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EDUCATION POLICY COMMITTEE****OECD Future of Education and Skills 2030: Curriculum analysis****Draft Change Management: Facilitating and Hindering Factors of Curriculum Implementation****9th Informal Working Group (IWG) Meeting****22-24 May 2019****Vancouver, British Columbia, Canada**

The paper was drafted by Ariel Tichnor-Wagner (Boston University) as one of the supporting materials for the 9th IWG meeting. Item 5.a.: Peer learning and multi-stakeholder dialogue on “change management for curriculum implementation” as part of initial discussions on Phase II.

The participants are invited to:

- NOTE the preliminary findings from the literature review on change management and
- PARTICIPATE in small group discussions in Item 5.b.

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1. Introduction

Implementation plays a key role in determining whether an intended curriculum achieves its desired outcomes (McLaughlin, 1990). Introducing a curriculum change at a school, district, or national level does not guarantee that those charged with implementation will implement the curriculum in ways that lead to deep changes to classroom practice. Instead, decades of implementation show that implementation variability is the norm. Educators may implement with fidelity by following the curriculum as prescribed, adapt the curriculum to the needs of their local context while adhering to its core principles, comply with the curriculum by only implementing surface-level changes, coopt the curriculum to fit with existing practices, or not implement the curriculum at all (Berman & McLaughlin, 1976; Tichnor-Wagner et al., 2018). This suggests that when planning for and managing curriculum change, it is vital to come up with a strategy for implementation support.

An effective implementation strategy will require a clear vision and a solid theory of change. A theory of change is the set of steps that policymakers and curriculum designers take and intentional strategies they adopt to that will lead to the desired outcomes of an intended curriculum. As Fullan (2006) argued, *effective* theories of change “must simultaneously focus on changing individuals and the culture or system in which they work” (p. 7).

To attain the desired outcomes of a curriculum reform (i.e., students’ development and application of knowledge, skills, values, and attitudes) necessitates more than changing teaching and learning outputs. It involves making coordinated, multifaceted changes at the classroom, school, and policy level.

One of the examples that a theory of change might look like comes from Fullan (2006), who suggests seven core premises of the theory of action: 1) a focus on motivation, 2) capacity-building focused on results (i.e., developing individual and collective knowledge, competencies, resources, and motivation), 3) learning in the context where one works, 4) changing context, 5) reflective engagement, 6) tri-level engagement of school and community, district, and state, and 7) persistence and flexibility in staying the course (e.g., expecting to see results, but not overnight). These premises then translate into concrete strategic actions that can change educational outcomes.

These seven premises incorporate facilitating conditions for implementation identified in the microsystem (i.e., classroom), mesosystem (i.e., school), exosystem (i.e., government), and chronosystem level (See II Conceptual Framework). In the microsystem, a) *a focus on motivation* attends to teacher commitment to put in the effort to make changes and b) *capacity-building focused on results* emphasises developing individual knowledge and competencies. In the mesosystem, a) *capacity building focused on results* further emphasises developing collective knowledge, competencies, resources, and motivation across the organisation and b) *learning in context* highlights the importance of professional learning taking place where changes to teaching and learning are actually happening. *Tri-level engagement of school and community, district, and state* addresses coherence across the different system levels. Finally, *persistence* addresses the chronosystem (i.e., changes over time) by suggesting that all premises “must be cultivated over time” (Fullan, 2006, p. 11).

A multifaceted and complex mixture of ingredients determine the extent to which a curriculum change is implemented in a way that reflects the curriculum’s intent. Policies (e.g., goals, targets, and tools), people (i.e., all of those who play a role in curriculum design and implementation), and places (e.g., where curriculum implementation unfolds) affect implementation, along with how these various policies, places, and people interact (Honig, 2006).

This literature review examines conditions for successful implementation of curriculum change that can be applied at the policy, school, and classroom level. Specifically, it explores the relation between the intended and implemented curriculum. The *intended* curriculum is the curriculum as designed on paper, which can include stated learning objectives, pedagogy for attaining learning objectives, scope and sequence, and prescribed lessons or units to teach. The *implemented* curriculum refers to what students actually experience in classrooms, including the content that is actually taught and how that content is delivered. Specifically, this review answers:

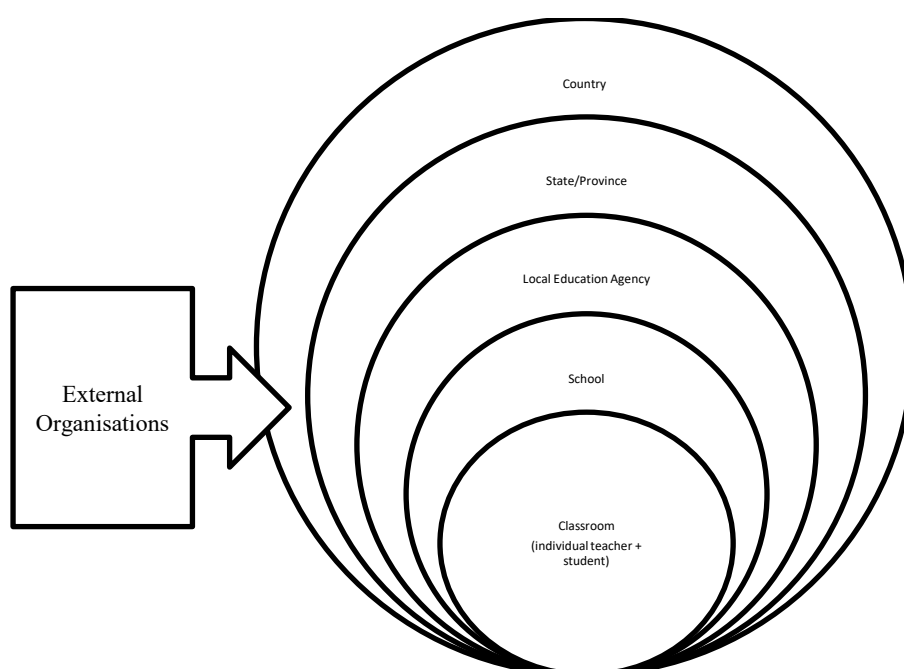
- 1) What contextual factors help or hinder effective curriculum change at the policy level, school level, and classroom level?
- 2) How do these factors relate to each other across different levels of the system?

2. Conceptual Framework: Applying Ecological Systems Theory to Educational Systems Change

Education is a complex system, with layered levels that play a role in influencing the “core of educational practice”, that is, the teaching and learning that goes on in classrooms and schools (Elmore, 1996, p. 2). The most direct impact on student learning outcomes are the classroom-level interactions between teachers, students, and materials that directly influence learning outcomes. At the same time, decisions, processes, structures, and policies taking place within local education agencies; state, provincial, and regional governments; and national governments influence what students ultimately learn in school. (See Figure 1).

Each of these levels indirectly affects the content (i.e., what is taught), pedagogy (i.e., how the content is taught), and outcomes that students experience in schools. For example, school leadership can have an indirect positive impact on student outcomes when they create a school wide learner-centred vision that all staff feel comfortable working towards, build trust among staff in a collaborative work environment, and create opportunities for building staff capacity (e.g., Leithwood et al., 2004). Local education agencies can generate buy-in among key stakeholders, allocate fiscal and human capital resources, and provide capacity-building opportunities to support implementation of new curriculum (Firestone, 1989; Rorrer, Skrla, & Scheurich, 2008). State, provincial, and national government officials and agencies determine standards for teaching and learning and utilise policy instruments such as mandates, inducements, and capacity-building tools to promote implementation (McDonnel & Elmore, 1987).

Figure 1. Education System Layers



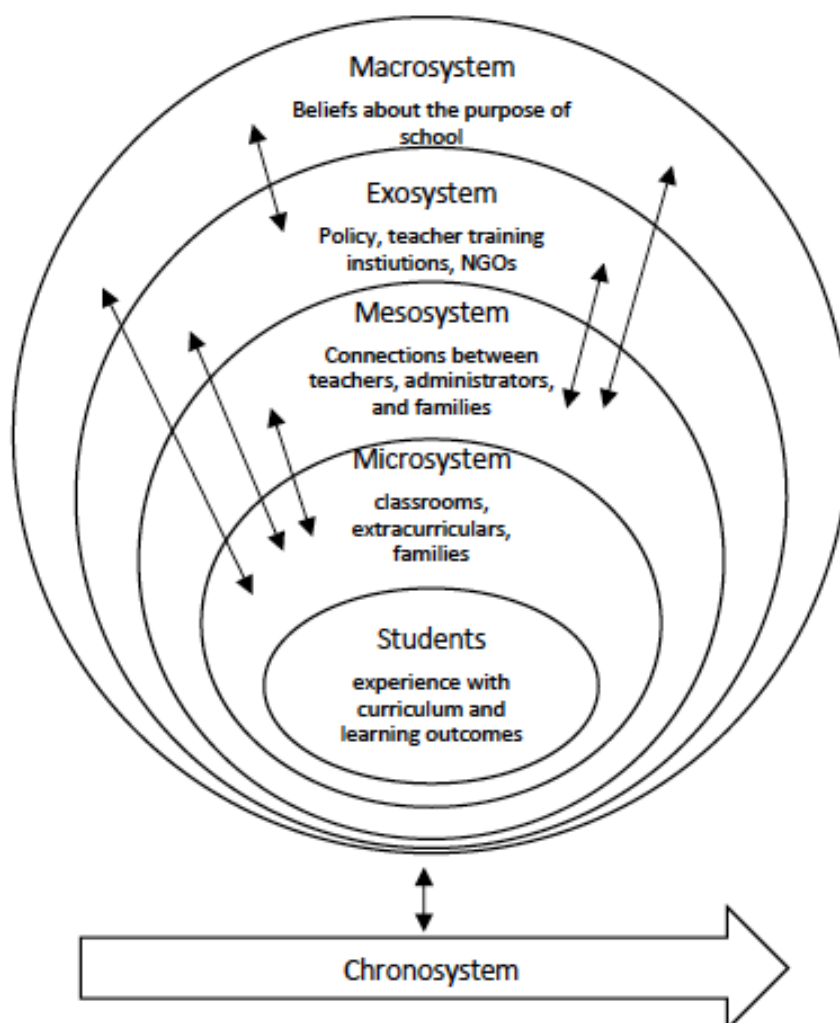
Organisations and institutions outside of education governance systems, herein referred to as external organisations, also influence whether and how a curriculum change and is implemented (Datnow et al., 2002; Honig, 2004). For example, non-profit and for-profit non-governmental organisations (NGOs) create curriculum and instructional materials, provide professional development, facilitate design teams and improvement communities, and advocate for curriculum reforms. Teacher and leadership preparation programs, typically housed in higher education institutions, train educators in educational theory and practice.

Ecological systems theory (Bronfenbrenner, 1979) illustrates how nested environmental contexts influence a child's development. This theory, born out of developmental psychology, can be adapted as a useful heuristic for mapping out the role that different levels of the education system play in influencing curriculum implementation and, ultimately, student outcomes.

Ecological systems theory purports that multiple, nested systems in an individual's environment directly and indirectly impact a child's development throughout his or her life. The *microsystem* contains the groups and institutions with which a child directly interacts (e.g., school, family, peers, neighborhood). The *mesosystem* is the connection between the various groups and institutions within a child's microsystem, for example, the connection between a child's teacher and her parents. Bronfenbrenner theorised that stronger connections between structures within the microsystem would improve a child's developmental trajectory. The *exosystem* is the larger societal structures that indirectly influence a child. Though the child may not directly interact with the exosystem, settings or institutions within the exosystem directly interact with someone in the child's microsystem. This could include the parents' workplace or government-mandated education reforms. The *macrosystem* contains social and cultural policies and beliefs that affect the larger context in which the child operates. Finally, the *chronosystem* addresses changes over time in the environments with which the child interacts.

Similarly, curriculum change is nested in multiple systems within the broader environment that influences teaching, learning, and student outcomes. Figure 2 illustrates what an ecological systems approach to understanding the implementation of curricular change looks like.

Figure 2. An Ecological Systems Approach to Curriculum Change



The *student* is at the centre of the nested system. Here, we are interested in how students actually experience an intended curriculum and whether they exhibit the desired outcomes – or, the specific knowledge, skills, attitudes, and values – that a curriculum seeks to develop.

The *microsystem* includes interactions with students that relate to the teaching and learning of an intended curriculum. These interactions take place at the classroom level, in the form of teacher instruction, learning activities and materials, assessments, and other conduits through which students engage with the curriculum. The ways in which students interact with the curriculum are largely shaped by teachers' understanding of the concepts covered in a curriculum and how to teach them, access to relevant instructional materials and assessments, and their motivations to teach it. Students may also interact with the curriculum during extracurricular and other out-of-school time (OST) activities and in the family/home environment.

The *mesosystem* involves school-level interactions between actors of the microsystem. This includes, for example, how teachers in different classrooms connect with one another through formal and informal processes and structures, how school leadership facilitates interactions with teachers, families,

and the broader school community, and how teachers connect with families. How teachers come to understand the meaning of curriculum, and how they subsequently operationalise it in the classroom, are shaped by the social contexts in which they are situated (Spillane, Reiser, & Reimer, 2002). Teacher networks, such as grade levels, departments, communities of practice centered around a particular topic or goal (e.g., equity and inclusivity, teaching vocabulary in the content areas), or informal groupings of teachers who share similar worldviews, facilitate how teachers make sense of how to operationalise a curriculum. Furthermore, the ways in which school leaders communicate the meaning and importance of a new curriculum, along with the ways in which they intentionally create opportunities for teachers to collaborate around teaching the curriculum, influence what actually gets implemented in classrooms (Coburn, 2001). Finally, when teachers and school leaders intentionally build bridges between home and school through culturally responsive, two-way channels of communication with families, students see the relevance of the curriculum and receive support from family members to achieve curriculum goals.

The *exosystem* involves policy activities that take place at local, state/provincial/regional, and national levels. Each of these government levels is a part of the exosystem because they each have jurisdiction over different aspects of education that directly impact the guidelines, training, time, and instructional materials that teachers have at their disposal to enact a curriculum, which in turn directly impacts students. Examples of educational policies that indirectly impact how students engage in the curriculum include mandated learning standards and assessments, teacher licensure and evaluation requirements, recognition programs, and funding through budget items and grants for staffing, resources, and professional development. External organisations (e.g., universities, NGOs) occupy the exosystem alongside government agencies, as they too indirectly impact how students engage with curriculum by providing teacher training, instructional materials, grants, and technical support to assist in implementation.

The *macrosystem* reflects broader societal and cultural beliefs about the purpose, or goals, of education. These beliefs, which can vary widely within countries and be hotly contested, strongly influence what is taught and how it is taught (Spring, 2010). For example, should schools focus on preparing students for success on entry exams to higher education institutions? Address holistic cognitive, social, emotional, and physical dimensions of learning? Serve as socialising agents for forging a national identity? Train students for job in a knowledge-based economy? These beliefs about the purpose of schooling are reified covertly and overtly throughout the education system in policy documents, curricular content that teachers choose to teach, and high-stakes assessments.

The *chronosystem* identifies where in the policy process implementation activities are happening. Timepoints in the chronosystem may occur before a new curriculum is officially passed or mandated, the year after a curriculum change is adopted, three years after a curriculum change is adopted, or a decade after a curriculum change is first introduced.

In addition to directly and indirectly impacting how students experience a new curriculum vis-à-vis implementation, the nested levels in the educational system interact with each other (Neal & Neal, 2013). The interactions among system levels are depicted by the multidirectional arrows in Figure 2. Interactions between systems are not necessarily hierarchical (Datnow et al., 2002). For example, beliefs about the goals of public education (i.e. the macrosystem) might directly impact the content that a teacher decides to cover in class (the microsystem), without filtering through the exosystem and mesosystem. How these levels influence one another is multidirectional as well. As Datnow (2006) explained, “multiple levels of education systems may constrain or enable implementation” and “local implementation may affect those broader levels” (p. 107).

However, the relative influence that one level has on another is not equal in weight, but is shaped by power dynamics. In a highly centralised government, policy change follows a top-down chain of command: the exosystem exerts power over the mesosystem, and the mesosystem exerts power over the microsystem. In this type of governance structure, policymakers or curriculum designers seek compliance from implementers on the ground (e.g., teachers) to carry out their directives without any alterations to the intended curriculum design. In contrast, a decentralised government with strong culture of local control may have educators in the microsystem and mesosystem shape curriculum content and policy instruments ultimately become enacted into laws and regulations in the exosystem. Yet even “loosely coupled” federal systems with a high degree of devolution, and where different levels of education governance operate semi-autonomously, have unequal power relations. In the United States, for example, states wield control over districts, districts over schools, and school principals over classroom teachers (Datnow et al., 2002; Malen, 1994).

Finally, curriculum change can originate in different levels of the system. In the exosystem, curriculum change takes the form of a) policymakers and government officials passing laws and regulations covering new standards and learning objectives and b) external organisations designing curriculum that they “vend” to schools. In the microsystem and mesosystem, teachers create and bring to scale new curriculum. For example, through adaptive teaching, teachers constantly adjust curriculum and instructional practices to meet needs of individual students as they arise (Corno, 2008). Design-based implementation likewise addresses localised problems of practice through iterative curriculum design that involves collaboration between practitioners and research experts (Fishman et al., 2013). No matter where curriculum change is initially conceived, an ecological systems approach hypothesises that successful implementation of the curriculum depends upon alignment and support of other levels of the system. As such, this review examines implementation facilitators and barriers within and across each system level.

3. Methods

To identify the factors that facilitate and impede implementation of curriculum reform, a review of the research literature on curriculum implementation and educational change was conducted. Criteria for inclusion included: a focus on K-12 (primary and secondary) education; discussion of the implementation phase of a curriculum reform (defined as addressing the content and pedagogy of teaching and learning); implementation occurred at the classroom, school, or multiple systems level; peer-reviewed and research-based, utilising best practices for quantitative and qualitative designs; and published in the last 30 years.

In total, 34 articles and one book were included in the final review. These are listed in Annex A. Articles covered 14 countries and discussed the implementation of a range of curriculum reforms: from outcomes-based education to inquiry-based pedagogies, from math to science to reading to social studies, from early education through high school. About half of the studies examined curriculum change within traditional subjects area: for example, various math, reading, and science reforms in the United States, art and geography curriculum in Australia, the national social studies curriculum in Turkey, and the math curriculum in China. The remaining studies examined wholesale national

curriculum change in Finland, Hong Kong, China, Japan, New Zealand, Norway, Scotland, South Africa, Uganda, and Wales that provided a holistic vision of twenty-first century competencies that students should develop. For example, Hong Kong, China’s “Learning to Learn” reform sought to bring out changes from content-based to outcomes-based learning and from didactic to student-centred learning (Kennedy et al., 2011), and involved the introduction of four key tasks – moral and civic education, reading to learn, project-based learning, and information technology – along with integrating skills such as critical thinking, creativity, and communication into existing school subjects (Cheung & Wong, 2010). In Uganda, the Qualitative Educators For All Initiative (QEA) included a National Thematic Curriculum that covered life skills, gender responsive teacher, and mother tongue languages (Spren & Knapczyk, 2017). Scotland’s Curriculum for Excellence emphasises the development of autonomous, self-directed learners and four capacities: successful learners, confident individuals, effective contributors, and responsible citizens (Priestly, Minty, & Eager, 2014).

Articles also included a mix of quantitative, qualitative, and mixed methods studies. The variety of research methods covered painted a holistic picture of the implementation process. Quantitative research allowed for generalisability to a broader population while qualitative findings helped to identify underlying processes, actions, and beliefs from on-the-ground implementers that further supported or provided additional insights on quantitative findings (Johnson & Onwuegbuzie, 2004). All articles, including the country, curriculum reform studied, unit of analysis (classroom teacher, school, government), and methods, are listed in Annex A.

Based on the findings from these articles, the next section identifies contextual factors that facilitate and hinder curriculum implementation at the microsystem, mesosystem, exosystem, macrosystem, and chronosystem level. This is followed by a discussion of interactions between each of these levels that can further promote or impede implementation.

4. Contextual Factors that Influence Effective Curriculum Change

Findings from the literature on curriculum change support an ecological systems approach to understanding curriculum implementation, as facilitating and hindering factors were identified at each level of the education system. Across the literature, there was wide variability both within and across schools in whether and how the curriculum was implemented, with implementation results often reported as low or mixed (Bjork, 2009; Cohen & Hill, 2001; Incekara, 2010; Priestly et al., 2014; Rogan & Aldous, 2005; Stringfield, 2000; Taylor et al., 2016; Tikkanen et al., 2017). There was also variability in what aspects of multifaceted reforms got implemented. For example, research on Hong Kong, China’s Learning to Learn reform found greater implementation gains for project-based learning in primary schools and for reading in secondary schools, with a smaller increase in moral and civic education (Cheung & Wong, 2011)

Why this variation occurred can be explained by facilitating and hindering factors at each level of the system. (See Table 1.) These factors differentiated teachers, schools, and countries or jurisdictions who demonstrated high levels of implementation of a curriculum reform from those with low levels of implementation.

4.1. The Microsystem: Classroom Practices

Facilitating factors.

At the classroom level, facilitating factors associated with high levels of implementation included teachers' commitment to implement the curriculum (e.g., Datnow et al., 2000; Datnow, 2005; Desimone, 2002) and alignment of teachers' beliefs about teaching and learning with the intentions of curriculum reforms (Marz & Kelchtermans, 2013; Roehrig, Kruse, & Kern, 2006).

Teachers' commitment to curriculum reform.

When teachers express a commitment to implement the curriculum, that is, the motivation, will, and enthusiasm towards a reform, they are likely to change their classroom practice accordingly (Coburn, 2003; McLaughlin, 1990). For example, in a longitudinal case study of 13 elementary schools in one culturally and linguistically diverse urban school district in the United States implementing Comprehensive School Reform, Datnow (2005) found commitment of school staff to be a differentiating factor between the five schools implementing the reform with moderate to high levels of intensity after three years versus the eight schools who had either ceased implementation all together or were implementing at very low levels.

Alignment of teacher beliefs about teaching and learning to curriculum reform.

The extent to which teachers believe that a curriculum change reflects best practices for teaching and learning and will lead to desired student outcomes also influences classroom-level implementation. For example, Roehrig, Kruse, and Kern (2006) found an association between a teacher's implementation level of an inquiry-based chemistry curriculum and whether that teacher believed teaching should be teacher-centered or learner-centered.

Hindering factors.

Reflective of the perception of teachers as gatekeepers of curriculum and instruction (Thornton, 1991), research pointed to numerous classroom-level factors that impeded curriculum implementation. These hindering factors at the classroom level include teacher misunderstanding or misconstruing of the content and pedagogy required of the curriculum (Bantwani, 2010; Cheung & Wong, 2012; Marz & Kelchtermans, 2013; Penuel, 2008; Rogan & Aldous, 2005; Smith & Their, 2017; Spillane & Callahan, 2000), teacher workload (Cheung & Wong, 2012; Priestly et al., 2014), and insufficient time (Bantwani, 2010; Incekara, 2010).

Teacher misunderstanding of curriculum content and pedagogy.

Misunderstanding of the curriculum may occur for multiple reasons. First, in low implementation contexts, teachers acknowledged a lack of awareness, familiarity, or training about what the new curriculum entailed regarding actual teaching practices in the classroom (Bantwani, 2010). Second, in some cases, teachers made sense of new practices through the lens of old practices (Spillane et al., 2002), leading to superficial changes to practice or "cooptation" of new curriculum under the umbrella of old practices (Berman & McLaughlin, 1976). For example, in-depth case studies of 12 schools in the Mpumalanga province of South Africa revealed that teachers tended to attach new jargon to their pre-Curriculum 2005 math and science teaching practices and to adopt superficial changes to teaching, such as group work, rather than deeper changes to child-centered learning and performance-based assessment that reflected the intended outcomes of the reform (e.g., "use process skills related to the Natural Sciences", "apply scientific knowledge and skills to problems in innovative ways")(Rogan & Aldous, 2005.)

Teacher workload.

Teachers across multiple studies also pointed to stressful workloads as an obstacle to implementation. For example, a survey of around 10,000 key stakeholders including principals, curriculum leaders, teachers, and students across 150 primary and 120 secondary schools in Hong Kong, China found that teacher workload was a top hindering factor listed by teachers, curriculum leaders, and administrators towards implementing the national curriculum reforms (Cheung & Wong, 2012).

Insufficient time.

Teachers and administrators across multiple studies also pointed to a lack of time as an obstacle to implementation. Specifically, participants noted a lack of time to plan for implementing the new curriculum and time in the schedule to execute the new curriculum (Abadie & Bista, 2018; Bantwani, 2010; Chapman et al., 2018; Tikkanen et al., 2017).

Reflecting a confluence of microsystem implementation barriers, in a mixed methods study of teachers' perceptions of the Revised National Curriculum Statement in South Africa, 95% of survey respondents admitted that they were not implementing the reforms (Bantwani, 2010). These teachers identified multiple hindering factors including too much paperwork, high staff-to-student ratios, not enough time to fill out the new daily lesson plans, and not being familiar with the project-based approaches that the new curriculum required.

4.2. The Mesosystem: School-Level Activities

Facilitating factors.

At the school level, facilitating factors that help curriculum implementation include strong school leadership support (Chapman, Wright, & Pascoe, 2018; Cheung & Wong, 2010; Cheung & Yueng, 2018; Coburn & Russell, 2008; Desimone, 2002; Hamilton et al., 2013; Priestly et al., 2014; Simmons & Maclean, 2018; Stringfield et al., 1998), allocation of resources towards the new curriculum (Casinader, 2016; Coburn & Russell, 2008; Desimone, 2002; Hamilton et al., 2013; Stringfield, 2000), and strong collaborative team cultures (Cheung & Wong, 2012; Roehrig, Kruse, & Kern, 2006; Simmons & Maclean, 2018).

School leadership support.

School leaders, including principals, headmasters, and department heads, promote curriculum implementation in numerous ways. In the reviewed studies, school leaders allocated time into the teaching, planning, and professional development schedule to support curriculum reform (Chapman et al., 2018; Coburn & Russell, 2008; Stringfield et al., 1998), created a congruent message into the vision and culture of the school that supports curriculum change (Coburn, 2006; Coburn & Russell, 2008; Datnow, 2005; Hamilton, 2013; Priestly et al., 2014), and selected instructional materials and professional development providers that aligned with curriculum goals (Cohen & Hill, 2001).

For example, through interviews with seven senior school leaders in schools implementing the New Zealand Curriculum, researchers found that the schools who were farther along in implementation developed and communicated a clear implementation plan and introduced the new curriculum as part of a schoolwide push towards student-centered learning (Hamilton et al., 2013). A literature review on Comprehensive School Reform in the United States similarly found that principals in schools with greater implementation success clearly communicated what was expected of teachers, gave teachers ownership over the reform model, successfully allocated resources and arranged schedules to support the new curriculum, supported teachers' professional development, and talked with teachers about changes to their instructional practices (Desimone, 2002).

Allocation of resources.

School-level resources that studies pointed to as benefiting curriculum implementation include time for professional development around the new curriculum (Hamilton, 2013; Stringfield et al., 1998) and designated staff to support implementation (Chapman et al., 2018; Coburn & Russell, 2008; Desimone, 2002; Stringfield et al., 1998). Support staff could take the form of teachers with expertise congruent with the curriculum (e.g., hiring more arts teachers to implement arts programming), curriculum coaches, or on-site facilitators.

Collaborative team culture. Strong collaborative team cultures can also support classroom-level implementation. For example, “team spirit and collaboration among teachers” was a top helpful factor on a nationally representative survey listed by teachers, curriculum leaders, and administrators in implementing Hong Kong, China national curriculum reforms (Cheung & Wong, 2012). Qualitative studies further suggest that *what* teams collaborate around matters, too (Coburn & Russell, 2008; Simmons & Maclean, 2018). For example, in a comparative case study of two urban school districts in the United States implementing new mathematics curriculum, Coburn and Russell (2008) found qualitative differences in the depth of conversation around mathematics instruction among coaches and teachers. More in-depth discussions may impact teachers’ understanding of new ways of teaching and, in turn, the extent to which they change their practices. School leaders play an influential role in shaping a collaborative culture by providing common planning time for staff (Desimone, 2002) and problem solving frames that guide robust conversations around the intricacies of implementing the curriculum (Coburn, 2006; Coburn & Russell, 2008).

Hindering factors.

School level factors that impede implementation include low levels of school leadership support (Datnow, Borman, & Stringfield, 2000), not enough time allocated in the schedule for teachers to plan for curriculum implementation (Desimone, 2002; Germenton, 2011; Penuel et al., 2008), a lack of resources (Desimone, 2002; Penuel et al., 2008; Spreen & Knapczyk, 2017), and lack of adequate training for both teachers *and* principals on new reforms (Chapman, Wright, & Pascoe, 2018; Germenton, 2011; Li et al., 2011; Spreen & Knapczyk, 2017; Taole, 2015).

Lack of school leadership support.

The absence of school leadership in promoting and scaffolding new curriculum for teachers was notable in schools with low levels of curriculum implementation. Datnow and colleagues’ (2000) mixed methods examination of the implementation of a Core Knowledge curriculum across four case study schools found three of the four school to be high implementers. Instructional leadership was a key differentiating factor between these schools; unlike the high implementer schools, the principal at the low implementing school did not have knowledge of the curriculum, accommodate teachers’ needs, nor participate in Core Knowledge networks to improve their own understanding and ability to support teachers.

Lack of time to plan and prepare for curriculum implementation.

Without shared planning time, teachers miss out on opportunities to gain knowledge about new curriculum, share best practices, and support one another in implementation, which can impede the enactment of curriculum in the classroom. For example, in a survey of teachers implementing an inquiry-based science curriculum in a southeastern state in the United States, a lack of preparation time was the most frequently listed barrier to implementation. In addition, the amount of time teachers had available to plan for curriculum implementation was significantly related to their perceptions of the alignment between the science curriculum and individual and school goals (Penuel et al., 2008).

Lack of resources.

Not enough funding, instructional and technology materials, or personnel can weaken implementation efforts (Desimone, 2002; Penuel et al., 2008; Spreen & Knapczyk, 2017). Schools have halted curriculum implementation when these resources became unavailable or school-level implementers could not reallocate existing resources to support the curriculum (Desimone, 2002). For teacher in northern Uganda charged with implementing the National Thematic Curriculum, coping with inadequate resources, including a lack of instructional materials for mother tongue languages and substitute teachers to allow teachers to attend curriculum trainings, was a common theme that emerged from interviews (Spreen & Knapczyk, 2017).

Lack of adequate training for teachers and school leaders.

Just as allocated time for teacher professional development and collaboration facilitates curriculum implementation, a lack of collaborative professional learning opportunities can hinder implementation. This is true not only for teachers but for school leaders as well. Germenton (2011) found that in Norway, principals did not receive much training on the new curriculum, even though they tended to be the ones who were to introduce the reforms to their staff. Likewise, multiple qualitative studies also revealed that school leadership did not understand the intention or pedagogy behind curriculum reforms, which can result in passing those misconceptions on to teachers (Coburn, 2006; Hamilton, 2013; Spillane & Callahan, 2000).

4.3. The Exosystem: Policy and External Supports

Facilitating factors.

Government and non-governmental organisations can utilise policy instruments such as capacity-building (e.g., professional development) and inducements (e.g., monetary grants) that support higher levels of curriculum implementation (McDonnell & Elmore, 1987). These include offering professional development directly aligned to the curriculum reform (Chan, 2010; Cheung & Wong, 2012; Cohen & Hill, 2000; Desimone, 2002; Taylor et al., 2016), providing schools external experts from universities, government offices, or curriculum design teams (Chan, 2010; Datnow et al., 2000), and creating documents that directly address specifics of how to implement the curriculum in the classroom (Desimone, 2002; Germenton, 2011; Kennedy, Chan, & Kwan, 2011; Smith & Their, 2017).

Professional development aligned to curriculum reform.

Professional development provided by government or non-governmental organisations was positively correlated with implementation. For example, in Wales, teachers who participated in more of the training for the mandatory Foundation Phase 3-7 year old curriculum were more likely to have implemented the Foundation Phase pedagogies (Taylor et al., 2016). Likewise, in a multistage cluster sample design survey of 595 teachers implementing California's reform-oriented math curriculum framework in the 1990s, Cohen and Hill (2001) found positive associations between teachers' access to extended learning opportunities around improving mathematics teaching, practices that were aligned to the new reforms, and student outcomes (i.e. math scores on reform-oriented math assessments). These learning opportunities were often provided by non-governmental organisations such as curriculum developers and universities.

At the same time, research suggests that the mere existence of training that educators can attend does not necessarily result in high levels of implementation. For example, in a survey of 188 teachers in a district in South Africa, the majority of teachers received training around the National Curriculum Statement (NCS). Yet 82% still reported that NCS teaching methods were difficult to implement and in follow-up interviews, teachers identified a need for longer-term training (Taole, 2015). This suggests that, concurrent with literature on professional development (Borko et al., 1997; Garet et al., 2001; Guskey, 2002), the trainings that schools provide should be sustained over time rather than "one and

done” workshops. In addition, effective professional learning that leads to changes to teacher practice and improved student outcomes are job-embedded, collaborative and hands-on, and scaffolds teacher learning.

External experts.

Qualitative studies further highlighted external experts, including government officials, professional development vendors, and university faculty, as an effective way to provide ongoing professional development and implementation support. For example, teachers in Hong Kong, China expressed that they found technical support of government officials as on-site coaches and tutors from a university partnership beneficial in helping them make sense of how to put the government guidelines into practice (Chan, 2010).

Documents that address classroom implementation.

Documents that provide practical guidance on classroom practice may also facilitate school leaders’ and classroom teachers’ understanding of curriculum reforms and ability to execute them in the classroom. These can include curriculum policy statements, reports, guidance documents, and curriculum support materials. In Norway, the new National Curriculum had five documents: the Core Curriculum, Principles for Quality Framework, Subject Curriculums, Distribution of Teaching Hours Per Subject, and Basic Skills and Competence in All Subjects. However, principals surveyed and interviewed only considered the subject curriculum and basic skills and competence documents important because they were the only two documents that addressed classroom implementation (Germenton, 2011).

Research, however, on the efficacy of detailed documents is mixed. Penuel and colleagues (2008) found that even though the state of Alabama created numerous guidance documents detailing how to align a new science curriculum with content standards *and* provided training on how to use those documents to align the curriculum with content standards, implementation levels among science teachers surveyed remained low. Cohen and Hill (2001) also did not find a correlation between policy documents that included a clear curriculum framework and guidance for a mathematics reform in California and changes to teacher practice.

These findings suggest that the presence of these documents alone might not be sufficient in changing teachers’ practices. Attention must also be paid to how teachers make sense of policy documents and curriculum guidance individually (i.e., in the microsystem) and collectively (i.e., in the mesosystem). Teachers construct meaning of new curriculum through the lens of their preexisting practices and worldviews; if pre-existing schemas are not replaced with new ones, teachers may interpret the same policy message in different ways, misinterpret new ideas as familiar, make superficial connections between old and new practices, or act biased towards prior beliefs and values (Coburn, 2001; Spillane et al., 2002).

Fiscal resources.

Government agencies also utilise fiscal resources, such as budget lines and grants, to effectively incentivise facilitate implementation (Chan, 2010; Cheung & Wong, 2012; Durand, et al., 2016; Kennedy, Chan, & Kwan, 2011; Lawson, Wilcox, & Schiller, 2016; Smith & Their, 2017). For example, in a survey of nearly 10,000 principals, curriculum leaders and teachers in Hong Kong, China, Cheung and Wong (2012) found that resources and support from the government, specifically the Capacity Enhancement Grant, was listed as one of the top facilitating conditions for implementation across stakeholders. Many school principals wrote in the open-ended portion of the survey that funding allowed them to address many implementation barriers at the microsystem and mesosystem level, as

the grant helped them reduce teacher workload by giving them the funds to hire more staff. In the United States, interviews with district leaders across six states revealed that federal Race to the Top grants incentivised adoption of the Common Core State Standards (Smith & Their, 2017).

Alignment across policy instruments.

Finally, alignment across *all* capacity-building and inducement policy instruments within the exosystem can help facilitate implementation (Cohen & Hill, 2001; Durand et al., 2016; Kennedy, Chan, & Kwan, 2011). Alignment activities include creating a shared vocabulary around reforms and clear and consistent messaging across communications, (Durand et al., 2016) and ensuring that accountability systems, whether external school reviews or student assessments, match the curriculum guidance, instructional materials adopted, and professional development offerings (Cohen & Hill, 2001; Kennedy, Chan, & Kwan, 2011).

Hindering factors.

The absence of the facilitating conditions described above can obstruct implementation. This includes a failure to provide resources (Chapman, Wright, & Pascoe, 2018; Desimone, 2002; Smith & Their, 2017; Spreen & Knapczyk, 2017; Tikkanen et al, 2017), abstruse documents that do not provide clarity on what the reforms should look like in the classroom (Chapman et al., 2018; Chan, 2010; Priestly et al., 2014; Simmons & MacLean, 2018), and lack of alignment across policy instruments that governments utilise (Bantwani, 2010; Rogan & Aldous, 2005; Simmons & MacLean, 2018).

Lack of resources.

The failure to provide resources, specifically funding for supplies, staff, and professional development, can hinder curriculum implementation. For example, in interviewing 11 arts curriculum leaders in Australia, Chapman and colleagues found that schools needed money for supplies, staff, and dedicated space to teach (2018). Interviews with state and district leaders across six U.S. states implementing the Common Core State Standards further highlighted how a lack of funding for professional development was an obstacle for implementation (Smith & Their, 2017).

Abstruse documents.

Policy documents that lay out what the goals and outcomes of the curriculum are without providing clarity on what the reforms should look like in the classroom impede the actualisation of the intended curriculum. For example, semi-structured interviews with physical education teachers implementing Scotland's new physical education curriculum found the vague course documentation inhibiting to implementation, and would have preferred more detail and direction (Simmons & MacLean, 2018).

Lack of alignment across policy instruments.

A lack of alignment between policy instruments may also hinder implementation, specifically regarding incompatible accountability systems and completing and revolving reforms. High-stakes accountability systems that do not measure curriculum goals pressure teachers and schools to focus on what the accountability systems measure instead (Bantwani, 2010; Rogan & Aldous, 2005; Simmons & MacLean, 2018).

In addition, the presence of multiple competing reforms being pushed onto schools by the government takes resources away from supporting curriculum implementation (e.g. time in the schedule, dedicated staff). This revolving door of reforms also diminishes educators' confidence that the latest curriculum will stick, and therefore may diminish their willingness to take the necessary time to engage with it (Cheung & Yueng, 2018; Coburn & Russell, 2008; Datnow, 2005; Penuel et al., 2008; Priestly et al., 2014; Stringfield, 2000).

4.4. The Macrosystem: Education Beliefs and Values

Facilitating factor: Belief in underlying principles.

Across numerous studies, surveys found educators to generally believe in the underlying principles of curriculum reforms and their broader purpose of better serving students, be it the Common Core State Standards in the United States (Abadie & Bista, 2018), Scotland’s Curriculum for Evidence (Priestly et al., 2014), Uganda’s Quality Educators for All Initiative (Spreen & Knapczyk, 2017), Japan’s Integrated Studies programme (Bjork, 2009), the New Zealand Curriculum Key Competencies (Hamilton et al., 2013), or Wales’ Foundation Phase (Taylor et al., 2016). As Taylor and colleagues (2016) found, 89% of all Foundation Phase lead practitioners surveyed said that the introduction of the Personal and Social Development, Well-Being and Cultural Diversity (PSDWCD) Area of Learning was an improvement from the prior national curriculum.

There is some evidence that these beliefs can influence implementation. Cheung and Wong (2011) found a positive association between teachers who agreed with the Hong Kong, China Learning to Learn reform items and changes to teaching and learning strategies. An exploratory study of 20 educators in Belgium integrating statistics in the math curriculum found that those teachers who philosophically agreed with the reform accordingly changed their practices, while those who opposed the reform did not (Marz & Kelchtermans, 2013).

However, the high percentage of practitioners who rated themselves as believing in the importance of the reform-oriented curriculum were evident even in studies where low or inconsistent implementation was observed (Cohen & Hill, 2000; Spreen & Knapczyk, 2017). For example, in studying mathematics reform in California, Cohen and Hill (2001) found lower frequencies of reform mathematics practices as compared to conventional math practices, even though high frequencies of teachers agreed with the ideas manifest in the math reform. This suggests that teacher agreement with the reform is perhaps necessary but not sufficient in influencing high levels of curriculum implementation. Likewise, even though Chapman and colleagues (2018) pointed to reports that 85% of the population in Australia believed that the arts is valuable, they noted that the participants in their study shared that arts education was not implemented at high levels in Western Australia. Even when macrosystem beliefs coincide with curriculum goals, that does not necessarily outweigh the greater value placed on high stakes assessments generated in the macrosystem that determine matriculation or postsecondary placements.

Hindering factors.

The reported agreement that a curriculum reform is what students should be learning does not supersede other macro-system beliefs, including the value of traditional subject areas and the primacy of high-stakes assessments and accountability systems.

Primacy of traditional subject areas.

Societal values of certain subject areas over others can thwart curriculum reform efforts (Benavot & Resh, 2003; Bjork, 2009; Casinader, 2016; Taylor et al., 2016). For example, in comparing patterns of curriculum implementation in a nationally representative sample of lower secondary schools two sub-sectors of the Israeli¹ educational system, Benavot & Resh (2003) found highly uniform implementation levels for subject areas “viewed as having a strong instrumental value for further

¹ The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

educational advancement or dominant in official guidelines” (p. 183), namely, mathematics and English. In fact, schools spent more time teaching those subject areas than the hours prescribed on official curriculum guidelines. Similarly, in the age 3-7 Foundations curriculum in Wales, which emphasised Personal and Social Development, Well-Being, and Cultural Diversity as an area of learning, practitioners still valued literacy and numeracy the most, and continued to deliver it through traditional direct and didactic teaching styles (Taylor et al., 2016). A qualitative case study that examined how three schools were implementing a mandated geography curriculum in Australia revealed that because history held a higher status among school leaders, geography remained on the periphery of humanities courses offered (Casinader, 2016). Other studies found that teachers believed that new curriculum, particularly the parts focused on inquiry-based approaches to learning, “threatened” or undermined traditional subject areas (Bjork, 2009; Priestly et al., 2014).

Tensions between child-centred reforms and standardised high stakes exams.

Another noted obstacle was a tension between the value of child-centered reforms and standardised high stakes exams (Bjork, 2009; Rogan & Aldous; Taylor, Rhys, & Waldron, 2016; Spreen & Knapczyk, 2017). Rogan and Aldous (2005) found deliberately low levels of classroom interaction and assessment of South Africa’s Curriculum 2005 because of the high societal value placed on the Grade 12 matriculation exam and the pressures schools faced in having high pass rates. The exam emphasised rote memorisation and algorithms, whereas Curriculum 2005 was meant to emphasise more hands-on learning and multiple modes of assessment. Bjork (2009) found that teachers in Japan worried that public opinion would look down upon them teaching the Integrated Studies curriculum because they believed it would interfere with rigorous academic instruction and student performance on entrance exams. Parents similarly believed in the goals of Integrated Studies, particularly the importance of reducing pressure on students and increasing excitement about learning, but remained nervous about reduction on entrance exam scores (Bjork, 2009).

4.5. The Chronosystem: Implementation Timelines

Facilitating factors.

The passage of time is in itself a variable that can facilitate implementation, as studies found implementation of curriculum reforms to increase over time. For example, in Hong Kong, China the implementation of the four key tasks in the Learning to Learn framework steadily grew from 19% to 63% between the first year of implementation in the 2001-2002 school year and 2006-2007 for primary schools and 29% to 63% of secondary schools (Cheung & Wong, 2011). From a practical standpoint, this involves giving teachers time to adjust to the new curriculum before expecting full implementation (Abadie & Bista, 2018; Cheng & Wong, 2011; Cheung & Wong, 2010; Durand, Lawson, Wilcox, & Schiller, 2016; Hamilton et al., 2013; Li et al., 2012). For example, a mixed methods case study of how the Common Core State Standards were implemented in public and private schools in Louisiana found that in the public schools where teachers were asked to implement the math and English standards right away, teachers felt frustrated with not having enough time to prepare. Conversely, the private school waited to implement until the school had collected and created the necessary instructional materials, and even then, focused on one subject area at a time. Private school teachers expressed more positive opinions about the Common Core State Standards as it related to teacher identity and impact on students as compared to the public school teachers (Abadie & Bista, 2018). Given that it takes time for teachers to feel comfortable and confident in changing teaching practices, curriculum reforms that are sustained over time are perceived as an asset for implementation (Tikkanen et al., 2017).

Hindering factors.

While the passage of time allows for changes to teacher practice and student learning to become more engrained in individual teachers’ practice and to spread across more teachers (Coburn, 2003),

sustainability of curriculum implementation over multiple years can be impeded by other changes in the policy environment (Datnow, 2005). As Datnow (2005) found in a longitudinal case study of 13 schools in an urban school district in the United States who adopted new curriculum as part of Comprehensive School Reform, the seven schools who dropped the reform all together or continued to implement at very low levels used new district and state policies that emerged over the years as an excuse to discontinue or put the reforms on the “back burner.”

5. Impact of System Level Interactions

Collectively, the research reviewed suggests that each level within the education system does not independently influence students’ engagement with the curriculum. Actions at one level are entangled with actions at other levels, and the interaction of these levels with one other further affect curriculum implementation. Certain facilitating and hindering factors were found at multiple levels of the system, illustrating how the inextricable linkages between system levels can bolster or obstruct how students experience the curriculum.

5.1. Building Teachers’ Capacity

Numerous studies pointed to teacher learning – via individual and collective sense making and through formal professional development – as an important factor that influenced whether teachers changed practices in ways that embodied the principles of a new curriculum. While resources such as funding, instructional materials, and curriculum guidance are facilitating factors for implementation, multiple studies found that resources alone did not change practices if they were not coupled with in-depth training on how to make sense of those resources (Cohen & Hill, 2001; Penuel et al., 2008; Rogan & Aldous, 2005). At the same time, resources such as time and funding are also vital for securing in-depth training (e.g., Spreen & Knapczyk, 2017).

Teacher sensemaking around curriculum guidance can also be influenced by professional social networks, illustrating a microsystem-mesosystem connection (Coburn, 2000; Penuel et al., 2008; Spillane et al., 2002). These school-based networks can include teachers in the same grade-level or content area, teachers in different grade levels and subject areas, and staff who are not classroom-based such as instructional coaches. As qualitative research uncovered, school leaders play an influential role in the extent to which these networks focus on the content and pedagogy reflected in the curriculum and the amount of time teachers within these networks have to interact with one another (Coburn & Russell, 2008).

Teacher sense making around new curriculum guidance can also be shaped by access to and experience with curriculum-aligned professional development provided by outside vendors or government officials, illustrating a microsystem-mesosystem interaction (Chan, 2010; Datnow et al., 2000). At the same time, school leaders can determine the time teachers have available to participate in professional development and can determine the professional development that teachers receive (Coburn & Russell, 2008; Stringfield et al., 1998). This suggests that a mesosystem-exosystem connection can mediate microsystem-exosystem connections.

5.2. Message Coherence

Alignment in messages regarding goals and priorities coming from official policies (the exosystem), school leadership (the mesosystem), and resources that governments and school leaders allocate may also lead to higher classroom implementation (Datnow et al., 2000; Desimone, 2002; Durand et al., 2016). First, school leaders can “bridge” or “buffer” messages coming from the exosystem so that teachers receive a coherent message about the learning activities and outcomes they should prioritise (Honig & Hatch, 2004). Bridging activities involve selectively engaging with specific policy demands that match internal goals; buffering activities involve limiting a school’s interactions with external organisations and symbolically adopting government demands without changing daily practice (Honig & Hatch, 2004). For example, principals of schools that demonstrated high levels of implementation of the Core Knowledge curriculum made efforts to align the curriculum with their state accountability system (Datnow et al., 2000). Likewise, school leaders who sustained the implementation of Comprehensive School Reform curriculum helped staff to align the school curriculum with new state standards and “buffer” other district reforms that did not mirror curriculum goals by symbolically filling out paperwork (Datnow, 2005).

Resource allocation can also send coherent message about policy goals and priorities. For example, when governments provide funding for professional development and curriculum support staff, it signals to schools that a new curriculum is a priority and provides the capacity-building tools necessary to make changes. Likewise, when school leaders allocate time in the schedule for teachers to collaboratively plan around a new curriculum or use existing budgets to provide training and instructional materials to support curriculum goals, it signals to teachers that implementing the curriculum is a school priority.

However, given the competing demands that schools face and fragmentation in policies, programs, and resources coming from the exosystem (e.g., Cohen & Hill, 2001), message coherence between levels of the system can be difficult to achieve, therefore making it less likely that students will equitably experience a new curriculum (Spren & Knapczyk, 2017).

5.3. Philosophical Beliefs versus Practical Realities

Teachers’ positive beliefs about the value of curriculum change do not necessarily counteract negative perceptions of curriculum change that arise from insecurity about teaching in a way that is unfamiliar (i.e., a microsystem influence), lack of time in their school schedule to prepare (i.e., a mesosystem influence), constantly changing government mandates (i.e., an exosystem influence), and macrosystem beliefs about the primacy of test scores, played out in parent expectations of how schools should prepare students, government accountability formulas, and college and career matriculation (Abadie & Bista, 2018; Bantwani, 2010; Bjork, 2009; Chapman, Wright, & Pascoe, 2018; Priestly et al., 2014). Even when teachers and schools have autonomy in how they enact the curriculum on a daily basis at the mesosystem and microsystem levels, they have less autonomy in what is valued vis-a-vis broader national conversations and the resources they have at their disposal (Chan, 2010).

5.4. Structures for System-wide Interactions

A handful of researchers also pointed to formal structures for stakeholders in different levels of the system to interact in the creation of curriculum reform as a valuable process (Pietarinena et al., 2017; Tikkanen et al., 2017). In Finland, stakeholders appreciated opportunities for teachers, university professors, associations and government officials to come together as a means of building collective ownership over the new curriculum; this top-and-bottom approach was associated with positive

knowledge sharing, change management, school impact and societal impact (Pietarinena et al., 2017). Alternatively, a lack of collaboration between policymakers, school leaders, and teachers was an inhibitor of implementing reforms (Simmons & Maclean, 2018). For example, Stringfield and colleagues (1998) found in a study of Comprehensive School Reform in the United States that in schools with low levels of implementation, principals tended to not give teachers a voice in choosing the school reform design to be implemented or choice and creativity in how they could teach the curriculum.

6. Theory of Change in Action: Curriculum Reform

What are examples of theories of change that countries have utilised? Some countries and jurisdictions have utilised standards-based accountability measures as a means for improving student outcomes (Fullan, 2006). For example, Chile instituted test-based accountability as a way to increase implementation of twenty-first century curriculum reforms that covered a range of cognitive learning outcomes. However, the standardised tests through which they publicly measured schools focused narrowly on traditional reading, math, and writing subjects, which resulted in educators neglecting twenty-first century competencies (Bellei & Morawietz, 2016). The 2001 No Child Left Behind Act in the United States similarly utilised managerial, test-based accountability and standards-based reforms as a mechanism for improving student outcomes by sanctioning schools who did not meet adequate yearly progress on student achievement in reading and math. This, however, neglected to develop lower-performing schools' capacity to improve and narrowed the curriculum to basic knowledge and skills in tested subject areas (Stewart, 2010).

On the other end of the spectrum, countries have used decentralisation as a theory of change. For example, Japan introduced Integrated Studies as part of the national curriculum in 2002 as a way to provide students the opportunity to investigate meaningful issues in their lives. The Ministry of Education Culture, Sports, Science, and Technology intentionally kept directives to a minimum and issued no textbooks or prescribed curricular resources. Instead, they gave schools and teachers flexibility and autonomy in designing and executing the Integrated Studies curriculum. The theory of action was that entrusting teachers as designers of the curriculum would enhance their commitment to the schools where they worked (Bjork, 2009).

Bridging top-down accountability and site-based accountability, some countries have emphasised a “top-and-bottom” theory of change by bringing policymakers, curriculum designers, and practitioners together in a democratic, iterative process of designing and implementing curriculum to optimise student learning. On-the-ground implementers have a voice at the table alongside policymakers in identifying learning areas to cover and have autonomy to adapt the principles of that curriculum to their local contexts (Datnow et al., 2002; Tichnor-Wagner et al., 2018). For example, Finland intentionally utilises a top-and-bottom approach as a change management strategy (Pietarinena et al., 2017). Drawing heavily on a tradition of school and teacher autonomy, the Finnish national core curriculum provides general goals, core content, principles, and guidelines yet relies on schools to develop their own pedagogy and plans for subject integration. Furthermore, when the curriculum goes through revisions every ten years, the state agency that leads the work brings in hundreds of stakeholders representatives from universities, schools, and associations. As Pietarinena and colleagues (2017) argue, “the core

curriculum's ability to facilitate aligned yet context-sensitive local implementation is a crucial part of successful curriculum reform" (p. 24). Finland has further invested in building a strong cadre of local implementers (i.e., educators), focusing resources on teacher capacity-building (Stewart, 2010). This theory of change addresses the facilitating factors of message coherence across the system and teacher beliefs and motivations.

Singapore adopted the 21st Century Competencies (21CC) Framework, which articulates a set of cognitive, intrapersonal, and interpersonal competencies and core values and guides schools to change curriculum, pedagogies, and assessments to reflect these desired outcomes. As with the Finland example, their theory of change emphasised systemic coherence across key education stakeholders. The PPP (Policies, Practices, Preparation) model is a collaborative partnership between 1) the Ministry of Education, which articulates the goals of education in the country via policy, 2) the National Institute of Education, the country's teacher education institute which aligns the learning experiences and outcomes of preservice teachers and leaders-in-training to the 21CC framework for that when educators matriculate they are ready to implement the policy goals, and 3) cluster superintendents, principals, and teachers working in schools, who translate the policies into appropriate practices and initiatives (Tan & Low, 2016). When a new policy is designed, these three entities come together to plan for implementation and evaluate the efficacy of the new policy (Stewart, 2010).

Hong Kong, China officials utilised a mixture of "soft" and "hard" measures to strategically motivate educators to implement the 2002 Learning to Learn curriculum reform (Kennedy et al., 2011). "Soft" measures included 1) a gradualist approach that encouraged schools to develop and adapt the curriculum at their own pace and in a way that responded to students' needs and abilities and 2) inducements that provided schools fiscal and human capital resources to support implementation. This approach was complemented by a "hard" policy accountability via the Basic Competency Assessment for students and an External School Review, both of which aligned to the new reforms (Chan, 2010; Cheung & Wong, 2011; Kennedy et al., 2011).

While it is beyond the scope of this paper to assess the efficacy of these various theories of change, literature suggests that theories of change that take actions across multiple components of the education system are more likely to yield successes (Bjork, 2009; Fullan, 2006). As Stewart (2010) argued, high-performing and significantly-improving education systems have adopted theories of change that combine "intelligent, multifaceted, transparent accountability with initiatives that build professional knowledge and capacity to implement and evaluate best practices at the school level" (p. 91).

As the examples above illustrate, a) ongoing teacher professional learning, b) systems of accountability that emphasise capacity-building of individual educators and collective capabilities of schools, c) coherence and communication across different levels of the education system, and 4) an incremental timeline for implementing reforms and expecting results are critical components that countries should collectively take into account when envisaging a strategic plan for educational change to curriculum enactment and student outcomes. Furthermore, these components address facilitating factors for curriculum implementation within and across system levels. Ongoing professional learning addresses teacher commitment, beliefs, sensemaking and professional development aligned to curriculum reform. Collective capacity-building embodies school leadership, collaborative team culture, resources (e.g., time, money, personnel, instructional materials), and external experts for technical support. Third, coherence helps to reduce tensions between child-centred reforms and standardised high stakes exams and includes the creation and dissemination of documents that reflect classroom practice. Finally, an incremental timeline attends to the chronosystem.

7. Reflections

Curriculum change is complex. Implementing new curriculum in ways that lead to deep changes in teaching and learning involves an intricate recipe of microsystem, mesosystem, exosystem, macrosystem, and chronosystem factors. Therefore, curriculum designers should address actions at each level of the system to facilitate implementation before and during curriculum implementation and to mitigate potential barriers. The following discussion reflects on three key areas for policymakers and practitioners to consider when facilitating curriculum change, which the OECD Future of Education and Skills 2030 Informal Working Group (IWG) member countries have identified as focus areas for Phase II of the project.

7.1. Curriculum Change as Part of a Bigger Change Management

Change management that embraces an ecological systems perspective takes into account the people, places, and policies at the policy, school, and classroom level that affect implementation (Honig, 2006). Government agencies can create or provide financial support for hubs that foster cross-level collaboration as new curriculum is developed and implemented. Hubs invite classroom teachers, school administrators, government officials across different jurisdictions, and external organisations so that coherence is created across sectors and all stakeholders feel like they have a voice in shaping the curriculum, therefore building commitment to reforms and belief in its efficacy. Through hubs, practitioners can also reach back out to the exosystem for technical support and resources, therefore helping individuals to understand the curriculum and its underlying content and pedagogy and helping to build collective capacity of schools to engage in the work. For example, school leaders can use hubs to reach out to external organisations that provide professional learning for staff, ask government agencies for clarification on policy documents, and advocate for specific funds and materials that they will need before the curriculum takes effect.

In managing change, patience is also central. Because implementation rates increase as time goes on (Cheung & Wong, 2011), it is difficult to measure impact of a curriculum before teachers feel comfortable actually implementing it. Therefore, school leaders and government officials should wait for curriculum to take hold before evaluating its impact or moving on to something new. Finland, for example, reviews its curriculum every ten years (Pietarinen et al., 2017).

Implementation is crucial part of the curriculum change process. Without consistency in implementation, there is no way to evaluate the efficacy of a particular curriculum, nor is there a way to ensure equity so that all students, regardless of the school they attend or the teacher they are assigned to, can actually access curriculum intended to improve their personal development and societal outcomes. For curriculum reforms to take hold in ways that lead to real changes in what each and every student is learning, also going deep, focusing not just on the quantity of implementation supports but of the quality of those supports, not just on teachers but on school leaders, government officials, community organisations, and public opinion. In sum, a multi-faceted systems approach for managing change is needed for new teaching practices and learning outcomes to become the new normal.

7.2. Aligning Curriculum Change with Changes in Teacher Training

In conjunction with detailed documents (e.g., curriculum scope and sequence, guidelines for classroom practice), policymakers can ensure that they develop and disseminate - or partner with external organisations who develop and disseminate - curriculum-aligned professional learning opportunities.

In comparing high-performing education systems around the world, including Finland, Singapore, and Canada, Stewart (2012) corroborates the importance of developing high quality teachers and leaders through a combination of teacher preparation programs and ongoing professional development. She writes, “There seems to be a broad consensus that no matter what reform strategy is being pursued, the overall quality of a school system rests on the quality of its teachers, and the quality of teachers depends on the systems in place to support them” (p. 87).

To support equitable curriculum implementation, teacher training can be designed and offered in such a way that it is accessible to all educators. The substance of curriculum training matters as well. Whether the professional development provider is a university, government agency, or an NGO, professional development should be job-embedded, directly relate to the curriculum and classroom practice, and include multiple touchpoints throughout the school year so that it results in changes to classroom practice (Borko et al., 1997; Cohen & Hill, 2001; Garet et al., 2001). Importantly, professional development can target school administrators as well. As the literature demonstrates, schools leaders served as mediators between the microsystem and exosystem, particularly around teacher learning and message coherence. At the same time, the implementation literature provided few examples that addressed the provision of the professional learning of school leaders even though, as Fullan (2001) writes, “The principal is absolutely key when it comes to developing the school capacity” to manage change” (p. 8).

Practitioners working in schools and classrooms can also put effective implementation supports in place before and during the enactment of a new curriculum that emphasise teacher training. First, because of the relationship between teacher sensemaking and implementation, educators might engage in meaningful reflections individually and with colleagues about what the new curriculum entails, how it is different or similar from current practices, and specific areas needed to bridge pedagogical and content knowledge gaps. School leaders can consider dedicating time and space in the school schedule that allow these reflections about new curriculum in light of daily teaching practices to take place.

Educators can also forge professional learning communities within and across schools to enhance understanding of how new curriculum can become embedded into classroom practice. As with professional development, the substance of learning communities matters. As Coburn and Russell (2008) found, learning communities can vary widely in how conversations are structured; those conversations can push teachers to enact reforms in particular ways. Professional learning communities that include the following characteristics have been associated with positive changes to teacher practice and student outcomes: a shared commitment to improving student learning, adequate time and space to share repertoires of practice and create a culture of support, and a focus on classroom instruction (Coburn & Stein, 2006; McLaughlin & Talbert, 2001). Again, school leaders play a pivotal role in creating formal time in the schedule for teachers to collaborate consistently and meaningfully.

7.3. Aligning Curriculum Change with Changes in Pedagogy and Assessment

Policymakers can intentionally craft a coherent message across education policies, curriculum guidelines, and policy instruments, including budgets and grants, accountability systems, and professional learning opportunities that directly align to the desired outcomes of the curriculum. Particularly for curriculum that emphasises holistic education and student-centred learning, there is a need to phase out accountability policies that philosophically oppose curriculum intentions (e.g., high stakes testing on select subject areas and that emphasise rote memorisation). So long that students have to take examinations with high stakes attached, whatever concepts are on those examinations will be what students, teachers, and parents value (Bellei & Morawietz, 2016).

This is easier said than done, as it involves a macrosystem societal shift in expectations of what makes a successful student and school, and involves working across sectors to achieve this consistency (e.g., collaborating with the business sector on how to screen employees entering the workforce and how to advertise the need for their employees to have cognitive and socioemotional skills; working with higher education so that acceptance criteria aligns with K-12 curricular goals).

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Table 1. Factors that Influence Curriculum Implementation

	Facilitating Conditions	Hindering Conditions
<i>Microsystem</i>	<ul style="list-style-type: none"> • Teacher commitment to reform • Alignment of teacher beliefs about teaching and learning with reform 	<ul style="list-style-type: none"> • Teacher misunderstanding of curriculum content and pedagogy • Teacher workload • Insufficient time
<i>Mesosystem</i>	<ul style="list-style-type: none"> • School leadership support • Allocation of resources, including time and support staff • Collaborative team culture 	<ul style="list-style-type: none"> • Lack of school leadership support • Lack of time to plan and prepare for curriculum implementation • Lack of resources (funding, materials, technology, personnel) • Lack of training for teachers and school leaders on new reforms
<i>Exosystem</i>	<ul style="list-style-type: none"> • Professional development aligned to curriculum reform • External experts • Documents that directly address classroom implementation • Fiscal resources • Alignment across policy instruments 	<ul style="list-style-type: none"> • Lack of resources • Abstruse documents • Lack of alignment across policy instruments
<i>Macrosystem</i>	<ul style="list-style-type: none"> • Belief that underlying principles will better serve students 	<ul style="list-style-type: none"> • Primacy of traditional subject areas • Tensions between child-centered reforms and standardised high stakes exams
<i>Chronosystem</i>	<ul style="list-style-type: none"> • Allowing multiple years for reforms to take hold 	<ul style="list-style-type: none"> • Changes in the policy environment over time

Annex A. List of Articles Reviewed

	Country	Curriculum Reform	System Level	Methods
Abadie & Bista (2018)	USA	Common Core State Standards	Classroom, School	Survey of all teachers in a single school district and follow-up interviews with teachers and principal in a public and private school in that district
Bantwani (2010)	South Africa	National Curriculum Statement (Natural Sciences)	Classroom	88 questionnaires and 14 qualitative interviews with primary school teachers
Benavot & Resh (2003)	Israel	Official curricular policies	School	Descriptive analysis of time allocated to different subject areas for nationally representative sample of 98 Jewish-sector and 75 Arab-sector schools
Bjork (2009)	Japan	Integrated Studies	School	Interviews and observations with educators over a 4 year period
Casinader (2016)	Australia	National geography curriculum	Classroom, School	Qualitative case study of an independent, catholic, and government school
Chan (2010)	Hong Kong, China	Learning to Learn national curriculum reform	School	Qualitative case study of 4 schools, including document analysis and 8 interviews of front-line teachers
Chapman, Wright & Pascoe (2018)	Australia	Arts curriculum	School	Qualitative interviews with 11 arts curriculum leaders across different

				schools in Western Australia
Cheung & Wong (2011)	Hong Kong, China	Learning to Learn national curriculum reform	Classroom, school	Survey of stratified random sample of 150 primary schools and 120 secondary schools
Cheung & Wong (2012)	Hong Kong, China	Learning to Learn national curriculum reform	Classroom, school	Survey of stakeholders in 132 primary and 108 secondary schools, including 7,869 teachers, 209 school principals, 1,412 key learning area heads, with follow-up in-depth interviews
Cheung & Yuen (2018)	Hong Kong, China	Learning to Learn national curriculum reform	School	Survey of 125 curriculum leaders and 10 semi-structured interviews
Coburn (2006)	USA	Reading reform	School	Ethnography of urban elementary school
Coburn & Russell (2008)	USA	Inquiry-based math curriculum	School, District	Qualitative case studies of 2 districts, and 4 elementary schools within each district
Cohen & Hill (2001)	USA	Math reform	Classroom, Government	Survey of 595 classroom teachers representative of the state
Datnow, Borman, & Stringfield (2000)	USA	Core Knowledge	Classroom, School	Longitudinal quasi-experimental, untreated control group design of 4 case study schools, with interviews and observations
Datnow (2005)	USA	Comprehensive School Reform	School	Longitudinal case study of six Comprehensive School Reform models implemented in 13 schools in one urban districts
Desimone (2002)	USA	Comprehensive School Reform	School	Comprehensive literature review

Durand, Lawson, Wilcox, & Schiller (2016)	USA	Common Core State Standards	School, District	Case studies of 9 “beating the odds” and “typical” elementary schools, involving interviews with school and district leaders
Germenton (2011)	Norway	2006 National Curriculum	School	Survey of 53 principals from 92 schools in Finnmark region, with 5 follow-up interviews
Hamilton, Farruggia, Peterson, & Carne (2013)	New Zealand	New Zealand Curriculum Key Competencies	School	Interviews with 7 school leaders across 5 SES-diverse schools
Incekara (2010)	Turkey	National Social Studies Curriculum	Classroom	Survey of 129 social studies teachers in either public or private schools across 15 provinces
Kennedy, Chan, & Kwan (2011)	Hong Kong, China	Learning to Learn national curriculum reform	Government	Document analysis
Li, Ni, L, & Tsoi (2012)	China	Mathematics curriculum reform	Classroom	Survey of 584 elementary mathematics teachers
Marz & Kelchtermans (2013)	Belgium	Secondary school statistics curriculum	Classroom	20 teachers from nine secondary schools in Flanders
Penuel et al., 2008	USA	Inquiry-oriented science curriculum	Classroom	Survey of 225 teachers from 51 different schools in one state
Pietarinena et al. (2017)	Finland	Finnish national curriculum	Government	Survey of 117 implementers
Priestly, Minty, & Eager (2014)	Scotland	Scotland Curriculum for Excellence	Classroom, School	Case study of 2 secondary schools; 43 in-depth semi-structured interviews
Roehrig, Kruse, & Kern (2006)	USA	Inquiry-based high school chemistry curriculum	Classroom	Interviews and classroom observations with 27 teachers
Rogan & Aldous (2005)	South Africa	National Curriculum Statement	Classroom, School	Case studies of 12 schools, focusing on Grades 8 and mathematics and science teaching

Simmons & Maclean (2018)	Scotland	Scotland Curriculum for Excellence	Classroom	Interviews with five full time PE teachers working within one secondary school in Scotland
Smith & Their (2017)	USA	Common Core State Standards	Government	46 interviews with district leaders across 6 diverse states
Spreen & Knapczyk (2017)	Uganda	Quality Educators for All Initiative's National Thematic Curriculum (life skills, gender responsive teaching, and Mother Tongue Languages)	Classroom	292 surveys collected from headmasters and teachers across 40 schools; interviews and classroom observations at 14 schools and 12 focus groups with teachers
Stringfield et al., (1998)	USA	School restructuring curricula from external vendors	School	Longitudinal case study of 13 elementary schools
Taole (2015)	South Africa	National Curriculum Statement	Classroom	Survey research design of 188 teachers in a single district with representation of urban and rural schools; 5 follow-up interviews
Taylor, Rhys, & Waldron (2016)	Wales	Foundation Phase (3-7 year old curriculum)	Classroom	41 case study schools with surveys, interviews, and observations
Tikkanen et al (2017)	Finland	National Core Curriculum Reform	Government	Surveys with 20 officials from the National Board of Education and interviews with 23 officials