet simple enough so that every student can conduct it without mishaps and get results within the exam’s time frame. In addition, the support infrastructure must include a central lab that can provide all schools in the country with the materials and equipment needed for the lab exam. For decades, a central institution operating under the supervision of the Ministry and financed by it provided the pedagogical and technical support needed for the lab exam.

At the beginning, the Ministry’s regulations regarding the 70/30 reform demanded that the lab exam become the school’s internal alternative assessment needed to fulfill the “30%” requirements. However, the demand to turn the lab exam into an internal school-based assessment completely ignored the complexity inherent in the practice of managing its infrastructure. It is unrealistic that each school will prepare its own lab exam every year while expecting that the exam will still be of an

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<sup>6</sup>In high school, students can elect some of the subjects they learn. The “five units” is the most advanced biology class taught in high school.

acceptable standard. In addition, preparing students for the lab exam requires a significant financial investment of the school, because it must cover the budget for a fully equipped laboratory and the cost of a lab assistant who can help teachers prepare the materials and equipment for students' experiments. School principals are unlikely to make this financial investment if the lab exam will become an internal affair of the school, unmonitored by the Ministry.

Given all of the above, it was obvious to the leaders of biology at the Ministry of Education that, if the lab exam became an internal "school-based" affair, its quality would rapidly deteriorate. Within a few short years, it would probably disappear altogether. The biology education leaders therefore opposed the Ministry's management and demanded that the lab exam remain an external exam. At the end of the day, following a ferocious battle, biology received a special permission to keep holding two external exams—the written paper and pencil exam and the lab exam. Consequently, the lab exam was in practice included in the "70%" portion of the material defined as mandatory. Unfortunately, this was not the end of the story.

The biology inquiry project (the Bio-Inquiry) turned into the 30% of the material students would be tested on by means of school-based assessment. To adjust the curriculum to this constraint, the biology leading team was forced to propose a curriculum that would match the Ministry's demands in terms of the 70/30 split. To meet the requirements, they proposed a truncated curriculum that, although meeting all the formal demands, was far inferior to the previous curriculum. The Ministry's senior biology leader with whom I spoke describes the process as follows:

I'm in shock. We had this intricate puzzle that worked well. And now it became necessary to take it apart and put it together again... [The result is] a bad, bad, bad curriculum. It has no internal logic and coherence. It's the best we could achieve under the circumstances, but a step backwards compared what we had.

In addition to the damages to the whole biology curriculum, considerable damage was inflicted to the magnificent operation of inquiry-based learning whose model was meticulously developed in the course of several decades. The model consisted of a delicate balance between school-based assessment and external regulation, including an oral exam, during which external examiners came to the school and spoke with every student about his/her inquiry project. This regulation supervised the quality of the school-based internal assessment, monitoring its validity and reliability. As noted earlier, the reform required that the inquiry project would become the 30% of the biology school-based assessment, thereby disrupting the balance between school autonomy and external regulation. It also led to the concern that, under the new regulations, school principals would pay less attention to students' inquiry projects. Altogether, the new regulations inflicted considerable damage to the biology school-based inquiry project that had in the past been the pinnacle of the five-unit biology program:

...They did not construct any regulation mechanism... Initially, they wanted the lab exam to be internal... Obviously, principals won't maintain the lab if [the exam] isn't external... Over time the lab would clearly suffer... It's like what happened in chemistry... [In chemistry] they threw away the lab [when it became internal]. ... Because principals enjoy autonomy... Instead of having the inquiry project be the pinnacle of learning [they would get rid

of it]. It will be interesting to see where Bio-Inquiry is headed in the next few years if there's no external supervision... The oral exam was crucial. Now they are going to cancel it... There's no point... The current change damaged biology more than any other school discipline.

In sum, these quotations indicate that the system did not draw on the mass of knowledge that had for decades accumulated in biology teaching. Moreover, blind regulations treated all school subjects in an identical way, ignoring their unique histories. The regulations disrupted the magnificent pedagogical accomplishments that had been achieved in biology education during several decades. Because of the reform, meaningful learning in biology regressed rather than progressed. This account also demonstrates what can happen to uniform “top-down” instructions when they encounter the contextualized intricacy of details in the field, stressing the necessity of a wide degree of autonomy for the practitioners who are working in the field.

### *The Reform in Chemistry*

The case of the reform in the most advanced, five-unit chemistry program is also particularly instructive. Like in biology, means to support deep learning (e.g., emphasizing relevance to students' everyday life and evaluation by alternative assessment) were already embedded in chemistry education before the Meaningful Learning Reform. Practical “hands-on” labs requiring comprehensive scientific inquiry skills were integrated into the teaching of the theoretical parts of the curriculum. Accordingly, students (usually working in small groups) engaged with all the stages of scientific inquiry: prep work, formulating research questions, raising hypotheses, defining variables, planning experiments, conducting them, recording and analyzing the results, and drawing conclusions. Following each lab, students had to write lab reports. Using a detailed rubrics provided by the Ministry, teachers graded the lab reports, providing both a quantitative score and detailed qualitative feedback that supported students' ongoing learning. The rubrics determined the teaching objectives and signaled to teachers what is considered important. The rubrics also enabled students to evaluate themselves and their peers and to know what they are expected to learn, what they were doing right, and where they needed to improve. In the last year of high school (grade 12), all lab reports were compiled into a portfolio on which students were tested and assessed orally by an external examiner.

The lab module was not mandatory, but it became a widespread assessment method, and many schools opted to include it as part of the matriculation exam in chemistry. Based on data from the National Subject Superintendents' publications, it is clear that the percentage of students examined on the lab module was steadily increasing (National Subject Superintendent for Chemistry Publication, 2012–2013). Furthermore, in 2006, the Ministry introduced a new chemistry curriculum, designed to update chemistry education by adapting it to changes that had taken place in

chemistry in the previous 20 years (National Subject Superintendent for Chemistry Circular, 2006–2007, 2009–2010). The new curriculum emphasized the relevance of chemistry to everyday life and its contribution to various technological applications as well as to additional fields of knowledge. The aim was to make chemical knowledge more accessible for students, in order to meet the growing demand to increase public understanding and involvement in issues pertaining to ecological and medical decision-making.

In order to meet these goals, there was a need to cut considerable amount of material from the chemistry curriculum. Entire basic chapters, such as organic chemistry, were removed, while new chapters addressing current and relevant issues, such as the food chemistry, were added. The remaining topics were made more meaningful to students by drawing connections to everyday life, by adding literacy assignments and by developing digital activities (Avargil et al., 2013; Barnea et al., 2010). For example, oxidation-reduction reactions and acid-base reactions were taught in the context of reactions in the human body. Studying about biological molecules, such as fats, carbohydrates, and proteins, was conducted through explicit discussions of food and pharmaceutical development. Since the school year 2014–2015, when the “70/30 Reform” was made mandatory, the inquiry lab exam was also made mandatory and was counted under the 70% part of the curriculum assessed by “external examination” (National Subject Superintendent for Chemistry Circular, 2014–2015).

In order to understand how chemistry teachers perceive the “70/30 Reform,” and to look at their point of view regarding the changes that took place in their teaching practice following the reform’s initial implementation stages, 12 chemistry teachers were interviewed. These teachers (two men and ten women) teach in various Israeli high schools and had prepared their students for the matriculation exam for two consecutive years according to the 70/30 model. All 12 teachers are active chemistry teachers who had begun to prepare students for the matriculation exam before the Meaningful Learning Reform. Their teaching seniority ranged from 3 to 30 years ( $\bar{X} = 21.75$ ,  $S.D. = 7.79$ ). They have advanced academic background (five teachers hold PhDs/post-docs in science, seven have an MA/MSc degree in science, science education, or curriculum assessment and planning). The 12 teachers work in different geographical areas in non-selective schools serving students from a wide range of backgrounds.

The interviews consisted of 16 questions probing teachers’ views of how the reform affected the depth and scope of students’ knowledge of chemistry. The most interesting finding was that teachers’ responses reflected full consensus: all 12 teachers unanimously agreed that the reform does not promote the development of students’ deep and extensive knowledge. Teachers supported this opinion with a variety of explanations.

Most teachers feel that the reform was less relevant for chemistry than it was for other subjects, because alternative assessment had already existed in the chemistry curriculum before the reform. In expressing this view, teachers refer to the lab inquiry module, which was similar to the reform in terms of the skills and capabilities it aimed to foster: teamwork, independent learning, searching for information,



formulating questions, processing data, drawing conclusions, etc. In the original inquiry module in chemistry, students' learning was evaluated during the 3 years of high school, and the lab reports of all the experiments were collated into a portfolio. The chemistry teachers therefore explain that the Meaningful Learning Reform tried to implement something that had already been implemented in chemistry in most schools before the reform:

By the way, I think that meaningful learning existed in chemistry all along, and the tools for alternative assessment – they had also been there for years. Therefore, from the perspective of our school subject, the Meaningful Learning Reform is a little less relevant.

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I know that, in other school subjects, the reform is more relevant. Like, it makes a bigger difference to them. In chemistry, we had the whole inquiry thing, it was already there [...].... I really like the inquiry module, I think it's really well-done. Now they divided it in a way that's really complicated. So that, like, in chemistry, it didn't make such a difference, because... Really, the reform aimed at making other subjects be more like chemistry.

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Look, first of all, in chemistry, an inquiry module had always been there, for many years, long before the 70/30 and the school- based assessment reform.

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In chemistry, we don't have that many changes because we have the lab. And the lab is already considered an alternative assessment. That's how it was and that's how it's going to stay.

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Contrary to what people like to say, I think we did meaningful teaching also before [the reform].

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In chemistry, not too much [had changed], because in any case, for many years, long before the reform, we got into the inquiry lab thing. [...] We went into that program by choice. We came to believe that we needed experiments more than theoretical learning. It was a type of alternative assessment, because the evaluation was based on experiments... We had PD for the inquiry module, and we have been deep into this thing for a long, long time. We moved into the alternative assessment long before it became mandatory. So, in chemistry, there is no dramatic change.

According to the chemistry teachers who participated in the interviews, it seems that the reform brought nothing new to chemistry education. Moreover, the next excerpts show that these teachers complain that the reform did not take into account the teaching and assessment methods meticulously implemented in chemistry education long before the onset of the reform and which they believe had been highly successful. Consequently, they believe that in the case of chemistry education, the implementation of the reform actually caused harm. Some of the teachers report that, instead of adding something of value, the new inquiry module impaired the valuable learning that had been taking place in chemistry for several years. A few teachers view some of the experiments suggested in the new inquiry module as meaningless compared to the experiments they conducted in the past and as irrelevant to the material in the theoretical part of the curriculum. They also complain about the new regulation requiring to prepare students to take the entire written matriculation exam in a single year (rather than to spread the written exam out over 2 years). The argument was that the new regulations have a negative impact on the

inquiry module, in preventing deep discussions about the implications of the lab experiments beyond what is necessary for preparing students for the test:

Once, before the reform, when I had time, I would do inquiry on all sorts of things, even on topics unrelated to the curriculum. I stopped. I am limited in time. Now inquiry learning in my class is only on topics we are studying anyway [to prepare students for the test]. When an experiment is silly and is not connected to the material, like some of the experiments suggested in the new inquiry module... It's an experiment with no meaning.

In addition, teachers state that the removal of 30% of the contents from the mandatory curriculum considerably impaired students' knowledge. Some view the 30% of the curriculum shifted to school-based assessment as material that was doomed to "be lost" because, in their view, once there is no external exam, teachers no longer teach it properly:

They [the students] will suffer. When they'll want to go to university, they won't have enough knowledge.... There are topics they haven't ever heard of, such as inorganic compounds. I remember studying that in high school. Now it's not there. How can you not even have heard of them? This is going to affect their academic studies later on.

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Yes, the whole physical chemistry piece, which became part of the 30% school-based assessment. I am very sorry that it's going to be lost. It's a pity.

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Q: In your opinion, how does the reform affect the depth of students' knowledge? Do you think they are benefiting from the reform in this sense?

A: I don't think so. Because... It's as if, supposedly, they're learning in a different way... So, in terms of learning skills the reform clearly meets that goal. But if we're talking about contents... at the end of the day they reduced the amount of contents student must master at the level of the matriculation exam... And when I look at chemistry, I know that these students – the graduates of the reform – will get to university with a lower level of knowledge in some of the topics.

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So I think that to begin with, our program was a good program. And the fact that now, the material students are supposed to master for the matriculation exam has been reduced – it's a shame. The bottom line is students who know less chemistry than the ones studying before the reform... So really, like, we compromised, and the kids we're graduating now will know less; we gained a few more skills, a bit more variety in teaching methods. But the benefit, in my opinion, does not compensate for the loss in student knowledge.

It is important to note that teachers believe the reform caused damage not only to the scope of students' knowledge, but also to its depth:

I really try to do things in depth, but I teach in less depth than I used to, because I'm limited by time [...] There is no profound learning. On the contrary – it's less profound!

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The scope of the assignments, the time they require – it's not for deep learning. Who has the time to teach in depth material that won't be on the matriculation exam [i.e. the external exam] while trying to prepare students for the test?

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On the contrary [i.e. there is no deep learning], the reform only manages to undermine it, because it presents students with such a heavy load.

Because students' inquiry learning takes place after they had completed the written matriculation exam, most teachers feel that students invest less time in their studies and are less committed to enriching their knowledge both emotionally and

intellectually. After the pressure of the external exam is over, students feel there is no need to invest in their inquiry projects as much as they did before the reform:

From my experience this year with the 12th grade – they don't have the matriculation exam, because they took it last year... – I feel that both I, as the teacher, and them as students- are less stressed and also less prepared. We are free of the pressure from the matriculation exam, so we invest less.

## Conclusion and Discussion

The data described in this chapter are based on convenience sampling. I chose these particular participants because they were easily accessible to M.A. students at the Hebrew University: teachers from schools where the M.A. students themselves were teaching, or teachers they knew through personal connections. As such, it is reasonable to assume that the sample is not representative of all Israeli teachers who teach in the upper secondary school. Rather, their pedagogical knowledge probably represents a higher level of the relevant knowledge compared to the pedagogical knowledge of a representative sample of all teachers in the Israeli school system. Therefore, I saw no point in calculating the frequency of the various positions teachers expressed. Nonetheless, these interviews consist of a unique and fascinating collection of authentic testimonies regarding the implementation of the Meaningful Learning Reform 2 years after its kickoff.

One of the main conclusions drawn from the first group of conversations ( $n = 34$ ) concerns the large variance among teachers and schools in terms of the reform's implementation. The data show that, in fact, the implementation consisted of a patchwork of diverse conditions. It seems that, in some schools, the reform facilitated a considerable improvement in teaching and learning methods and in teachers' self-efficacy. On the other hand, there were schools where—based on the participants' statements—the reform caused chaos and a deterioration in the quality of teaching and learning. Teachers in these schools expressed frustration, a sense of loss of autonomy, and a sense of a blow to their professional capabilities. It seems that many of the schools where the reform led to improvements had already developed knowledge resources and relevant working patterns before its onset. In other words, according to the teachers, it is clear that the reform generated a positive change in schools that had started to change in similar directions before the reform. These schools started working several years ago on inquiry-based and/or project-based learning and/or on implementing diverse assessment methods such as student portfolios. These schools had also made a considerable investment in PD. One might say that in these cases, the systemic reform, imposed on the schools in a top-down direction, encountered the “islands” of pedagogical innovations and excellence already in the system, some of which developed in schools in a bottom-up direction. In these schools, the reform was an enabling catalyst for processes that had begun earlier: it removed bureaucratic barriers that had previously prevented

progress, supporting and empowering ongoing pedagogical change processes. The teachers' descriptions of the successful change processes that have been taking place in their schools for several years provide authentic testimony to the detailed planning and meticulous implementation that are necessary for changing substantive pedagogy.

The cases in which the systemic reform imposed from above met schools and teachers lacking the appropriate knowledge resources and working patterns seemed to fall into two groups. Given time, one group managed to catch up and develop appropriate working methods, whether thanks to internal, school-based sources of knowledge or thanks to external assistance (PD programs, the National Subject Supervisor, or school-based support). The teachers in the second group were lost. The reform forced them to abandon their traditional, familiar practices, but they had not yet developed new ones that would be more relevant to the new policy. According to reports by teachers in this second group, the reform caused a deterioration in the quality of teaching and learning. These findings can explain the absence of a strong impact of the reform revealed in the study conducted by the National Authority for Measurement and Evaluation in Education (2016): positive effects of the reform in some schools and negative effects in others may have cancelled each other out to create a zero effect.

We need to remember that this chapter addresses the effects of the reform in the upper high school grades, where the study of the National Authority for Measurement and Evaluation in Education (2016) found less-encouraging findings than in other age brackets.<sup>7</sup> According to these findings, one would expect interviews with elementary and middle school teachers to reveal more positive results. Yet, despite the methodological limitations of the present study, our findings are similar to the findings regarding parallel issues in the National Authority for Measurement and Evaluation in Education study (2016). Both sources reveal a gap between the real and the ideal in terms of the most important resource for the success of deep changes in substantive pedagogy—teachers' PD, which is a crucial element in the success of reforms addressing substantive pedagogy. Both sources indicate that many teachers still lack sufficient tools to implement the reform. They also indicate that teachers are avid for PD, more tools, and more school-based support and that the practical manner of the reform's implementation was unclear to teaching teams in many schools. Both sources also point to the need to improve the training of the reform's leaders. Finally, both sources show that, in terms of the quality of students' knowledge, reduced quantity of contents did not make way for better quality of knowledge.

These findings raise two concerns. One is that the reform will exacerbate the educational gaps already inherent between schools. The schools with pedagogical excellence and knowledgeable teachers will continue to improve, while schools lacking pedagogical excellence will continue to deteriorate. This is in blatant

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<sup>7</sup>It should be noted that the report of the National Comptroller points to a different conclusion, stating that the implementation of the reform in elementary schools was less successful than in other age levels (State Comptroller, 2018).

contradiction to the stated policy of the Ministry, highlighting the need to close gaps. The other concern is about students' depth of knowledge. One of the stated goals of the reform was to facilitate deeper knowledge. The teachers cited in this chapter say however, that, on more than one occasion, the implementation processes actually resulted in knowledge that was less comprehensive and more superficial than in the past. This finding supports the arguments presented in Chap. 2.

Teachers' statements show that the first stages of the reform were not well-organized, resulting in disorder that was sometimes very worrisome and described as "chaos." However, some of the teachers remarked that, with time, the disorder was resolved. This finding calls for a critical examination of this implementation method, which was not incidental. Informal conversations with senior Ministry officials, including the former Minister himself, made it clear that, already at the beginning of the implementation process, they were afraid that because of political instability, they would only be in office for a short term. Therefore, they (rightfully) predicted that they might not have enough time to set up the pedagogical infrastructure necessary for the reform in a systematic way. Nonetheless, they made the conscious decision to prefer a non-systematic introduction of the reform, to the alternative of taking a few years to plan and prepare for an orderly implementation process. The downside of a slower pace is the risk that nothing will be accomplished before the political situation changes, bringing in another new Minister of Education and another new reform. Some of the quotations in this chapter show that, in some places, the decision to work quickly worked. With time, internal, school-based resources, as well as external ones (such as PD, clarifications from the National Subject Superintendents, or Facebook support groups), helped dispel the fog. In other places, the sense of disorder resulted in ongoing dissatisfaction. It seems to me that, at this point in time, there is still not enough data to determine whether one can rely on this implementation method as tried and tested. It is necessary to wait and see what would be the effects the reform over the next few years and collect systematic data from organized samplings. One factor that may tilt the scales is the extent of investment in PD in the near future, which could help implement new teaching and learning methods in schools that still lack appropriate human capital and knowledge resources. Such schools have no way of making progress without systematic and extended PD. One possible implication of these findings is that a way to counter the ever-growing gaps between schools due to the reform might be to identify the schools lacking the appropriate knowledge resources and to construct for them a special strategic program for developing the human capital and the knowledge they sorely lack.

Another issue relates to the pattern of the uniform, inflexible implementation demanded across the board, in all school subjects, without considering processes that had already taken place over several years, creating solid routines for promoting meaningful learning. In this context, one should in particular mention the examples of biology and chemistry. The lack of consideration for past processes that took place in these subjects prior to the reform led to two negative consequences. First, the Ministry missed the opportunity to enjoy the benefits of the knowledge resources accumulated in these school subjects over the years that could have helped with the

implementation in other school subjects. Second, in school subjects like chemistry and biology, in which solid structures and methods had been constructed over the course of many years, the implementation of the reform actually undermined the fulfillment of its own goal. In fact, the implementation processes destroyed what had already been there without offering an adequate alternative. This insensitivity to the efforts teachers and other educators in biology and chemistry made over many years was frustrating, creating a feeling of going backward instead of forward. In this context, one could propose to those involved in implementing pedagogical changes to adopt the Hippocratic Oath: first, do no harm. To extend this analogy, the findings would seem to indicate that educators about to impose a change should look at the schools in which they intend to work and identify enclaves or places where the goals that the reform aims to promote had already been implemented. Considerations of efficiency and of the need to respect practitioners' previous efforts should lead decision-makers to think about what they can learn from practitioners about advancing the goals of their reform and about how they can support practitioners in preserving and even enhancing prior practices that are aligned with the goal of the reform. Instead of taking a step forward and another step back, such a line of thought and action would help the system stride forward.

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## Chapter 8

# Wide-Scale Implementation of Higher-Order Thinking (HOT) in an Era of High-Stakes Testing



**Abstract** This chapter addresses the relationship between a policy advocating thinking-rich instruction and a policy advocating a quick change that consists of “raising students’ test scores” in standardized tests. Top-down pressure to raise test scores turns standardized assessment into “high-stakes testing.” The chapter analyzes how leading science teachers view the influences of high-stakes testing on the implementation of the policy advocating thinking-rich instruction. The chapter draws on 20 individual interviews conducted with leading science teachers at the time they were preparing their students for the TIMSS international test. The findings show that the teachers’ expectations regarding a “new spirit” of teaching higher-order thinking (HOT) and inquiry-based learning were not met. Teachers reported that following the inclusion of more HOT items in national tests, test preparation indeed consisted of an increased engagement with HOT items. However, because of the high-stakes climate, engagement with these items consisted of training and practicing toward the exam. Under pressure, teachers focused on mechanical learning of techniques for answering HOT correctly rather than on nurturing authentic students’ thinking. Moreover, in effect, the high-stakes climate actually generated an increase in achievement gaps with regard to the development of students’ thinking, despite an explicit policy stating the opposite. From a perspective of the whole book, this chapter documents the extent to which educational policies in various areas may affect substantive pedagogy in general, and education for thinking in particular, showing how this influence actually takes place in the reality of schools.

**Keywords** Wide-scale implementation · Higher-order thinking (HOT) · High-stakes testing · Raising students’ test scores · Achievement gaps

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## Introduction

If you teach inquiry while teaching Ecology- it's like a death verdict for everything else... It's meeting the requirements and covering the curriculum against thinking [quote from one of the interviewees for this chapter].

Wide-scale implementation of HOT is not taking place in a void. Its outcomes are strongly influenced by the educational context in which it operates. The implementation of policies advocating instruction of HOT takes place in many countries while administering multiple standardized tests for accountability purposes. This testing creates a climate of high-stakes testing, with far-reaching consequences for all those involved: school principals, teachers, and students. One of the most negative outcomes is intense test preparation. This chapter examines how a culture of high-stakes testing affects the implementation of policies advocating instruction of HOT.

The effects of policies that in effect create a climate of high-stakes testing on learning and instruction have been documented by numerous researchers in many school subjects (e.g., Koretz, 2008; Mansell, 2007; Nichols & Berliner, 2007). These studies show that when efforts are taken to raise test scores in a short time, scores may go up, while deep processes of learning and instruction are being undermined.

Many studies show that this general phenomenon is also prevalent in science education (e.g., Maerten-Rivera et al., 2010; Marx & Harris, 2006; Shaver et al., 2006). Anderson (2012) conducted an integrative review of science education studies in this area. As noted in previous chapters, numerous policy documents and science education organizations currently support the use of progressive pedagogies such as inquiry-based instruction, instruction geared toward constructivist learning, project-based learning, and student-centered teaching. Anderson's review shows that under policies that induce high-stakes testing, research-based reforms aiming to implement progressive pedagogies tend to be compromised. Teachers' practice becomes more fact based; they teach less science content; they become less satisfied and fail to meet many students' needs. Accordingly, studies addressing educators' beliefs show that educators on all levels think that such compromises indeed take place. For example, Kersaint et al. (2001) interviewed 46 principals supported by NSF-funded science education centers in four cities across the USA. Most of these principals felt that testing policies, not reform ideals, are in effect the force that drives instruction.

Teachers often perceived accountability as disrupting to the efforts to induce educational reforms and as changing their course of instruction. In addition to their feeling that they must teach to the test, teachers reported that they no longer teach the way they think best. Although science education experts encouraged the use of inquiry-based instruction, teachers reported that high-stakes testing discourages its use. Studies consistently showed that under high-stakes testing conditions, inquiry-based lessons take place much less frequently. Teachers stated that they included much more inquiry-based curriculum in classes not connected with tests, whereas

instruction in classes connected to the tests was more fact based. Generally speaking, the reviewed studies indicated that accountability measures emphasize isolated facts rather than HOT and that even when tests try to assess HOT skills, they do not necessarily influence teachers to teach these skills (Anderson, 2012).

## Achievement Gaps and High-Stakes Testing

On the face of it, test-based accountability appears to have increased attention to achievement gaps because it increases expectations for all students, particularly low-income and minority ones (Anderson, 2012; Nichols & Berliner, 2007). Yet, many researchers argue that high-stakes testing and accountability widen rather than narrow achievement gaps. Research suggested that the structure of most accountability systems led teachers to focus more on students near the scoring cut-off point of meeting standard than on the lower achieving students. Teachers often view low-achieving students as less likely to be able to move from below to above the critical standard. Therefore, teachers neglect to nurture low-achieving students because they view them as “lost cases” in terms of their ability to meet the standard (Elmore, 2004; Gamoran, 2007; Huber & Moore, 2000; Nichols & Berliner, 2007; Shaver et al., 2006; Supovitz, 2009). Nichols and Berliner (2007) argue that children in too many schools rote-learn while slaving over worksheets for too many hours “preparing for the tests.” Many poor and minority children, however, are required to do so even more than other children. The phenomenon of “narrowing the curriculum,” including the avoidance of critical thinking while teaching for high-stakes testing, affects such students more than others. Marx and Harris (2006) address this point eloquently. They warn that especially in low-performing schools that are under intense pressure to show immediate improvement on test scores – test preparation and test taking account for substantial instructional time. These researchers are concerned that instructional time in low-performing schools will be spent on a narrow set of scientific facts needed for short-term success on tests. Moreover, as testing requirements increase, there is mounting pressure in marginal or failing schools to standardize instructional approaches that in turn will squeeze out components such as inquiry-based learning (IBL) from teaching science. In high-performing schools, it is more likely that time would be spent on a more ambitious approach to instruction, including more time for inquiry, because far less time will have to be allocated to test preparation.

These findings relate to a group of other studies, showing that teachers believe that instruction of HOT is indeed an appropriate educational goal for high-achieving students, but not for low-achieving ones. Research data show that in effect, teachers apply more thinking-rich instruction with high-achieving than with low-achieving students (Oakes, 1985; Raudenbush et al., 1993; Warburton & Torff, 2005; Zohar et al., 2001; Zohar & Dori, 2003).

## Educational Context

The study described in this chapter was conducted in a specific educational context. Between 2009 and 2012, the official policy of the Israeli Ministry of Education (MOE) consisted of (among other issues) the following three components:

- (a) *An aggressive policy stating the need for a rapid improvement in the scores of standardized tests* (the international PISA and TIMSS, and the national Mafmar and Meitzav science achievement tests, Israeli MOE, 2009). In addition, the policy also indicated a need for a rapid increase in students' participation rate in the most prestigious high school matriculation exams. The following quotation provides an example of a policy document stating this policy:

In the next three academic years the educational system will advance 10 places in the international (2012) PISA ranking in mathematics, science and language ... In four years, the number of students eligible for the 5 units matriculation certificate [i.e. the highest level matriculation level] will increase by 10% in each of the following school subjects: mathematics, physics, chemistry and English as a foreign language (Israeli MOE, 2010).

- (b) *A policy advocating the development of students' HOT and inquiry skills*. As noted in Chap. 1, the MOE continued to support the "Pedagogical Horizon: Educating for Thinking" policy advocating a system-wide change towards a thinking-rich curriculum. The support continued even after a change of government was accompanied by radical changes in the MOE's educational policy in many other areas. Consequently, in science education, the goal of teaching thinking was expressed in the official policy of the MOE Science and Technology Unit who decided that the implementation of scientific inquiry will be one of its major goals:

This decision would lead to construction of HOT skills as well as to meaningful construction of content knowledge. Consequently, students' achievements will improve (Israeli MOE, Science and technology administration, 2012).

- (c) *A policy calling to narrow achievement gaps*. For example, section #2 of the MOE "Goal Plans for the year 2011" states that the education system will strive to "Narrow academic gaps" (MOE, 2011).

The MOE took several quite dramatic steps in a top-down manner to implement the "raising test scores" policy in junior high schools:

- (a) Introduction of considerable changes to the junior high school science curriculum in order to improve its overlap with the TIMSS framework.
- (b) Addition of extra weekly hours to science instruction for test preparation.
- (c) Putting together a set of new learning materials (called the "Hila Kits") for teachers' use. The Kits consisted of a detailed description of the required knowledge and skills, theoretical materials for teachers, suggestions for instruction, and numerous examples of test items.
- (d) Issuing new strict regulations about what teachers needed to teach in each part of the year.

- (e) Hiring a team of instructors for visiting schools, in order to provide guidance and assistance about how to teach the renewed curriculum and new learning materials, but also to inspect whether teachers were teaching according to the new guidelines.

Several top-down steps were also taken in order to implement the teaching for thinking policy. The development of the Hila Kits was a significant contribution to this process. The Kits were designed to support teachers in planning and applying the content and skills designated by the science and technology junior high school curriculum. They were viewed as suggestions only, and each teacher was advised to adapt them to the specific needs of the school she/he was working in. The units of the Kits focus on chosen central topics of the curriculum (each unit covers 15–20 h of instruction) and central skills. Each unit consists of description of the knowledge and skills students would need, relevant pedagogical content knowledge for the unit's main topic (e.g., energy, reproduction and heredity, ecological systems), scientific background; practical suggestions for instruction, suggestions for lab activities, and a collection of assessment tasks (National Teaching Center for Science and Technology in Junior High School, 2010). The learning materials in the Hila Kits consist of many HOT and inquiry activities that are integrated into the science content. In addition, in order to encourage teachers to actually engage in teaching thinking, the national science achievement tests were gradually changed over several years, so that, eventually, approximately one-third of their items assessed HOT (Zohar, 2013a, b). The items in these tests are either multiple-choice items or items that require a short (up to three lines) constructed response. All items address topics from the science curriculum.

The HOT items normally consist of a requirement to apply knowledge studied in class to new circumstances, to construct explanations of a scientific phenomenon, or to apply scientific inquiry skills in investigations that are intertwined with the science content covered by the curriculum. The latter items present either a problem or some research data and ask students to plan experiments, to record findings, to analyze data, to draw conclusions, etc. An analysis of these items according to a taxonomy of levels of thinking such as modern versions of Bloom's taxonomy (e.g., Krathwohl, 2002; Leighton, 2011) would indeed place them as items that require more than memorization or simple comprehension. For example, an item addressing the eighth-grade electricity chapter stated that Neta conducted an experiment with the goal of finding out how the thickness of an iron rod influenced the level of current in an electric circuit. The item presented a diagram of an electric circuit that included a section made of an iron rod and a table with data about six iron rods differing in length and thickness. The item asked students to advise Neta as to which rods she should pick for her experiment. This was a multiple-choice item because students were asked to circle one of four combinations of three rods that the table provided (e.g., a. Rod #1, #3, and #5; b. Rod #1, #2 and #6; etc.). This was followed by another question, asking students: "Explain your choice by referring to the *length* and *thickness* of the rods you chose." Students were given one line to compose their response. An official website of the National Authority for Assessment and

Evaluation published an analysis of these items, stating that they addressed the sections of the curriculum about energy and about understanding scientific inquiry. In explaining what these items require students to be able to do, the website consisted of the following assertion:

these items require of students to identify the independent variable (thickness of the rods); to understand that only the independent variable in an experiment needs to be changed while all the other variables (length of the rods) need to stay constant; to understand how to apply the rule of variable control in an experiment; to identify in the table of data the rods that are suitable for this experiment. (National Authority for Assessment and Evaluation)

It should be noted that it is not easy to come up with original types of HOT test items. Indeed, an examination of tests from several consecutive years reveals that they consist of a limited number of patterns of test items that are repeated in diverse content areas.

An important question in the context of the current research is whether or not students can be cued or prepared for answering HOT test items, such as the example described in the previous paragraph. When answering multiple-choice items that are designed to assess HOT, students may often pick up the correct answer using a heuristic that directs them to answer correctly rather than by applying deep understanding of the reasoning strategy assessed by the test item (Cooper, 2015; Talanquer et al., 2015; Zohar, 2013a, b). A possible remedy for this problem is to ask students to explain their response to the test's multiple-choice questions in order to verify their understanding. Yet, simply asking for a short explanation is not always sufficient because there is evidence that students can rote learn correct responses to recurrent patterns of reasoning item requiring simple, short-constructed answers (Zohar, 2013a, b). One such example draws on data from the Israeli matriculation exam in biology during the 1980s. The exam contained a chapter that addressed scientific inquiry skills, including an item that assessed the control of variables strategy. For several years, students' scores on this item were extremely high. Suddenly in a certain year students' scores dropped dramatically. An examination of the items that appeared in the exam over the years explained the drop: the pattern of the control of variables item was quite similar over many years, but was changed in the year the scores dropped. The item was not more difficult, but since it was different than the pattern students were cued on, they could not use the heuristics teachers taught them for answering the control of variables item. In general, the limited number of patterns of HOT test items that are repeated over the years in diverse content areas is a key factor in the current discussion because under such circumstances, teachers can and often do prepare students not only for choosing the correct multiple-choice response but also for justifying their choice in a short sentence (Zohar, 2013a, b).

It should be noted that whether or not an item actually makes it necessary to think in order to answer it correctly obviously depends on the nature of the item, but also on the educational context within which students have to answer it. An item may require deep thinking when students encounter it for the first time. The same

item may require mainly retrieval from memory if students have been drilled in numerous examples of similar items as part of intense test preparation.

Finally, in order to implement the third policy calling to narrow achievement gaps, teachers were asked to facilitate personalized treatment of students. Specifically, teachers were required to follow up and report upon achievements of individual students.

The educational context in which these three policies were made at the same time provides a unique opportunity to study how their consequences interact with each other. The present study therefore aims to address this issue from the perspective of how senior science teachers view the effects of several simultaneous and interacting policies on classroom practices.

## Methodology

Twenty semi-structured interviews were conducted with 20 senior science teachers in junior high schools. In addition to current science classroom instruction, all participants either served as heads of science departments in their schools or were engaged by the MOE as instructors in professional development programs for science teachers. In order to be chosen for these roles, teachers needed to have good reputation in terms of their instructional skills as well as to have a robust background of a large variety of in-service professional development courses (many of which focused on teaching inquiry and HOT) and/or a higher degree than just the BA and the teaching certificate that are necessary for teaching science. As indicated by the data analysis presented in what follows, the more senior than average participating teachers were indeed knowledgeable in terms of progressive teaching methods.

The singularity of the interviews is in their timing—they took place close to the time the international TIMSS, and local Meitzav, and Mafmar science tests were administered. Consequently, it was close to the time teachers had prepared their students for the test, while this experience was still fresh in their memory. The semi-structured interviews were approximately 1.5 h long, consisting of 11 core questions and numerous probes, addressing issues such as: What are teachers' main goals in teaching science and what do they see as the best ways to achieve them? What is their view about teaching HOT in science classrooms? How do they believe students should best be assessed? What is their opinion concerning the policy of raising test scores, the new science curricula, the new testing regime and the hila kits? And, how do they think these issues had affected science teaching? In addition, the interview asked about the pressure to raise test scores and how it had affected all of the above.

The data was analyzed using a pragmatic qualitative research approach that is particularly suitable for professional fields because it provides the descriptive information that can inform professional practices (Savin-Baden & Howell-Major, 2013; see also Chap. 4). The research conducted within this approach is just what the name implies: research that draws upon the most sensible and practical methods

available in order to answer a given research question. It aims for description of experiences and events as interpreted by the researchers. It therefore marks the meeting point of description and interpretation, in which description involves presentation of facts, feelings, and experiences in the everyday language of participants, as interpreted by the researcher. Analysis typically consists of qualitative content analysis using modifiable coding systems that correspond to the data collected, and interpretation stays close to the data (Savin-Baden & Howell-Major, 2013).

## Findings: “Because Of The Measuring—We Are Loosing It”

The official voice of the system is to encourage thinking skills. But the way it is implemented ... because of the attempt to raise test scores, because of the measuring- we are loosing it.

These pessimistic words of one of the interviewees summarize the views of many of the teachers concerning the gap between the stated policy regarding the advancement of inquiry and HOT in science learning and what actually takes place in science classrooms. It seems that the simultaneous requirements for a rapid improvement in test scores and for fostering HOT, created considerable tensions and conflicts. The rest of this chapter examines various aspects of this statement and their implications.

## Teaching for the Test Increases the Frequency of Engagement with HOT During Instruction

Sixteen teachers (80%) view the system-wide tests as a tool that directs learning and instruction:

If we want to succeed in international tests, there is no other way. Currently, *we are teaching for the test* (original emphasis by the interviewee).

According to these 16 teachers, in order to prepare students for the tests, it is necessary to teach them both the content and the skills the tests require. Because the tests are rich in thinking items, part of test preparation must consist of addressing thinking skills in the classroom:

The Meitzav test is oriented towards learning, and it focuses on thinking skills. Once I understood that this is what is important for the test, I began to emphasize it [in my teaching].

This year the Mafmar test will definitely include inquiry skills such as controlling variables. Students don't know that, so I taught it before the test.

Throughout the years we learned that students fail the HOT items. We need to prepare them in a better way for the challenge involved in this part of the test.

Not only the tests but also the learning materials in the Hila Kits addressed HOT in an extensive way:

I thought the Hila Kits were really good because they had more thinking skills ... It is important that thinking issues are being treated.

A total of 13 teachers (65%) noted that the materials they received in the Hila Kits addressed diverse thinking levels, including questions requiring HOT strategies such as text analysis, understanding graphs, formulating research questions, formulating evidence-based arguments, drawing conclusions, etc. These findings indicate that on the face of it, both the high-stakes tests and the Hila Kits learning materials encouraged and supported the policy of teaching for thinking. The picture changes, however, when we look deeper into the data.

## **Rote Learning of HOT?**

According to many of the interviewees, test preparation caused “teaching thinking” to consist of rote rather than meaningful learning. In order to explain this view, I will first highlight the differences between how teachers view rote and meaningful learning in general and then show how these differences are expressed in the ways by which test preparation affects teaching for thinking.

Fourteen teachers (70%) explained the difference between how they view meaningful learning (which they called “real learning”) and non-meaningful learning. The interview transcripts showed that these teachers have rich pedagogical knowledge that may enable them to support students’ deep understanding in diverse topics. The following citation is an example of how one of the teachers explains the central idea of the relationship between surface area and volume to her grade 7 students. This central idea is replicated in many biological contexts such as the small intestine, lungs, red blood cells, and plants’ leaves. I chose this particular example from many other transcripts showing teachers’ rich pedagogical knowledge because it demonstrates several aspects of meaningful learning of both scientific concepts and HOT:

I found a solution [for how to teach] the relationship between surface area and volume. I bring to the classroom two baguettes and chocolate spread. I spread the chocolate on the surface of one of the baguettes and cut the other one to small, round slices. Then I spread chocolate around each slice. While I am doing it, I ask them where I am using more chocolate ... They are watching and know the answer right away: the sliced one. In the test you could see that this was experiential learning. This is meaningful learning. I met again several of the students who were in that class while we were studying about the digestion system when they were in 10th grade. They all said that this is exactly the same thing as the baguette and the chocolate. It is exactly the same ... They remembered and could apply [the principle] correctly. Students are active, involved, experiencing and they take responsibility during [meaningful] learning ... [when students come to me and ask:] How should we do



this experiment? [I tell them:]... Let's plan it together. I find this is the most important thing... For meaningful learning they need to think about it for themselves in a deep way, the need must come from them ... That they will ask clever questions ... that don't have easy answers, that you need to search information [in order to find the answer]. All students are going to search for information and then next time we meet each student tells what he or she found about this question. Each student presents his or her findings. This process also places me in a proper role: the teacher also does not know [the answer] so we are all investigating it together. (#1)

In this excerpt, the teacher talks about two ways of meaningful teaching and learning. In the first part of the excerpt, she explains how she had taught the principle of the relationship between surface area and volume by engaging students with an experiential demonstration of a baguette and chocolate spread. This demonstration shows students that the amount of chocolate you can spread on a whole baguette (which has a large volume compared to the volume of each slice) is smaller than the amount of chocolate you can spread on all the slices (i.e., the pieces you get when you slice the baguette) combined. This shows that the total surface area of many bodies with small volume is larger than the relative surface area of a large form that has the volume of all the smaller volumes combined. The teacher notes that due to the vivid experience involved with this demonstration, students had not only remembered it for several years, but could also apply the principle they had learned to a new context (the digestive system).

In the second part of the excerpt, the teacher discusses several characteristics of meaningful learning, noting the following relevant aspects: learning is experiential; students are active learners who are deeply involved in their own learning; students ask "smart questions" leading to an inquiry process that triggers a need to look for information and construct new knowledge; during inquiry learning the teacher's role changes from being a source of information to supporting students in thinking and in looking for solutions; and the teacher is learning along with her students.

Like additional teachers who talked about meaningful learning, this teacher held a constructivist view of learning according to which learning is a process of meaning-making by active learners who engage in inquiry and HOT. These teachers view instruction in which the teacher is transmitting information and "spoon feeding" her students as learning that does not bring about deep understanding. Teachers view such learning as shallow rote learning that does not support the development of thinking tools and the ability for deep thinking because learners do not go through an active process that help them construct their own knowledge. This idea is expressed in the following citations:

Real learning means you reach some very serious situations of thinking. Raising authentic hypotheses, examining things, deliberating, experimenting. If you don't allow them to make mistakes, it's not real learning. Because it is you that does and explain everything. To transmit information..., while it doesn't matter whether or not they got it ... Rote learning does not mean that I went through a process, or that I had learned anything for the sake of learning, for the purpose of fostering students' thinking. Instead, I had learned because I had to, and I did not receive enough tools that can help me to think differently.

Another teacher had explicitly described the negative effect of the policy for raising test scores on the quality of learning:

Measuring and running after achievements is not real learning. It's the same as reciting a History chapter ... and doing well on the test. [...] It's not clear what will remain in my head in a month.

The interviews show that the pressure to do well in the tests leads to abandonment of complex teaching goals such as meaningful learning with deep understanding and thinking, in favor of simpler goals focusing on test achievements.

Despite the fact that the interviewed teachers seemed to have rich pedagogical knowledge that may enable them to support students' deep understanding in diverse topics, there is ample evidence that test preparation hindered their use of that knowledge. Seventeen (85%) of the interviewees reported that the new guidelines to teach the content and skills that are necessary for the exam drove them to change their teaching patterns, narrowing the opportunities to provide students with meaningful learning experiences. In general, these teachers stated that they are no longer able to combine complex thinking tasks with their daily teaching routine. About half of these teachers said explicitly that the requirement to raise test scores made them reduce mainly teaching processes focusing on thinking, inquiry, and creativity:

Precisely because of the new program, I am less able to provide meaningful learning so that the child will engage in inquiry, will be interested, will be able to explain to others, to ask HOT questions ... I have less time for creativity.

Why did I stop doing inquiry? Because my class was supposed to take the TIMSS test ... So I needed time to prepare them ... *And you can't do it all at once. It creates a conflict.* (emphasis in teachers' own voice)

It turns out that when you're stressed learning is not meaningful. Teachers teach the material because they have to, they just tick it off, and it chills any enthusiasm. Teachers felt stressed ... They had no time for projects, papers ... These things take time.

A stressed teacher will run away from allowing students think. She doesn't have the time to develop a discussion until they reach a conclusion ... [she] will tell them what the concept means and that's it.

How do these ideas align with the findings from the earlier section according to which test preparation increases the frequency of engagement with HOT during instruction? Teaching thinking is usually viewed as contradicting rote learning (Zohar, 2013a, b). A careful reading of the interview transcripts, however, shows that in an era of intense test preparation, this contradiction is no longer necessarily true. HOT test items address strategies such as control of variables, formulating research questions, verbal explanations of graphs, and drawing conclusions. Twelve teachers (60%) said that it is possible to engage with issues involved with such thinking strategies in a superficial or "mechanical" way. This means that instruction focuses on drill and practice that aim at improving students' ability to respond correctly to HOT test items, rather than on the construction of students' thinking *abilities*. Therefore, according to the interviews, engaging with HOT items does not necessarily reflect scientific thinking because students can engage with them and even answer test items correctly by applying rote learning:

Many children learn by memorization, they engage in rote learning of knowledge, and get great test scores. This is not yet scientific thinking ... The system however views test scores as the ultimate manifestation of achievements.

A child who studies science in the way that is common in today's schools, does not develop scientific thinking even if he does get high test scores ... The Meitzav test indeed contains HOT items, but this is not enough because they are clearly not questions about processes. Questions about fragmented issues that are disconnected to each other, actually mean you need to spill out what you have memorized, to spill out the thinking skills. (#19)

These quotations indicate that the teachers indeed believe that it is not necessary to actually engage with active HOT in order to answer the tests' HOT items, because students can answer such questions by "spilling out" the material they had memorized for the exam. Indeed, nine teachers (45%) said explicitly that while they prepare students for the test, they must teach HOT strategies in a mechanical way rather than as a process that fosters the development of students' thinking abilities and deep understanding.

It is important to note that instruction emphasizing memorization rather than active thinking results from the pressure to prepare students for the exam rather than from lack of the pedagogical knowledge required for good teaching. For example, one of the teachers described how she was obliged to teach a thinking strategy (formulation of an inquiry question) in a "transmission of information" approach. The teacher explained that this was not the way she would have liked to teach, making it clear that she had the pedagogical knowledge required for constructing students' reasoning abilities in an active and profound way. She explained how she would have taught if she only could. She would have encouraged students' brainstorming to raise multiple possible questions and then ask students to classify the questions they had raised, to create criteria for high-quality research questions, to make reasoned decisions about which question to choose, and to think about the variables they would like to investigate. Yet, rather than apply this comprehensive pedagogical knowledge in the classroom, she described how she had begun her lesson by "telling" her students what is a research question, which research question they are going to investigate, and what would be the dependent and independent variables in their investigation. This teacher explained that the time pressure created by the preparation for the test forced her to teach thinking strategies "in a mechanical rather than a meaningful way." She summarized this section of the interview by stressing that she believes the way she had taught does not lead to "real learning" (these quotations are cited verbatim).

Another teacher elaborated even more about teachers' difficulties in working in the midst of conflicting policies—on the one hand a policy pressing to raise test scores and on the other hand a policy advocating the development of students' thinking:

The [Hila] Kits were written with *a new spirit* of saying YES to thinking and skills. This year they told us to emphasize inquiry skills ... I would have expected it to be performed in that spirit, so that students will get a message that they really needed to think. In second thought, perhaps *their goal was only to show that test scores are suddenly going up* (original emphases by teacher). The Kit consists of some rather amazing questions that could be part of our lessons ... But this is all a function of how much time we have, if we can actually fulfil their potential.

This teacher clearly saw the Hila Kits' potential in terms of advancing the new spirit of teaching HOT and was hoping that it will indeed affect her teaching. However, her expectation that the new spirit evolving from the teaching thinking policy will indeed affect students' thinking was not fulfilled. This excerpt indicates that parallel to the recognition of the demand to teach students to think, she also recognizes the demand to increase test scores. According to this teacher, the possibility to integrate the Hila thinking questions (which she describes as "amazing") into her routine teaching does not materialize because of the lack of time resulting from the pressure to prepare students for the test. It seems that under these conditions, students and teachers cannot allow themselves to "waste" time on thinking. Teachers' attitudes toward the conflicting messages coming from the MOE are also expressed in the following citations, whose first lines are also cited at the beginning of the chapter:

If you teach inquiry while teaching Ecology- it's like a *death verdict for everything else*. You must devote special time for it because otherwise you will be short of time ... I see it in other schools too, exactly the same difficulties as here ... I must meet the requirements and cover the curriculum ... What can I do? *It's meeting the requirements and covering the curriculum against thinking* (emphasis in origin, apparent in teacher's voice). This is difficult because our students are racing to reach the goal – the final test, after they had covered all the material ... At the beginning of the year I give them the syllabus and each time I am marking on it what we already covered ... *So we are talking about doing something according to schedule, not about learning* [emphasis in origin, apparent in teacher's voice]. Learning is not meaningful. Teachers say that they feel they are racing. We may have mentioned a concept on the level of naming it, but we didn't really teach it. There is no joy of learning, of accomplishment, of doing something deep ... Everything is about tic, tic, tic, quickly, quickly, and about meeting requirements on time.

Following the new program, I have less of a possibility to teach in a meaningful way, so that the child will investigate, will be interested, will be able to explain to others, to ask HOT questions about a process ... I have less time for creativity, so that each child would be able to be creative, that his curiosity will not be lost... I have changed the way I teach.

We are currently abandoning learning by inquiry [because otherwise] we will be unable to meet the requirements on time. I don't have the privilege of letting them conduct an experiment, do something with their own hands. This is a considerable transformation in perception.

These teachers describe their difficulty to devote time to teaching HOT, particularly to teaching thinking (as well as content) in a meaningful way while still meeting the requirements in terms of test preparation. As mentioned earlier, 60% of the interviewees reported a similar conflict.

In summary, despite a policy stating that developing students' thinking is one of the MOE's explicit goals, the policy stating the need to raise test scores overrules. Test preparation drives out thinking-rich instruction and deep learning.

## Narrowing Achievement Gaps

The studies presented earlier point to educators' belief that the pressure to raise test scores increases rather than decreases achievement gaps (e.g., Elmore, 2004; Marx & Harris, 2006; Nichols & Berliner, 2007; Shaver et al., 2006). Nichols and Berliner (2007), for example, argued that the focus of schools on raising test scores and on test preparation undermines the school system's stated goal of narrowing achievement gaps. As explained, another policy advocated by the Israeli MOE at the period examined here addressed the need to narrow achievement gaps by (among other things) raising test scores for *all* students (Israeli MOE, 2011).

This section examines how the raising test scores policy affected diverse students' populations. Although no interview question addressed this issue directly, 11 interviewees (55%) spontaneously raised the issue of students' diversity and meaningful instruction of science topics (including application of HOT) to *all* students. These teachers argued that there is a contradiction between the requirement to teach complex topics (e.g., density, forces and interactions, and complex processes in the human body) in a limited amount of time and the requirement to adapt instruction to students' diversity. According to these teachers, the quick pace of instruction required to cover the curriculum in terms of both content and skills is suitable for the abilities of high-achieving students. The same quick pace, however, harms the ability to provide a suitable response to students with low academic achievements:

Meeting requirements in terms of covering the material in a limited amount of time is something that currently pressures teachers ... From my own point of view, this pressure is very positive ... I teach a strong student population for whom this pressure is excellent. The pressure to study helps them to make progress ... Strong students get much more from the new program ... They get everything really quickly ... There is also a feeling that we can run quickly with the material and waste less time ... rehearsing each topic ... *So the weak students are left behind* (emphasis added by authors).

For the weak students the topics we need to teach are too many and too complex. This creates difficulties ... For these students I need to reduce the amount of topics I teach ... It flows smoothly for the strong ones ... The strong ones want to move forward, they want more information, but I need to restrain myself so that I will not frustrate the weak ones who need more drilling in order to understand ... It is very difficult to cope with all this in a heterogeneous classroom

Turning our attention more specifically to the issue of teaching thinking, previous studies found clear evidence showing that students from *all* levels gain from instruction of HOT. Yet, most teachers believe that it is an appropriate educational goal for high-achieving (HA) students but not for low-achieving (LA) ones (Warburton & Torff, 2005; Zohar et al., 2001). These studies alert us about the danger embedded in this belief because it might become a self-fulfilling prophecy. Teachers who hold this belief may direct thinking activities more to HA than to LA students, thereby inhibiting them from making progress. In effect, this belief may widen achievement gaps. Previous studies also found that teachers lack instructional tools for teaching thinking to LA students and specifically for providing the scaffolding these students need.

In contrast to these previous studies, 10 of the 11 leading teachers who expressed their views regarding this issue in the present study believe that the goal of teaching HOT is equally appropriate for LA and HA students. Only four teachers were apprehensive about the frustration of LA students following instruction of HOT. Yet, the interviewees are not blind to the difficulties of LA students. In effect, they acknowledged these difficulties but believed they can overcome them by using appropriate scaffolding, as long as they can devote an appropriate amount of time to the teaching of this issue. The excerpts also show that the interviewees have complex pedagogical knowledge that includes specific instructional strategies such as scaffolding a complex task by dividing it to several smaller tasks, or scaffolding through a series of guiding questions:

Not all students can reach the highest levels of analysis or synthesis.... I would give such tasks only if I could teach the proper background. This is not an easy task... Weaker students have a problem with understanding graphs... I would not give them such tasks without first verifying that they know how to read a graph, and that I had taught them about dependent and independent variables. Only then I would ask them to analyze it.

I would give that task to the stronger students, but I would not make it too easy for those who find it more difficult ... There are so many thinking strategies ... I would break them into small portions ... do it in a more friendly way ... and let everybody deal with it as is. They can do such a task even if it is difficult.

I believe that a task which requires HOT is appropriate for all students. Some students will be able to draw a conclusion on a rather simple level and others will find it difficult to draw any conclusion at all ... Therefore, whenever we have high-level questions, I would provide support by asking guiding questions to those who find it more difficult ... Perhaps by the end of the school year more students will be able to operate on high thinking levels.

Yet, these teachers explained that there is a mismatch between the program's demands to teach many topics (some of which are rather complex) in a limited amount of time and the need to adapt instruction to students' diversity. They stressed that the quick pace of teaching dictated by the stressed atmosphere characterizing high-stakes testing may be suited for the needs of HA students, but interferes with providing the support that LA students need:

The stated goal of the MOE was to increase the test scores of weak students. For example, they gave teachers examples of how to accommodate learners' diversity when planning a lesson ... But a stressed teacher will be less attentive to learners' diversity. She will be running ahead to cover the curriculum and therefore will lose 20% of the 'weaker' students.

Teachers that got stressed ... did not reach high achievements and did not adapt their teaching to learners' diversity ... To learn information by heart or to watch the teacher demonstrate an experiment is evidently not enough. In order to treat learners' diversity you must apply a variety of teaching methods, to use scaffolds. This must be done in a systematic way by those who design new learning materials ... teachers must have the option to respond to students' diverse needs.

Strong students get much more from the new program... they get it quickly... There is a feeling of a quicker pace and less wasted time in the new program... so the weak one stay behind.

I failed to bring the weak students to the level of application ... because they did not go through the process, did not internalize the skills. In addition, the topics they learned this year were very complex and abstract, requiring high levels of thinking ... If the

curriculum is not suited to students' cognitive level, even the most professional teacher with the highest motivation will not be able to make it. Following the innovations of the last two years teachers had started to question students' abilities. They say ... students will not be able to cope with it. Such teachers will be less attentive to students' diversity. If such teachers will run forward they would lose 20% (of the students)

## Summary and Discussion

This chapter examines how senior science teachers view the policy of raising test scores in terms of how it affects instruction of HOT and narrowing achievement gaps. Previous studies show that “teaching for the test” focuses on memorization of facts and basic skills rather than on instruction of HOT (e.g., Koretz, 2008; Mansell, 2007; Nichols & Berliner, 2007). When comparing these findings with those of the present study, the data show mixed results. On the one hand, our data show that following the implementation of a policy calling for instruction of HOT, teachers indeed devoted more time to engage students with HOT while they were preparing them for the tests. Please note, however, that we use the words “teachers devoted more time *to engage* students with HOT,” rather than the words “teachers devoted more time *to teaching* HOT,” because our analysis shows that many of the teachers didn't actually think they were teaching students how to think, but more how to respond to particular types of test items. They did this by using algorithms and drill and practice.

Part of preparing students for the tests consisted of engaging with HOT tasks taken from the Hila Kits and from tests of previous years. Following the policy calling for teaching students to think, the design of the Hila Kits addressed thinking strategies such as analysis of scientific texts and graphs, formulating inquiry questions, controlling variables, formulating evidence-based arguments, and drawing conclusions. Teachers therefore believed that the Hila Kits had an important role in preparing students for the tests. Many of the participants in this study expressed the view that teaching HOT is a worthwhile instructional goal and indicated that they had elaborated pedagogical knowledge of how to practice it with their students in a meaningful way. Yet, their expectations regarding a “new spirit” calling for instruction of inquiry and HOT throughout the system did not materialize. They reported that under the regime of high-stakes testing, instruction of HOT seemed to take the form of “mechanical instruction,” implying rote learning and drilling students in answering HOT items, rather than teaching for thinking in a meaningful way.

How can we explain this finding? As explained in the methodology section, it seems that the standardized tests under consideration indeed applied many items that can be classified as HOT items. But as the data reveal, the structure of a test item is only one of the factors determining how it will affect learning and instruction. Our study shows the significance of the educational context in which the tests are applied. In the case of the present study, two main factors in the educational context seemed to have an especially large effect. The first factor is the large amount

of material that needed to be covered in a limited amount of time. The second factor is the fact that the tests were given in an educational context that pressured teachers to experience them as high-stakes tests. The data show that the combination of these two factors made teachers resort to more didactic methods than they cared for. Pressing teachers to “cover the curriculum” in a limited amount of time made teachers engage with the complex learning materials from the Hila Kits in a shallow way of drill and practice. Teachers’ beliefs regarding the strategies addressed by the tests influenced their decisions as to which thinking strategies they should teach. In addition, the fact that the tests consisted of patterns of HOTS items that were applied repeatedly over the years made it possible to drill students in how to respond to such items using external cues, rules, and algorithms rather than deep thinking. Under these circumstances, instruction may have facilitated students’ ability to improve test scores, but did not make a real contribution to the development of their scientific reasoning and deep understanding. In sum, the chapter demonstrates the diverse ways by which the educational climate created by the “raising test scores” policy had affected the substantive pedagogy in the context of teaching HOTS.

The analysis presented in this chapter points to future directions for improving testing from the perspective of its potential contribution to valid assessment of HOTS. One recommendation is to develop more complex tasks. Teachers will find it difficult to prepare students for such tasks by using “technical” drilling and rote learning. We can assume however that written tests are a limited means to accomplish this goal. Consequently, there is a need to develop more diverse means of assessment such as inquiry papers, projects, portfolios, etc. Yet, improving assessment is only part of the story. A second recommendation relates to the educational culture of the school system.

Strong pressure to raise test scores creates a culture of high-stakes testing. Even the best assessment methods cannot function well in such a culture that drives principals, teachers, and students to adopt diverse means for raising test scores without really improving learning (Zohar, 2013a, b). *Therefore, if we want assessment to be able to support deep thinking, we need to develop both appropriate assessment tools and a climate that will be free of the pressure to raise test scores.*

The findings show that despite a policy stating the need to narrow achievement gaps, under such circumstances, learning of low-achieving students is compromised. Many of the teachers in our study believed that in principle, it is possible and worthwhile to develop the thinking of low-achieving students. Yet, because of the aggressive policy regarding a quick improvement of students’ achievements, they had to abandon the goal of teaching HOTS to low-achieving students.

In sum, the central contribution of this chapter to the main argument of the book is in demonstrating how a policy embracing the development of students’ thinking is affected by policies regarding raising test scores and the climate of high-stakes testing that follows such policies. In particular, the findings show that the considerable efforts to implement the policy advocating instruction of HOTS were compromised in terms of their effects on classroom practice within the climate of high-stakes testing. Substantive pedagogy does not take place in a void because it is sensitive to culture and context. A strong pressure from policy makers and administrators to



raise test scores leads to a climate of high stakes. Such a climate interferes with teachers' abilities to develop students HOT even when they have the knowledge, supporting learning materials, and motivation to do so.

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## Chapter 9

# The Implications of Serious Consideration of Substantive Pedagogy for Policy and Implementation of Deep Changes: Summary, Conclusions, and Discussion



**Abstract** This chapter summarizes the value of the book for educators who are interested in scaling up instructional innovations in general and in innovations pertaining to teaching higher-order thinking (HOT) in particular. It stresses the idea that *in order to achieve deep changes, and to avoid superficial, mechanical ones*, reformers need to engage in strategic and systematic planning of the implementation of substantive pedagogy. For example, it is not enough to plan professional development (PD) courses in terms of their budget and hours, but it is also necessary to plan the knowledge of HOT and the pertinent pedagogical knowledge the courses will address and how this knowledge will be taught. The chapter argues for *a new model for deep change processes*, focusing on a need to adjust the scope and pace of change to teachers' level of knowledge. Accordingly, in addition to the initial goals of a reform, considerations regarding teachers' initial knowledge and expected scope of PD will also affect the reform's design. Two additional important conclusions argue that successful scaling up of innovative instructional innovations require the combination of generic knowledge about scaling up with content-dependent knowledge pertaining to the specific instructional innovation and a need to conduct deep and systematic PD processes for middle-level pedagogical leaders. These conclusions are relevant for changing educational systems of diverse sizes: from large systems such as the whole education system, but also for smaller systems such as a network of schools, a district, a single school, or one school department.

**Keywords** Higher-order thinking (HOT) · Educational change · Deep change · Scaling up · Policy and implementation

## Introduction

In my work as a consultant in the field of change processes in learning and instruction, I encounter the same phenomenon over and over again. The people I work with (change leaders) are passionate and motivated about educational reform. They are confident they will be the ones to change the world. They declare that they intend to produce pedagogical change. However, during our conversations, it becomes clear

that they are actually referring to changes in pedagogical administration or changes in the pedagogy of the structure of teaching. I tell them something is missing. I explain that past experience suggests that, without well-planned and meticulous work on substantive pedagogy (although I do not use this term explicitly), the chances they will succeed in bringing about real and positive change in the quality of education are slim. “We leave those aspects to the principals and teachers in the classrooms” is the answer I often get from the people sitting across the table from me, who often have no personal experience with working in classrooms or schools. They do not understand substantive pedagogy. In fact, they do not see it at all. As if it is transparent to them.

I already know how the conversation will end. I can anticipate how, in all likelihood, the change process in which they are going to invest a significant amount of time and public money is going to end. I expect yet another reform replete with all the bells and whistles, but ultimately one that will not touch the core of teaching and learning processes. It will make no real change. My heart aches. It is, however, hard for me to explain what I see as critical for a successful change process: a systematic, meticulous planning of the implementation of substantive pedagogy. This book is an effort to explain this critical issue.

## Focusing on Deep Systemic Change of a Particular Instructional Goal

The theoretical literature discusses how to bridge the gap between *educational* policy on teaching and learning and the teaching and learning that actually take place in classrooms. Scholars state that this is an important and complex issue that has not yet been adequately addressed in educational theory or practice (Coburn, 2003; Elmore 2004; Lee & Krajcik, 2012; McDonald et al., 2006; Raudenbush, 2007; Zohar, 2013a, b). The literature emphasizes the pressing need for further research, conceptualization, and maintenance of an appropriate level of intellectual discussion of the subject.

The present book aimed to bridge this gap by examining the **deep** components of a broad and system-wide change in teaching and learning. It is based on Raudenbush’s (2007) definition of teaching as classroom interactions between teachers and students that are taking place around educational content. Following Coburn (2003), the current book addresses the significant challenges inherent in trying to reach a large number of schools while focusing on those aspects of **deep educational change** that are necessary for a coherent and sustainable reform. Some previous researchers have also focused on the **depth** of the desired changes in learning and instruction. For example, Cohen and Barnes (1993a, b) discuss the slow and inconsistent progress characterizing efforts toward deep changes in educational systems. They assert that many reformers, whose goal is to distance themselves from traditional teaching models, aspire for high-quality teaching. Implementing such

high-quality teaching on a large scale, however, involves considerable difficulties. Cohen and Barnes explain that in order to find ways to improve implementation, it is necessary to delve into the depths of teaching and learning processes, to examine how their various aspects are integrated in the implementation, how they influence various implementation processes, and how they are influenced by them. Other previous studies (e.g., Elmore, 2004; Fullan, 2007a; Zohar, 2013b; Cohen & Mehta, 2017) argue that educational reforms seldom generate the desired change in the quality of teaching and learning because they tend to focus on shallow rather than on deep elements. They feverishly make changes in various aspects of the organizational, economic, and administrative structures of the education system, but do not address the actual processes of teaching and learning, or at least do not address them in a serious and well-planned manner. It is therefore hardly surprising that they do not succeed in improving these processes.

The present book takes the discussion a step further, focusing on two main perspectives. First, from the perspective of those interested in educational change, it investigates aspects of systemic change in teaching and learning regarding a **specific instructional goal**—teaching higher-order thinking (HOT)). In most research on pedagogical reform, the unit under study is a reform in one organizational unit: a nation, province, regional/district educational system, school network, a single school, and so forth (Cohen et al., 2013; Cohen & Mehta, 2017; Levin, 2008). In contrast, this book investigates change processes regarding **one instructional goal, across different organizational units**. By using this methodology, the book can analyze in a new way the distinctive issues that arise from large-scale implementation of a reform in a particular type of instructional innovation. Consequently, it deals with specific issues in implementation related to the specific nature of the proposed instructional goal: the challenges it poses and the specific interactions it requires between policy-making and strategic planning at organizational and instructional levels. The specific case of analyzing large-scale implementation in the field of teaching HOT may serve as a general model for future work dealing with the theory of educational change processes in other specific instructional areas (e.g., improving literacy in writing, reading, or mathematics).

The second main perspective is for those engaged in fostering HOT. The particular goal of instruction chosen for this study is the transition toward education for thinking. As seen in the first chapter, this is currently a policy focus in many educational systems around the world. Therefore, the broad perspective that examines a variety of aspects related to the introduction of systemic changes in the field of teaching thinking, beyond a specific reform, is particularly valuable for those working in this field. It may help to draw generalizations about implementing the teaching of thinking in complex educational systems that cannot be made when we study a single change process taking place in one organizational unit. Teaching for thinking therefore serves in this book a double purpose: as an example, illustrating a more general argument regarding the methodology of studying large-scale implementation processes, as well as a vehicle of educational innovation in the area of teaching HOT that is an end to itself.

The book chapters examined and integrated four main sources of knowledge: (1) theoretical literature in the area of teaching and learning in general and teaching HOT in particular; (2) theoretical literature on wide-scale implementation of change processes; (3) research and analysis of diverse processes of wide-scale implementation that took place in the Israeli educational system in the area of developing students' HOT; and (4) reflections on the author's personal experiences with implementing HOT on a wide, national scale.

## Substantive Pedagogy and Its Role in Change Processes

As noted at the beginning of this chapter, I have participated in numerous discussions on educational change processes in which my colleagues used the phrase "pedagogical change" to describe changes in aspects as varied as budgeting, planning the number of hours allocated to each school subject, leadership style, integration of students with learning disabilities, establishing a network of schools, supporting new teachers, and more. Optimal functioning in all these aspects is important and may even be crucial, for generating deep changes in major processes pertaining to learning and instruction. However, simply engaging with these issues does not necessarily affect teaching and learning on a **deep level**. In most cases, it fails to bring about even the slightest change of this level.

To sharpen the distinction between pedagogical changes that are at the heart of teaching and learning processes and changes that are more peripheral, I distinguish between three types of using the word "pedagogy": **administrative pedagogy, structural pedagogy, and substantive pedagogy**. In the present discussion, the substantive pedagogy is the most vital. This concept deals with substantive patterns of teaching and learning. It addresses issues such as teaching for understanding; achieving change in the way students understand concepts and processes; integrating HOT into the teaching of content; integrating discussion of social, moral, and ethical issues in teaching of content; improving reading comprehension; using metacognition; fostering students' epistemic thinking; and assessing students' HOT and their ability to apply learning to new contexts. Acting seriously to improve these issues makes it necessary to deal directly with improving ways of thinking and understanding. Therefore, it involves a **deep change** in the quality of teaching and learning processes. Other researchers have expressed similar ideas, even without necessarily using the specific set of concepts embedded here (Elmore, 2004; Spillane, 2000). This book argues that, in order to bring about the desired improvement in the quality of educational systems, it is crucial to introduce change not only in pedagogical administration or in the pedagogy of the structure of teaching but also in substantive pedagogy. This argument is relevant to pedagogical changes of various scopes: reforms in the education system as a whole and reforms in smaller systems, such as a school network, a single school, one academic subject within one school, or even a certain cohort within a school.

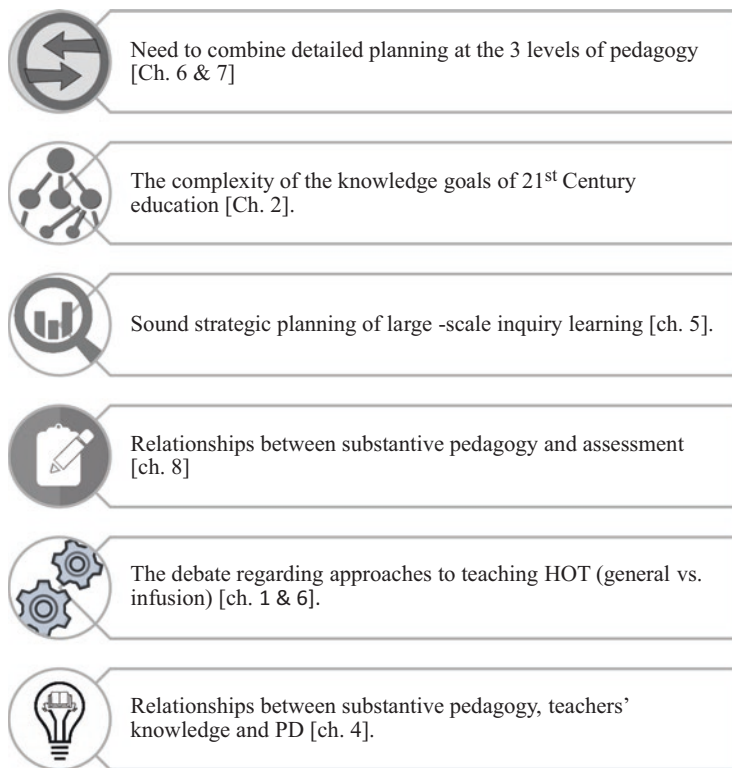
What is required, then, to succeed in bringing about real change in substantive pedagogy? The answer seems simple. One necessary (even if insufficient) condition for such a reform is that the change process will engage in a focused, planned, and intensive manner with substantive pedagogy. While this statement may sound self-evident, it is surprising to discover how rarely this condition is met in systemic change processes, whether within a single school or in large-scale changes pertaining to entire educational systems. The problem is that many reforms described as “pedagogical changes” are concerned with improving pedagogical or structural administration, while the substantive pedagogy remains invisible. Although learning and instruction are supposedly at the core of education (Elmore, 2004), many people do not see them as a factor that must be considered in planning and implementing educational reform processes.

Following previous researchers who expressed a similar idea (e.g., Fullan, 2007a; Elmore, 2004) and following the definition of “substantive pedagogy,” one of the main arguments of this book is that, in order to bring about **a deep educational change**, the often-ignored **substantive pedagogy** must be a salient component in the planning and implementation of an educational reform.

This idea was the common denominator for the issues discussed in the various chapters of this book (see Fig. 9.1). An effort was made to portray various aspects of substantive pedagogy intrinsic to teaching HOT. The various chapters demonstrated how specific aspects related to substantive pedagogy interact with multiple issues connected to wide-scale implementation. Ideas related to substantive pedagogy were weaved into the various chapters in multiple ways:

- (a) The need for combining detailed planning at the three levels of substantive pedagogy with planning at the organizational level was demonstrated in Chaps. 6 and 7 through the analysis of two large-scale change processes: the “meaningful learning” reform and the reform in citizenship education.
- (b) Chapter 2 highlights current challenges related to the status of knowledge in today’s schools. It shows how—in addition to philosophical and normative considerations—bad substantive pedagogy may influence people’s beliefs about what schools should be teaching. It also demonstrates educators’ contradicting views regarding this issue and explains the interrelationships that exists between “how” to teach (i.e., instructional methods or pedagogy) and “what” to teach (knowledge goals).

The complexity of the aims of education in the twenty-first century explained the extent of the difficulty in enacting the desired deep changes in substantive pedagogy. The desired changes consist of instruction that merges content, thinking strategies, and an advanced epistemic approach. Chapter 2 illustrated the challenges involved in implementing such complex aims by analyzing challenges related to the status of knowledge in the school system. Many teachers have left behind instruction that assumes a deterministic epistemic conception of knowledge, yet have not yet adopted an evaluative epistemic conception. It therefore seems that the education system is “stuck” at a stage of pedagogies



**Fig. 9.1** Issues pertaining to substantive pedagogy that must be a salient component in the planning and implementation of an instructional reform (and the chapters in which they are discussed)

that assume a multiplist perception of knowledge, i.e., that no knowledge claim is more valid than another, so that “anything goes.” Such pedagogies make it difficult to attend to deep knowledge and generally impair teachers’ abilities to engage in deep intellectual activity. Under these conditions (in which teachers lack advanced epistemic perceptions), teaching HOT may involve a collection of isolated strategies. It cannot however be expressed in its stronger sense, that is, as influencing knowledge construction through critical examination and evaluation of knowledge statements. Chapter 2 raised the urgent necessity for designing criteria for evaluating the quality of knowledge taught in school and for creating relevant learning and assessment materials for the use of teachers and students. In planning system-wide implementation, there is therefore a pressing need to allocate resources for these purposes. Such resources could include funding teams of experts and developing learning and assessment materials.



- (c) Chapter 5 discussed inquiry-based learning (IBL), whose successful enactment is another feature of improving substantive pedagogy. The chapter illustrated the complexity of IBL, noting that it could be taught in a modular rather than in an “all or nothing” way. The design of system-wide implementation of IBL was described as a complex process of decision-making regarding the scope and nature of students’ inquiry. This process involves questions and considerations relating to the policy objectives of introducing IBL and to strategic, long-term planning of its implementation. For example, assuming that we do not give up on the goal of deep learning, is it appropriate for policy documents to state ambitious goals of IBL despite all the challenges involved, or perhaps it may be preferable to settle for more modest goals? Ambitious goals may consist of students of diverse populations carrying out independent, long-term inquiry projects in diverse school subjects. Less ambitious goals may consist of working on shorter-term inquiry projects, in only a few selected school subjects, and with only part of the student population. Another way to practice less ambitious inquiry goals might be to have students critique work conducted by others (for instance, by critiquing research articles), rather than conducting their own independent research projects. Similar considerations for less ambitious goals may also influence the long-term strategic planning of policy implementation by dictating timetables and stages for achieving a range of partial IBL objectives. These considerations demonstrate how sound strategic planning of large-scale inquiry learning requires thorough understanding of the details of the substantive pedagogy related to inquiry.
- (d) Chapter 8 addressed the relationships between substantive pedagogy and assessment. The chapter showed that adding HOT items to standardized, high-stakes tests does not necessarily lead to deep learning of HOT. Within the climate of high-stakes testing described throughout the chapter, instructional goals designed to teach students to think were compromised in terms of their effects on classroom practice. Data from teachers’ interviews indicated that it is often possible to teach students to memorize replies to test items designed to test HOT. Under the regime of high-stakes testing, instruction of HOT seemed to take the form of “mechanical instruction,” implying rote learning and drilling students in answering HOT items. Such circumstances prevented active, deep thinking on the part of the students. The data reinforce the argument, discussed extensively in the literature, regarding the impact of a policy of high-stakes testing on the essence of teaching and learning. The findings indicate that it is not sufficient to improve tests by including items designed to measure students’ thinking. It is also necessary to reduce the degree of individual stakes experienced by principals, teachers, and students, while they interact with standardized testing. Otherwise, even hard work on improving substantive pedagogy through the implementation of IBL and HOT becomes useless. The implication of this finding is that if policy-makers are serious about the goal of improving substantive pedagogy through teaching for thinking, they must implement this policy in an educational climate that will allow a considerable degree of freedom and teachers’ autonomy rather than press them for immediate results.

- (e) Another significant issue is whether the large-scale implementation of thinking-rich teaching should adopt the general or the infusion approach to teaching HOT (Zohar, 1996). Decisions regarding this issue, which are inherently related to substantive pedagogy, will have a profound impact on the structural and administrative infrastructure of the implementation process. More specifically, they will affect the design of learning materials, assessment, and professional development (PD) programs (whether they should be school based and thus inter-disciplinary, or disciplinary, across many schools). Therefore, this issue provides another example of how substantive pedagogy is interwoven in a tight way to issues pertaining to pedagogical administration.
- (f) A final point concerns teachers' knowledge and the knowledge of other education professionals. Chapter 4 detailed the knowledge teachers need in order to be able to support their students in learning to think, clarifying the enormity of the task involved in PD in this field. In order for the implementation process not to be merely technical and superficial, it is vital to support teachers even in the smallest details of instruction. That is, it is necessary for PD to work with teachers all the way down to the level of how precisely they might interact with students when giving them feedback on a particular thinking task. Therefore, the outcomes of an implementation process may succeed or fail based on the quality of the PD processes at the level of substantive pedagogy. Large-scale implementation processes, however, do not usually provide the pedagogical and organizational infrastructure necessary for such PD. This raises two issues. The first is the need for detailed planning of PD. The planning should focus on the details of how to address elements of substantive pedagogy during the PD, as well as on the details of the organizational and budgetary infrastructure.

The second issue is the need to coordinate between the stated goals of the proposed change, the scope and pace of the implementation, and teachers' knowledge. The proposed planning will need to take into consideration not only teachers' initial knowledge but also the scope of the PD that will be part of the implementation and, consequently, the level of teachers' knowledge that may be achieved at the end of the PD. This idea is both important and complex, and I will therefore elaborate it in the next section.

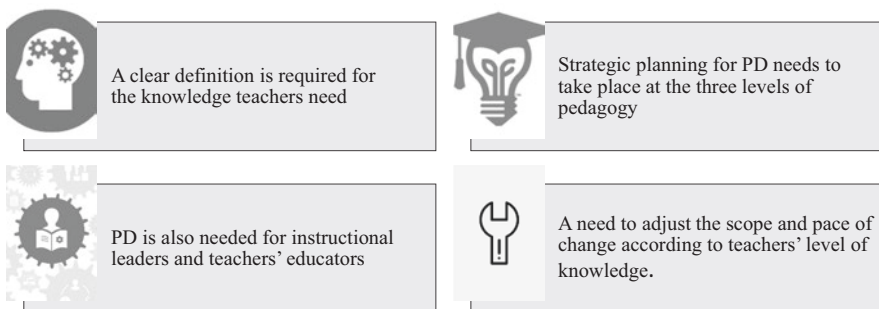
In conclusion, all the examples of wide-scale implementation discussed throughout this book highlight the role of substantive pedagogy. All the examples support the idea that, unless we want an outcome that is merely mechanical and/or superficial, a deep knowledge of substantive pedagogy is necessary for the planning and implementation of wide-scale changes. Moreover, one of the main arguments rejects the common state of affairs according to which instruction needs to "make do" with organizational and administrative structures that are designed for other purposes. In contrast, the claim is that it is necessary to purposefully design the administrative and organizational structures to support the objectives at the level of substantive pedagogy.

## Developing Professionals' Knowledge

Following the conclusions of other scholars (Elmore, 2004; Fullan, 2007a, b; Levin, 2008; Darling-Hammond, 2010), this book too recognizes the significance of thorough and meticulous development of human capacity for the enactment of changes in learning and instruction. Deep knowledge to be targeted in the change process (e.g., diverse aspects of HOT) and the pertinent specific pedagogical knowledge are necessary preconditions for teachers to be able to implement a deep change in classroom learning and instruction. Saying it differently, such knowledge is a necessary condition for a change that touches on substantive pedagogy. While researchers agree on this point, educators still struggle with the question of how to help teachers construct the relevant capabilities. The task is particularly challenging when it comes to working on a system-wide scale. Luft and Hewson (2014) formulate this by saying that “while the idea of scaling up is alluring and promising, its reality is unknown. The impact of **context** and the nature of teacher learning suggest that **scaling up may be an elusive construct**” (emphasis added by present author). Loft and Hewson assert that this is a “wicked” problem with a great deal of complexity and no easy solution.

The various chapters of the book discussed this “wicked” problem from different angles. Teachers’ learning was discussed in the context of instructional leadership, in the context of planning and executing PD processes, in the context of preparing teachers to support students in IBL, in the context of the detailed description of the changes in civic education, and in the context of the meaningful learning reform. In addition, Chap. 5 focused entirely on teachers’ knowledge and PD, offering the following insights (see Fig. 9.2):

- (a) **The knowledge that teachers require needs a clear definition.** Educators’ deep knowledge regarding the instructional goals they are trying to change constitutes a critical point. The possibility of generating a deep change in substantive pedagogy hinges upon this point. It is impossible to plan and execute sound



**Fig. 9.2** Summary of insights regarding teachers’ knowledge and PD in large-scale implementation processes

PD processes without an explicit, clear, and detailed definition of that knowledge. Chapter 4 presented an example of such a definition of teachers' knowledge pertaining to the instructional goal of developing students' HOT.

- (b) **Strategic planning for PD needs to take place at the three levels of pedagogy:** Naturally, strategic planning must take place at the level of administrative pedagogy (allocation of budgets, time, space resources, decisions regarding which teachers will participate in the PD, etc.). Strategic planning must obviously also address structural pedagogy (decisions regarding use of educational technology during PD courses, whether teachers will study individually or in small groups, etc.). However, all this may be useless if there is a lack of strategic planning on the level of substantive pedagogy. In order to make a breakthrough in changing deep elements of learning and instruction, it is necessary to plan carefully what and how teachers will learn. Explicit definitions of the knowledge teachers need make it possible to design the PD's curriculum, learning materials and activities. It also makes it possible to prioritize teachers' learning goals across time. For example, defining the knowledge that teachers will need in order to integrate HOT into content-based teaching indicates the need to work with teachers on the development of tools for teaching thinking in a variety of specific content-rich lessons. Chapter 4 mentioned multiple examples of such tools that supports teachers in activities such as:

- Helping students construct and analyze complex evidence-based arguments
- Guiding students in the construction of a fruitful research question
- Building together with students criteria for analysis, evaluation, and subsequent improvement of HOT tasks

The theoretical analysis and the research data presented throughout the book indicate that working on such tools, which tap on the smallest details of student-teacher interaction or of teachers' construction of learning materials, is a vital component in the implementation process. Without these tools, the implementation will be mechanical and superficial. **Therefore, the results of the entire implementation process may succeed or fail based on the quality of the PD processes that take place on the level of substantive pedagogy.**

In order to create a comprehensive and coherent implementation, the training processes for structuring teachers' knowledge at the level of substantive pedagogy must, of course, be integrated and coordinated with the strategic planning at the levels of pedagogical administration and the pedagogy of the structure of teaching. Take, for example, the decision to change the matriculation exams so that a percentage of the grade will be based on an inquiry-based project. This requires work on aspects such as scheduling the implementation of this change, allocating human resources to it, scheduling class hours, and running a public relations campaign aimed at preparing those working in the field to cooperate with the change. At the same time, it also requires work on the level of substantive pedagogy, including aspects such as understanding what new knowledge various groups of professionals (teachers, instructors,

principals, etc.; see next section for more details) need and planning how this knowledge will be fostered among the various groups. **Strategic planning at the level of substantive pedagogy** includes decisions such as:

- What aspects of the teachers' knowledge need to be addressed in the first stage of PD
- What aspects need to be addressed in later stages
- How to design learning materials to be used at various stages of PD
- How to design activities and educational experiences most appropriate for developing teachers' knowledge

The various chapters demonstrated how considerations at the level of substantive pedagogy are integrated into the planning and implementation of changes at the other levels (pedagogical administration and pedagogy of the structure of teaching).

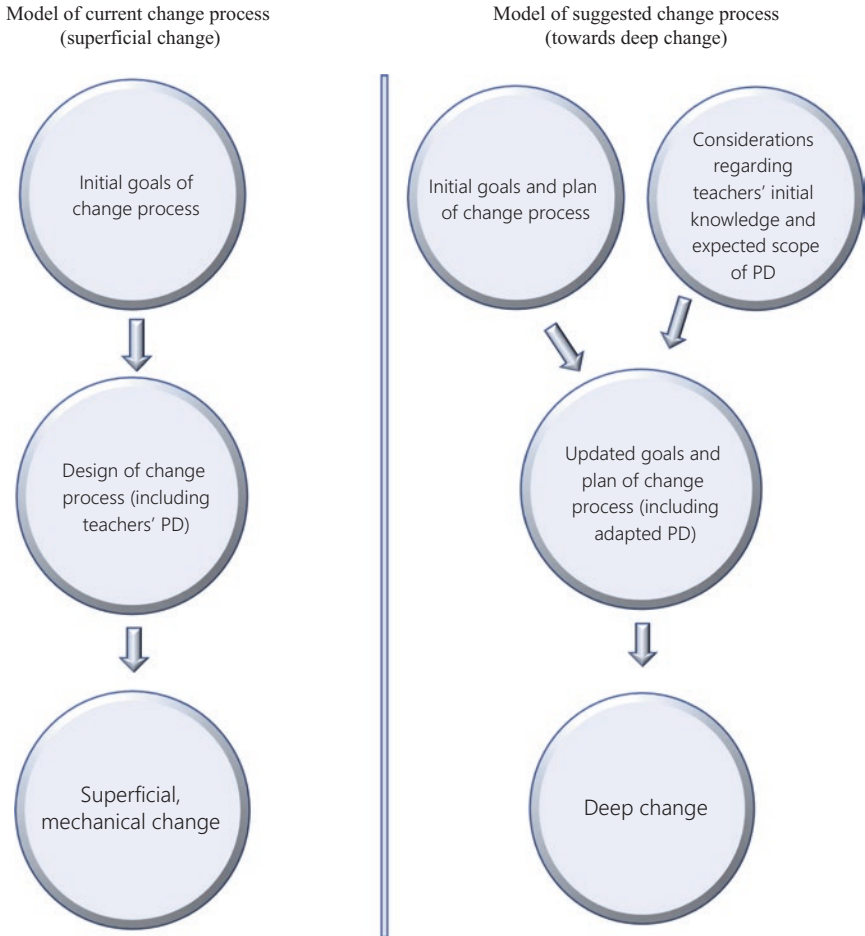
- (c) **There is also a need to attend to the PD of instructional leaders and teachers' educators (school principals, instructors, leading teachers, consultants, etc.).** The importance and need for pedagogical leadership in various circles of leadership and guidance indicate that PD for teachers alone is not sufficient. There must also be serious and systematic professional education for pedagogical experts, change leaders, instructors (who lead PD workshops and support teachers in classrooms), leading teachers, department heads, and consultants. The analysis presented throughout the book points to a shortage of leaders with deep pedagogical knowledge who can connect theory and practice. There is a need for instructional leaders who can work with teachers all the way to the micro level, in order to support them in the specific challenges involved in instruction and assessment of HOTS. Running PD for such leaders is not simple because teaching in such leaders' PD requires a combination of sophisticated theoretical and practical knowledge and it must be ongoing. There is evidence that part of the problem lies in the absence of an appropriate administrative infrastructure for middle-level leaders. This leads to rapid turnover of people in critical pedagogic roles, such as instructors and other teachers' educators (Zohar, 2013b). At the same time, we need to remember that people in leadership positions tend to have busy schedules, leaving little time for PD. Yet, without the necessary professional knowledge among those who are leading the system-wide change, the entire investment made in the organizational infrastructure for implementing a pedagogical reform may be compromised (Spillane, 2000). Many resources are typically invested in planning and budgeting an organizational infrastructure. This may include activities such as recruiting and financing instructors, creating and financing PD programs, and recruiting teachers to participate in those programs. But the organizational infrastructure cannot bring about the desired change if there is a shortage in experts who can facilitate the flow of knowledge from change leaders through instructors and leading teachers to a large number of teachers. For this purpose, it is necessary to also plan and implement systematic learning processes for leaders.

- (d) **Adjusting the scope and pace of change according to teachers' level of knowledge.** The magnitude of the challenge in the implementation of a deep pedagogical change (such as infusing HOT into content teaching) needs to be recognized. As noted, a large portion of this challenge comes from issues related to knowledge and PD of educators at all levels. It raises a question regarding incompatibility between goals and performance. Is it possible that policy statements define goals that require educators to do too much too fast? If we are to take seriously the idea that an understanding of substantive pedagogy is necessary to bring about profound change, then, as shown in this book, **the depth of change cannot possibly exceed the depth of teachers' knowledge.** It also cannot exceed the depth of knowledge that PD can support in a reliable way. The present discussion assumes that superficial and "mechanical" change is something to be avoided at all costs. It follows that decision-making regarding the scope of an educational change presented in a new policy or curriculum needs to consider seriously whether the pedagogical knowledge of the educators involved in its implementation processes is adequate. Their level of knowledge must be considered as a central factor in the strategic planning of the implementation. At the same time, the data presented here indicate that large educational systems tend to give only limited support to PD of educators in the field of teaching HOT. In light of this, Chap. 4 emphasized that serious consideration of the knowledge needed to support profound change processes, combined with a realistic assessment of the likelihood that appropriate PD will be offered on a system-wide scale, may indicate a need to adjust expectations of what change is realistic. Perhaps the issue of teachers' knowledge must force us to make compromises regarding the scope of our reform goals.

This last conclusion has important implications for the field of teaching HOT and particularly for thoughts about how to scale it up. First, we need to view with suspicion the grandiose and sweeping statements that often appear in policy documents and curricula about intentions to make radical changes in learning and instruction, quickly adapting them to the vision for twenty-first-century education. Taking into accounts the limitations of teachers' knowledge, such statements are often too ambitious to be implemented in a meaningful way. This is especially true when changes are intended to be implemented within a short period of time.

In order to avoid superficial and mechanical implementation, such statements should be phrased in a more modest manner, appropriate to teachers' existing knowledge and to the scope of PD processes we can expect in a realistic way. Alternatively, it is possible to retain an ambitious vision of the desired change as a long-term goal, but to supplement it with a strategic plan that distinguishes between the long-term vision and more realistic short-term goals and actions.

These ideas suggest a new model for deep change processes that pertain to substantial pedagogy (see Fig. 9.3). The prevalent model of change processes imply that the initial goals of the change (usually stated in its policy documents) dictate its design, including any design that would pertain to PD. As shown in many of the previous chapters, the outcome of this sequence of affairs is often superficial and



**Fig. 9.3** Current and suggested models of change processes pertaining to deep pedagogical issues

mechanical implementation (see left column of Fig. 9.3). To avoid this unfortunate outcome, a new model of change processes assumes that it is futile to ignore the considerations regarding teachers' initial knowledge and the realistic expected scope of PD. The new model therefore suggests that in addition to the initial goals of the change, considerations regarding teachers' initial knowledge and expected scope of PD will also affect the reform's design. In effect, rather than being ignored, the question of teachers' knowledge will be seen as a bottleneck to the possible pace and scope of change and will therefore have a decisive role in generating updated goals and design of any change process (including a design for an adapted PD). According to the model, the outcome of an implementation process working under such conditions can be **deep change** (see right column of Fig. 9.3).

## Change Agents as Pedagogical Leaders

Change agents at multiple levels within educational systems often know how to lead changes that address the levels of pedagogical administration or structural pedagogy. However, as emphasized in Chap. 3, **to lead a successful change in substantive pedagogy, there is a need for change agents who are also instructional leaders.** Instructional leadership (at all levels of the system) is a necessary condition for addressing the essence of teaching, rather than addressing only the structures and conditions under which instruction is carried out. In addition to general leadership skills, instructional leadership requires deep knowledge of the specific field in which the educational change takes place. There must be sufficient professional personnel to support the teachers in making the expected changes in their practice. Thus, expanding the circles of leaders who have relevant theoretical and practical pedagogical knowledge is a necessary condition for the success of systemic change (Kraimer et al., 2019). Investment in developing the instructional knowledge of ever-expanding circles of leaders in all levels is a requirement for a reliable transmission of a message through a “top-down” transformation process. It can also, however, contribute to “bottom-up” processes. Participants in the change process need deep knowledge of desired learning and teaching practices, so they will be able to use their own experiences and creative thinking to generate increased relevant changes from the bottom up (Hargreaves, 2004). All this can occur only within a culture of covenant rather than contract and when educators feel they are working in an environment that grants them personal dignity and autonomy (Sergiovanni, 1998).

## Knowledge for Wide-Scale Implementation of Substantive Pedagogy: Combining Generic and Content Dependent Aspects (SUSIG)

Previous researchers have discussed the types of pedagogical knowledge necessary for high-quality teaching (Shulman, 1986, 1987), highlighting the role of pedagogical content knowledge that is an amalgamation of general and specific knowledge. Using an analogy to their conclusions, the knowledge needed for broad implementation of a pedagogical innovation also includes both generic and content-dependent aspects, but in a different sense than the in classic PCK. In processes of systemic change, we need both general knowledge related to change theories about scaling up instructional innovations and more specific pedagogical knowledge regarding the specific instructional goals of the innovation we aim to implement. The model of teachers’ thinking described in Chap. 4 provided an example of the latter, indicating a number of knowledge components specifically associated with teaching HOT. Some of these knowledge components were elaborated in other chapters. Other goals of pedagogical change, such as the development of reading and writing literacy (Levin, 2008) or implementing an “assessment for learning” approach



(Birenbaum, 2016), will, of course, also require different specific components of pedagogical knowledge.

In what follows, the knowledge necessary for scaling up the implementation of a specific instructional goal is termed knowledge for “Scaling Up Specific Instructional Goal” (SUSIG).

The chapters of the book described many examples of SUSIG knowledge. For example, Chap. 4 explored how we can structure PD so that it includes important aspects of substantive pedagogy in the context of teaching HOT while also taking into consideration the conditions that typically limit the scaling up of instructional innovations. Examples of such typical limitations consist of the short time allocated to PD and the lack of support for teachers in the field. In cases of small-scale projects, the question leaders ask is: How to design a PD program so that it achieves the greatest effect under optimal conditions? In cases of broad, wide-scale implementation, leaders face a more complex challenge. Large-scale implementation processes are prone to a “dilution” of the original ideas behind the reform (Fullan, 2007a) or, as described by Dede (2004), to “throwing things out the window.” This means that in the course of the implementation, we often remain with a “thin” version of the initial intent. Leaders of wide-scale implementation thus need to consider a different question: Which of the components shown to be successful on a small-scale will be resistant to the “dilution” processes that are typical in large-scale implementation? In order to answer this question in a sensible way, one needs to understand the general issue of dilution of instructional goals in scaling up processes, but also to understand the specific pedagogy of teaching thinking. Otherwise, planning what to include in the strategic plan of the implementation and what to leave out, and how to schedule different instructional goals across time, may make no sense.

Chapter 6 referred to this question by exploring issues related to school-based assessment. More specifically, the chapter analyzed the criteria included in rubrics intended to assess the civics performance assessment task. Rather than choosing the optimal criteria according to theoretical and empirical considerations, the criteria were determined in a way that would be more resistant to “dilution” and thus more suitable to the real world. The criteria were based on their suitability both for the major program goals and for the teachers’ level of knowledge regarding these goals. Teachers’ knowledge is a crucial factor here. The important thing is to ask what level of qualitative assessment we can expect in a realistic way, taking into consideration teachers’ prior knowledge and the scope of PD.

The field of IBL provides another example. Chapter 5 discussed diverse pedagogical and organizational issues that should be considered when designing IBL. Here too, the key is to think about what level of implementation we can expect in a realistic way, as we make decisions regarding the scope and depth of students’ inquiry processes.

Highlighting the need for considering SUSIG knowledge is one of the innovations of this book. Prevalent considerations in scaling up processes have been including issues such as the scope of political support, budget, organizational infrastructure, and so forth. SUSIG considerations also need to be integrated into decision-making processes regarding the strategic planning of a pedagogic change.

Assuming we want to avoid mechanical and superficial implementation at all cost, these considerations are crucial for determining in an accurate way which objectives can be achieved during the first years of the implementation process, which can be achieved during later years, and which objectives need to be discarded.

Because of the specificity of the SUSIG knowledge for any field of instructional innovation, **the knowledge in question cannot be generic**. We need to develop it separately for each significant instructional objective. The practical work and the research required to develop our knowledge of SUSIG requires close collaboration between people whose field of expertise is administration in general and pedagogical administration in particular and experts in the specific field of the instructional innovation. As seen in the literature review, the study of large-scale implementation of instructional innovations is still in its infancy. Recognizing that expertise in a specific field of an instructional innovation is necessary for deep and large-scale implementation processes implies that both research and practical developments cannot be done in a generic way. Instead, future research and development need to take place in multiple specific fields of instructional innovations. This conclusion has significant implications for future practice and research. It means that to enable more accurate and useful generalizations and conceptualizations than those currently available about policy-making and strategic planning of change processes of specific instructional innovations, we need more research findings on large-scale implementation of diverse, specific instructional innovations.

## **Autonomy and Control Regarding the Knowledge of Substantive Pedagogy**

As explained earlier, a thorough knowledge of the educational context in which the implementation takes place is a necessary condition for making significant adjustments. Only the practitioners themselves are the ones who are intimately familiar with the specific educational environment in which they operate. Consequently, it is essential that they are the ones who make the adjustments of an innovation to a particular context. The implementation of the “meaningful learning” reform in chemistry and biology (see Chap. 7) proved to be counterproductive when no consideration was given to tailoring the change to the specific circumstances of these school subjects. When no one listened to the “wisdom of the field” which practitioners had gained from their previous experiences, change processes associated with the reform had serious negative consequences.

In addition, the change theory presented in Chap. 6 (based on Fullan, 2007a; Hargreaves & Fink, 2006) emphasized the need to find the balance between autonomy and control and between top-down and bottom-up change processes. In order to harness the motivation, energy, and creativity of practitioners, it is essential to enable them to feel that the change process encompasses their own professional goals and needs (Hargreaves, 2004). Accordingly, practitioners cannot simply be

“technicians” of a change process dictated to them from above. They must have a high level of autonomy that will allow them to be reflective practitioners who act upon their knowledge. **Pedagogical autonomy is crucial to achieve the required balance.**

Chapter 7 analyzed an extreme example of a reform in which there was no such balance. Indeed, the data presented throughout the book support previous studies in emphasizing the significance of finding the delicate balance between autonomy and control and between top-down and bottom-up change processes in substantive pedagogy. The case presented shows how important it is that policymakers speak in a clear voice about the reform’s educational goals and provide means for achieving that goal. Yet, the data also highlight the fact that a considerable degree of imagination and creativity of the people in the field is necessary to generate the “bottom-up” initiatives that are crucial in achieving a deep change in learning and instruction. Such imagination and creativity can only flourish with a sense of autonomy. The case of the reform in civic education presented in Chap. 6 also demonstrates the delicate relationships between autonomy and control. Finding a balance is always complex, and here, too, there is no simple recipe for miraculous success.

It is important to explore the connection between structured top-down PD courses and teachers’ level of autonomy. People sometime wonder how a top-down policy, that results in a strategic plan for structured, system-wide PD programs, can go hand in hand with increased teachers’ pedagogical autonomy. **But a structured development of professional capabilities should not be confused with lack of autonomy!** In fact, the lack of pedagogical knowledge regarding the subject of the change is what limits teachers’ autonomy, because they are not free to choose to implement the change in a deep way. On the other hand, if the PD supports the development of teachers’ knowledge, without dictating whether and how to apply this knowledge, they are free to choose whether and how to apply this knowledge in their practice. Under these circumstances they do have pedagogical autonomy.

In Finland, for example, a great deal is invested in the human capital of teachers. This investment begins with teacher training institutions selecting the most outstanding candidates as teaching students, since the ratio of applicants for education studies to those accepted is 10:1. Subsequently, Finland invests heavily in the process of teacher training. All teachers have a master’s degree in their field and acquire comprehensive and deep pedagogical knowledge during their studies. Accordingly, the system trusts them and treats them as highly skilled professionals. It sets goals for them, but does not mandate how to achieve these goals. Instead, the system encourages teachers and students to try out new ideas and approaches. In other words, it encourages them to put curiosity, creativity, and imagination at the heart of teaching and learning processes. All of this guarantees that teachers and principals are good at what they do in their classrooms and schools and that they have deep understanding of how to improve learning and instruction. Under such conditions, it is sufficient that the central administration establishes general goals for schools and teachers and then leaves them with complete autonomy to develop and design, as they see fit, the ways in which they will meet these objectives. The success of the

Finnish education system has been well-known for many years and is evidence that this change strategy works (Sahlberg, 2011).

Nevertheless, it seems that even under optimal conditions, achieving a deep change in substantive pedagogy requires extensive PD focused on the specific pedagogical knowledge needed to support the relevant change process. That is, even in a country with good teachers and strong achievements on international tests, it is unreasonable to assume that practitioners will succeed in building the knowledge they would need to make a deep change without a guiding hand and a “top-down” effort. There is evidence of this, for example, from implementation of the New Zealand curriculum focusing (among other goals) on developing capabilities for the twenty-first century. Lack of teachers’ specific pedagogical knowledge has created considerable difficulties in the implementation. The curriculum in New Zealand is a rather loose framework of goals, allowing schools the autonomy to weave their own curriculum around it. This should enable schools to create a curriculum that would meet the needs of their local community and student population. An integrative reading of the curriculum indicates that the main capabilities or skills (such as thinking capabilities) are supposed to change how students construct the knowledge entailed in traditional school subjects and the epistemic thinking involved in learning (Hipkins et al., 2014). The curriculum includes a section with advice on effective pedagogy. However, when the curriculum was first introduced, the schools did not receive enough guiding materials demonstrating how to teach differently, and the teachers did not participate in systematic PD processes that would give them the necessary knowledge to do so (Gallagher et al., 2012). Recently, educational researchers in New Zealand have warned that the implementation of the curriculum was too loose at the pedagogical level. They noted that absence of clear epistemic criteria for teaching, for PD, and for evaluation, and the lack of adequate professional development, led to difficulties in implementing the desired progressive pedagogy. As a result, these researchers point to the need to tighten up the implementation processes. They particularly note the need to improve various aspects of PD, in order to provide better guidance, and to support teachers in constructing the necessary level of pedagogical knowledge (Zohar & Hipkins, 2018).

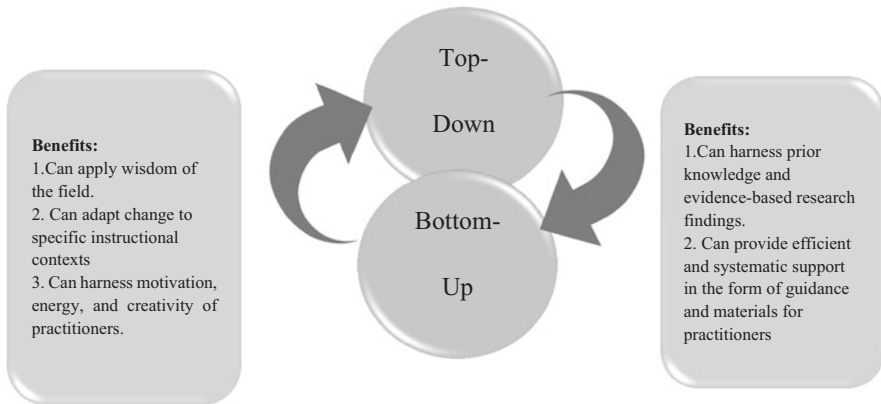
My own frequent visits to schools and conversations with educators confirm the disadvantages of strong “top-down” implementation processes of pedagogical innovations noted in the literature. The two primary disadvantages I encounter are low motivation of the participants and decontextualized changes that are not tailored to the needs of any specific pedagogical circumstances. Yet, field observations also show that pedagogical change processes that are limited to “bottom-up” processes often suffer from two other significant difficulties. First, when the main sources of knowledge for the change are the ones that had been in the school all along, the staff often disregards important relevant information from external sources. Too often, each school “reinvents the wheel” rather than builds on instructional methods and learning materials developed elsewhere or on research-based evidence for what works. Starting from scratch rather than taking expertise and prior efforts as a beginning point for each particular school’s efforts is inefficient, to say the least. Second (and related point), devoted staff members in

schools that are involved in deep pedagogical changes often experience an overwhelming feeling of burnout because the need for developing new teaching and learning resources requires lots of time and energy. An important pedagogical role of “top-down” implementation processes is therefore to provide efficient and research-based support, guidance, and materials to assist (rather than to command) the practitioners working in the field.

In sum, the classic understanding of regulation and autonomy generally focuses on the organizational and managerial aspects of change processes. The discussions in the previous sections suggest that there should be a similar, but not identical, meaning of regulation and autonomy, focused on substantive pedagogy: the managing entity provides “top-down” guidelines for the implementation process, in the sense of setting clear pedagogical goals. To fulfill these goals, educational leaders choose (ideally by consultation with professional experts) what bodies of knowledge may support teachers and teacher educators in facilitating successful implementation. Then, a central administration can invest in fostering educators’ knowledge by providing PD and field guidance, building a cadre of teachers’ educators, and constructing models of exemplary learning materials. In an ideal world, SUSIG will play an important role in designing these processes. At the same time, people in the field (teachers, principals, instructors, etc.) are given autonomy and resources to adapt the new instructional goals to the educational context in which they work; tailor them according to their personal tastes, needs, and educational goals; and generate new exciting innovations and changes. One of the most crucial factors determining the optimal balance between the degree of centralization and the degree of autonomy in these processes is the level of the professionals’ relevant knowledge. The deeper their knowledge, the more autonomy they can use in a fruitful way. This reveals an important insight: PD as outlined above provides teachers with professional tools and enables them to teach differently, but it does not dictate how and when to apply these tools in their classrooms. Therefore, a centrally controlled PD does not reduce autonomy, but rather, increases it. The blending of bottom-up and top-down change processes regarding substantive pedagogy is presented in Fig. 9.4.

## **Can Reforms in Substantive Pedagogy Succeed?**

In conclusion, I return to the main challenge and question posed in the first chapter: in light of all the issues discussed throughout this book, is it possible for reforms in substantive pedagogy to accomplish what they set out to do? Can the islands of small-scale, successful instructional innovations be connected to form a continent? Is there room for optimism that the much-needed, profound instructional change in the very nature of learning and instruction will be successful on a wide scale? These are all different formulations of the same main question. The answers provided throughout this book involve both bad news and good news.



**Fig. 9.4** Balancing control and autonomy and bottom-up and top-down processes in scaling up changes in substantive pedagogy

In order to answer these questions, we need to reexamine what we mean when we talk about the success of a change or about the nature of the change itself. Careful examination of the necessary conditions for implementing a reform in substantive pedagogy indicates that there cannot be rapid revolutionary change. The bottleneck is the learning and development of human beings. Making a profound change requires a change in the knowledge and beliefs that comprise human capital. This takes time, especially in large systems. In this sense, the findings in the book are bad news: if the expectation is to achieve a drastic and rapid change that will create a revolution in the quality of teaching and learning, the findings described in this book indicate this is impossible.

In another sense, however, the findings of this book are actually good news. If we moderate our expectations and have patience, there is room for optimism. The findings indicate that such a change is possible, if the expectation is for a gradual process over the course of years, during which a slow but steady improvement in the quality of teaching and learning will take place. In fact, this change has already begun. We are in the midst of it. As pointed out by Cohen (1988), processes that promote advances in teaching are slow by nature. Therefore, despite years of progress, this process is still in its infancy and needs many more years to reach completion. Cohen writes that, at this stage in the history of education, it is impossible to know whether we are at the beginning of a lengthy process that will eventually bring about the desired change or whether we are in a midst a long romantic dream that is doomed to fail (for more on this, see Zohar, 2013b). The findings of this book respond to Cohen's doubts, offering hope.

However, the findings also stress that there are no shortcuts. One cannot believe the promises of politicians or others who claim there is a quick fix for education. Yet, this book indicates that a combination of detailed planning at the level of substantive pedagogy, strategic planning at the other levels, and ongoing implementation of plans over time may lead to progress. While the very nature of this progress

indicates that it will be slow, there is a reasonable possibility that it will lead schools in the desired direction. In a general way, as noted by Cuban (1990) almost 30 years ago, one reform follows another, again, again, and again, but education does not improve. However, this vicious cycle may be broken if we understand that an important part of the problem lies in the superficiality of the pedagogical implementation prevalent in most reforms. **The key to success lies in serious and systematic work on substantive pedagogy.** As noted by the education researchers quoted in the first chapter, in this sense we are still only at the beginning of our journey. Obviously, this direction does not render irrelevant or redundant the extensive research and numerous projects regarding other aspects of reform, especially on the administrative, political, and organizational levels. To succeed, all these aspects are necessary and need to mutually support and be supported by one another. However, the very idea of a new direction that has not yet been fully explored is exiting because it provides a new horizon for future work and room for hope.

## Is Substantive Pedagogy Important in the Information Age?

One possible criticism of the idea presented in the previous section relates to the gap between the slow schedule required for deep change and the rapid pace of changes in our era. Another criticism, related to the first, holds that the changes we are witnessing in the areas of technology, generation of new knowledge, and the labor market are changing the rules of the game so radically that everything written here will soon be irrelevant because the goals of education, too, are likely to shift in a fundamental way. Some claim that the institution of the school itself is about to be abolished because children will be able to learn everything on their own, via technology, without the need for teachers. As noted in Chap. 2, even among those who think that schools are still viable institutions, some believe that knowledge acquisition should no longer be one of the central goals of education—because all the information is available out there at our fingertips (through the Internet). Chapter 2 discussed this issue at length, agreeing that today’s world indeed calls for a change in the basic goals of education and methods of teaching. However, that chapter also makes the claim that teachers still need to purposefully and skillfully support students in constructing their knowledge, HOT skills, and meaningful epistemic knowledge. Such teaching continues to be a central and necessary goal for schools and will remain so in the future. The new challenges to learning and instruction in our rapidly changing world do not make education simpler, but rather, more complex.

The fact that so much information is available at students’ fingertips does not mean that their intuitive conceptual framework and thinking skills enable them to internalize and utilize this information in the best possible way. One of the main and most important findings of educational research in the last several decades is the significance of prior knowledge and appropriate thinking skills for the construction of new knowledge. There are indeed many current changes in the accessibility and

structure of knowledge (e.g., that it is dynamic and net-like rather than hierarchical and linear). Yet, the need for prior knowledge, thinking skills, and basic language and learning skills, for acquisition of new knowledge, will remain significant. Clearly, there are young people who did not receive a formal education, but are still amazingly successful in professions and segments of the job market that the school system does not even begin to recognize that it should be teaching. Nevertheless, these examples should not confuse our discussion of the issues. There have always been individuals able to express their talents in a variety of fields even without formal education. The system needs to provide for the whole population, not a small segment of it.

Prophecy is indeed given to fools. However, in light of the matters discussed in this book, I believe that the transformation we are witnessing does not make the schools redundant, but rather challenges them. Indeed, the role of teachers is likely to continue to change, even more than it has changed thus far. The trend of teachers who do not simply transmit information, but rather mediate the construction of knowledge, will continue to grow stronger. This trend is not going to make teachers unnecessary. On the contrary, their role in mediating and developing dynamic knowledge, in helping students to develop thinking skills, and in acquiring independent learning tools will be more complex than ever. Accordingly, teachers' role will require an even higher level of personal and professional skills. Therefore, the need for PD in innovative teaching methods will only increase. Such PD would enable teachers to lead the building of students' deep knowledge, independent thinking, and ability to learn. Consequently, there is room to believe that the search for ways to implement, in a meaningful and systematic way, innovative teaching methods while addressing substantive pedagogy will become an even more important goal than it was in the past.

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