

Rapid Synthesis

Supporting Professional Learning Approaches to Foster Global Competencies in K-12 Education

1 April 2018



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**Rapid Synthesis:
Supporting Professional Learning Approaches to Foster Global Competencies in K-12 Education
30-day response**

1 April 2018

Forum+

The goal of Forum+ is to generate action on the pressing social-system issues of our time, based on the best available research evidence and systematically elicited citizen values and stakeholder insights. We aim to strengthen social systems – locally, nationally and internationally – and get the right programs, services and products to the people who need them. By social systems we mean the following government sectors and program areas: citizenship, children and youth services, community and social services, consumer protection, culture and gender, economic development and growth, education, employment, financial protection, food safety and security, government services, housing, infrastructure, public safety and justice, recreation, and transportation. With Forum+, we are building on McMaster’s expertise in advancing human and societal health and well-being.

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Timeline

Rapid syntheses can be requested in a three-, 10- or 30-business-day timeframe. This synthesis was prepared over a 30-business-day timeframe. An overview of what can be provided and what cannot be provided in each of the different timelines is provided on the Forum’s Rapid Response program webpage (www.mcmasterforum.org/find-evidence/rapid-response).

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Conflict of interest

The authors declare that they have no professional or commercial interests relevant to the rapid synthesis. The funder played no role in the identification, selection, assessment, synthesis or presentation of the research evidence profiled in the rapid synthesis.

Merit review

The rapid synthesis was reviewed by a small number of policymakers, stakeholders and researchers in order to ensure its scientific rigour and system relevance.

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KEY MESSAGES

Questions

- What professional learning approaches and supports help ensure educators have the knowledge and skills to foster, assess, evaluate and report on students' development of global competencies?
 - How and why do these approaches and supports enable educators to foster students' development of global competencies?
 - How do they enable educators to assess students' development of global competencies?
 - How do they enable educators to evaluate students' development of global competencies?
 - How do they enable educators to report on students' development of global competencies?

Why the issue is important

- Developments in technology and the related effects of globalization mean that societies are evolving at a faster-than-ever pace.
- Education systems are responding to these effects by preparing students with the required competencies to meet these changing demands, and teachers are central to building these competencies as they play a particularly critical role in student achievement.
- Education leaders and stakeholders have responded by creating a set of six core global competencies: critical thinking and problem solving; innovation, creativity and entrepreneurship; learning-to-learn/self-awareness and self-direction; collaboration; communication; and global citizenship and sustainability.
- The Ontario Ministry of Education has commissioned this rapid synthesis to examine the research evidence about professional learning approaches to foster, assess, evaluate and report on global competencies.

What we found

- Our searches of the empirical literature identified a total of 22 relevant documents, including eight systematic reviews, 12 primary studies, and two organizational reports.
- There was no consensus found in the empirical literature on the individual competencies that constitute the global competencies, with jurisdictional variability in conceptual understandings and terminology.
- There was very limited research evidence on professional learning approaches to foster, assess, evaluate and report on students' development of global competencies, and the majority of the empirical literature related to professional learning approaches to foster individual competencies in students.
- Limitations with the quality of the findings were noted, including the generalizability of findings, recency of systematic reviews, and small sample sizes of primary studies.
- The empirical literature examined various professional learning approaches to foster global competencies, including:
 - continuing professional development, partnerships with external partners (e.g., researchers to build capacity in teachers), in-service programs (e.g., technology workshops), strategies to foster a 'professional learning culture' within or between schools (e.g., supportive environment for teachers to take risks), and connecting teachers' and students' global experiences with the curriculum.
- We found no empirical evidence on enabling educators to assess students' development of global competencies. However, one organizational report by the OECD found that while most member countries include 21st-century skills in their curriculums, there is a general lack of formative or summative assessment policies for 21st-century skills.
- We found one primary study on the development of the Human Behavior Rating Scale–Brief to measure 21st-century skills that reported that teachers' ratings of 21st-century skills in their students were found to be predictive of students' test scores in reading and mathematics skills.
- We found no empirical evidence on enabling educators to report on students' development of global competencies.

QUESTIONS

What professional learning approaches and supports help ensure educators have the knowledge and skills to foster, assess, evaluate and report on students' development of global competencies?

- How and why do these approaches and supports enable educators to foster students' development of global competencies?
- How do they enable educators to assess students' development of global competencies?
- How do they enable educators to evaluate students' development of global competencies?
- How do they enable educators to report on students' development of global competencies?

WHY THE ISSUE IS IMPORTANT

Education is key to equipping individuals with the necessary skills to meaningfully contribute to society.(1) Rapid developments in technology, workforce changes and the effects of globalization mean that societies are evolving at a faster than ever pace. Responsive education systems are needed to properly prepare students with the required skill sets to meet these changing demands.(2)

Governments have been making strides in addressing the issue by both identifying the skills that students need to fully engage in today's society (e.g., citizenship), as well as recognizing the leadership role that teachers have in fostering these skills.(1; 2) The challenge that education systems currently face is how to develop the kind of teaching that is needed to allow learners to learn in deeper, more transferrable ways, which has been recognized as necessary to help students apply what they have learned in school to succeed in a fast-changing, globalized world.(3; 4) As a response to this, there is a global movement calling for education systems to undertake reforms to better prepare students to meet the demands of the 21st century. These reforms focus on K-12 education - teacher preparation and continuing education have been identified as key to fostering the skills in students needed in the 21st century.(2)

The province of Ontario has made commitments to define and measure 21st-century competencies as identified in the Ministry of Education's 2014 Achieving Excellence strategy.(5) The Framework of Global Competencies furthers these commitments by providing core definitions for global competencies and adds student descriptors that map to each of the six competencies.(6) In addition, the ministry has launched a multi-year initiative to update the curriculum and integrate global competencies.(7) The following rapid synthesis has been commissioned by the Ontario Ministry of Education to examine the research evidence about professional learning approaches to foster, assess, evaluate and report on global competencies. Although there are a range of conceptual understandings and approaches to global competencies, the Ministry of Education uses the term competencies to refer to the knowledge, skills and attitudes students need to reach their full potential and to face complex challenges now and in the future.(8) The term global is used to refer to the learner as a whole.(8) For the purpose of this rapid synthesis, we use the global

Box 1: Background to the rapid synthesis

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the Forum's Rapid Response program. Whenever possible, the rapid synthesis summarizes research evidence drawn from systematic reviews of the research literature and occasionally from single research studies. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

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This rapid synthesis was prepared over a 30-business day timeframe and involved four steps:

- 1) submission of a question from a policymaker or stakeholder (in this case, the Ontario Ministry of Education);
- 2) identifying, selecting, appraising and synthesizing relevant research evidence about the question;
- 3) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence; and
- 4) finalizing the rapid synthesis based on the input of at least two merit reviewers.

competencies described by the Council of Ministers of Education (CMEC) in their Pan-Canadian Global Competencies document.⁽⁹⁾ The CMEC defined global competencies as “sets of overarching attitudes, skills, and knowledge that can be interdependent, interdisciplinary and leveraged in a variety of situations both locally and globally.”⁽¹⁰⁾ Table 1 below details these competencies and provides their CMEC definitions.⁽⁹⁾

Table 1. CMEC pan-Canadian global competencies

Global competency	Definition and description
Critical thinking and problem solving	“Address complex issues and problems by acquiring, processing, analyzing and interpreting information to make informed judgments and decisions. The capacity to engage in cognitive processes to understand and resolve problems includes the willingness to achieve one’s potential as a constructive and reflective citizen. Learning is deepened when situated in meaningful, real-world, authentic experiences.” ⁽⁹⁾
Innovation, creativity and entrepreneurship	“Innovation, creativity, and entrepreneurship involve the ability to turn ideas into action to meet the needs of a community. The capacity to enhance concepts, ideas or products to contribute new-to-the-world solutions to complex economic, social and environmental problems involves leadership, taking risks, independent/unconventional thinking and experimenting with new strategies, techniques or perspectives, through inquiry research. Entrepreneurial mindsets and skills involve a focus on building and scaling an idea sustainably.” ⁽⁹⁾
Learning to learn/self-awareness and self-direction	“Learning to learn and to be self-directed and self-aware, means: becoming aware and demonstrating agency in one’s process of learning, including the development of dispositions that support motivation, perseverance, resilience, and self-regulation. Belief in one’s ability to learn (growth mindset), combined with strategies for planning, monitoring and reflecting on one’s past, present and future goals, potential actions and strategies, and results. Self-reflection and thinking about thinking (metacognition) promote lifelong learning, adaptive capacity, well-being and transfer of learning in an ever-changing world.” ⁽⁹⁾
Collaboration	“Collaboration involves the interplay of the cognitive (including thinking and reasoning), interpersonal, and intrapersonal competencies necessary to participate effectively and ethically in teams. Ever-increasing versatility and depth of skill are applied across diverse situations, roles, groups, and perspectives in order to co-construct knowledge, meaning and content, and learn from, and with, others in physical and virtual environments.” ⁽⁹⁾
Communication	“Communication involves receiving and expressing meaning in different contexts and with different audiences and purposes. Effective communication increasingly involves understanding both local and global perspectives, societal and cultural contexts, and adapting and changing using a variety of media appropriately, responsibly, safely, and with regards to one’s digital footprint.” ⁽⁹⁾
Global citizenship and sustainability	“Global citizenship and sustainability involves reflecting on diverse worldviews and perspectives and understanding and addressing ecological social and economic issues that are crucial to living in a contemporary, connected, interdependent, and sustainable world. It also includes the acquisition of knowledge, motivation, dispositions, and skills required for an ethos of engaged citizenship, with an appreciation for the diversity of people, perspectives, and the ability to envision and work toward a better and more sustainable future for all.” ⁽⁹⁾

In order to address the questions guiding this rapid synthesis, there are additional concepts that need clear definitions at the outset. The first set of definitions relate to assessment, evaluation and reporting. Assessment is the process of gathering and interpreting information (e.g., through observations, conversations, products) that accurately reflects the child’s demonstration of learning in relation to the knowledge and skills outlined in the curriculum expectations.(12) Evaluation is the process of judging student learning based on established performance standards.(13) The term ‘reporting’ refers to the process of how teachers determine a grade. Specifically, reporting is the communication of learning to students and their parents (e.g., Elementary Progress Report Cards for Grades 1 to 6, Elementary Provincial Report Cards for Grades 7 and 8, and Provincial Report Cards for Grades 9 to 12).(11)

The last concepts that require clarity at the outset of this rapid synthesis are professional learning and professional development. The term ‘professional learning’ is used to refer to the range of approaches and activities involved in teachers’ continuing development.(14) ‘Professional development’ includes many aspects of learning and also extends to the development of mindfulness, team building and other forms of intellectual growth for its own sake.(15) While the terms ‘professional learning’ and ‘professional development’ are often used interchangeably, they refer to different concepts, in that development requires learning and learning most often includes development.(15)

The Standards for Professional Learning outline seven core characteristics of professional learning that support effective teaching practices and improved achievement in students:

- 1) learning communities (e.g., communities engaged in a cycle of continuous improvement, sharing collective responsibility and accountability);
- 2) resources (e.g., staff, materials, technology, and time);
- 3) learning designs (e.g., application of theories, research and models related to learning);
- 4) outcomes (e.g., meeting performance standards);
- 5) leadership (e.g., building learning and leadership capacity);
- 6) data (e.g., data analysis to support evaluation of professional learning); and

Box 2: Identification, selection and synthesis of research evidence

To answer the questions posed in the rapid synthesis, we identified systematic reviews and primary studies on professional learning approaches, global competencies, 21st century skills and deeper learning. We conducted searches from October to December 2017 in Social Systems Evidence (www.socialsystemsevidence.org), ERIC, EPPI-Centre library, Campbell Collaboration library, and PsychInfo. In Social Systems Evidence, ERIC and PsychInfo we initially ran a broad search for empirical evidence on professional learning approaches and global competencies generally, with the following search strategies: 1) (“professional learning” OR “professional development”) AND (“21st century skills” OR “global competencies” OR “deeper learning?”); 2) (“professional learning” OR “professional development”) AND “education”; and 3) “global competencies” OR “21 century skills” OR “deeper learning.” To ensure we also captured literature on the individual competencies, we ran six additional searches using the following search strategies: 1) (critical thinking OR problem solving) AND (skills OR competenc*); 2) (innovation OR creativity OR entrepreneurship) AND (skills OR competenc*); 3) (learning*to*learn OR self*awareness OR self*direction) AND (skills OR competenc*); 4) (collaboration) AND (skills OR competenc*); 5) (communication) AND (skills OR competenc*); and 6) (global citizenship OR sustainability) AND (skills OR competenc*). We combined these search strategies with filters for language (English and French), recency (2006 – present), education level (K-12), and for peer-reviewed and scholarly journals. We also hand searched systematic reviews from EPPI-Centre library and Campbell Collaboration library.

In addition, we undertook a purposeful sampling of grey literature from relevant organizations including the Organisation for Economic Cooperation and Development, Learning Forward, Partnership for 21st Century Skills, and National Centre for Research on Evaluation, Standards, and Student Testing.

The results from the searches were assessed by one reviewer for inclusion. A document was included if it fit within the scope of the questions posed for the rapid synthesis.

For each systematic review we included in the synthesis, we documented the focus of the review, key findings, last year the literature was searched (as an indicator of how recently it was conducted), methodological quality using the AMSTAR quality appraisal tool (see the Appendix for more detail), and the proportion of the included studies that were conducted in Canada. For primary research, we documented the focus of the study, methods, key features of the intervention, and key findings. Note that the methodological quality of primary studies was not appraised due to the shortened timeframe

7) implementation (e.g., supporting and sustaining the implementation of professional learning).(16)

WHAT WE FOUND

We identified a total of 22 relevant documents, including eight systematic reviews, 12 primary studies, and two organizational reports.

Consistent with our findings from our rapid synthesis on the development of K-12 students' global competencies, we found limited research evidence on professional learning approaches and supports to help ensure educators have the knowledge and skills to foster, assess, evaluate and report on students' development of global competencies.(17) The majority of the literature focused on professional supports available, or teaching practices that can foster students' development of individual global competencies. We harvested during our search of the empirical literature 10 systematic reviews and one systematic review being planned about professional learning approaches, which did not focus specifically on global competencies. Due to lack of relevance to the research questions guiding this rapid synthesis, we do not discuss the findings from these reviews, but have provided full extractions of the reviews in Appendix 3.

Findings from relevant systematic reviews and primary studies generally focused on three of the standards for professional learning: resources to increase educator effectiveness (e.g., technology); outcomes to improve student results; and implementation to support and sustain learning. With regards to the individual competencies, findings generally focused on: critical thinking and problem solving; communication; and global citizenship and sustainability. Three limitations were noted with respect to generalizability of the research evidence found. First, despite our best efforts to prioritize Canadian literature, it should be noted that a large portion of primary studies have been conducted in the United States for which the education contexts may not be directly comparable. Second, the majority of the systematic reviews are older and five out of the eight reviews were published between 2002 and 2011. Third, many of the primary studies report on specific programs or approaches, have relatively small sample sizes, or are pilot studies.

We present the findings from relevant systematic reviews and primary studies. For systematic reviews, the findings are presented along with an appraisal of whether their methodological quality (using the AMSTAR tool) (9) is high (scores of 8 or higher out of a possible 11), medium (scores of 4-7) or low (scores less than 4) (see the appendix for more details about the quality-appraisal process). We also highlight whether they were conducted recently, which we define as the search being conducted within the last five years.

Taxonomies and frameworks used in the empirical literature

Similar to findings from our rapid synthesis on the development of K-12 students' global competencies, there is no consensus in the empirical literature on the individual competencies that constitute the global competencies.(17) There are a range of frameworks and conceptual understandings of global competencies and the terminology used to refer to them differs between jurisdictions. The United States, select education-oriented organizations (e.g., Asia Society, Big Picture Learning, International Network for Public Schools) and the OECD use the term "21st-century skills" or "deeper learning" ("the process through which transferable knowledge (i.e., 21st-century skills) develops") to refer to domains similar to global competencies.(18) The search terms guiding the rapid synthesis were inclusive of the range of terms used to refer to global competencies, in order to cast as wide a net as possible for relevant research evidence (Box 2).

A relevant issue that was identified in our rapid synthesis on the development of K-12 students' global competencies is how and under which competency to integrate literature on information communication technologies (ICT) and digital skills (or digital literacy) frameworks.(17) For the purposes of this rapid synthesis, we have incorporated the literature related to ICT and digital skills within the communications competency, which is consistent with how they are conceptualized in the CMEC's Pan-Canadian Global Competencies document.(9) One recent medium-quality review, which was captured in our previous rapid

synthesis, developed a framework that conceptualizes the integration of global competencies and digital skills.(17; 19) The framework re-imagines these competencies as:

- technical skills (e.g., understand the characteristics of devices and applications; operate basic applications; avoid losing orientation when navigating online);
- information management (e.g., use ICT to formulate research statements; use ICT to find and retrieve information from a variety of sources; judge the usefulness of information; organize information to find it later);
- communication (e.g., communicate information and ideas to multiple audiences using media and online formats);
- collaboration (e.g., interactive communication using a range of contemporary tools; use ICT to share ideas);
- creativity (e.g., generate ideas or new ways of doing things using ICT);
- critical thinking (e.g., use ICT to ask questions; use ICT to judge the suitability of a source for a given problem; link facts, ideas and notions; use ICT to suggest new ideas for discussion); and
- problem solving (e.g., acquire implicit or explicit knowledge about a problem from ICT; apply this knowledge to find a solution).(19)

The review emphasizes the need for more research on how this revised model should be incorporated to best benefit students.(19)

Professional learning approaches and supports to help ensure educators have the knowledge and skills to foster global competencies

We identified seven systematic reviews, 11 primary studies and one organizational report that focused on professional learning approaches to foster global competencies in K-12 education. The majority of the empirical literature found related to helping educators have the knowledge and skills to foster specific student competencies, however one organizational report examined effective professional development to support 21st-century skills.(20) Effective professional development was defined as structured professional learning that improves teacher practices, and consequently, student learning outcomes. The report identified seven widely shared features of effective professional development:

- content focused, through teaching strategies that are linked to specific curriculum content;
- active learning, through activities like designing and trying out new teaching strategies;
- collaboration, through sharing of ideas between teachers and schools;
- models of effective practice, through the use of best practices (e.g., lesson plans, sample student work, and video cases of teaching);
- coaching and support, through experts sharing evidence-based practices;
- feedback and reflection, through dedicated time for teachers to reflect as well as seek feedback on their practice; and
- sustained duration, though appropriate supports in terms of time for teachers to learn, practice, implement and reflect upon newly gained knowledge.(20)

Barriers to effective professional development included inadequate resources, failures to align policies or respond to the specific needs of educators and learners, and dysfunctional school cultures.(20)

The report also included policy and practice recommendations focused on: adopting standards for professional development; restructuring school schedules to allow for increased opportunities for professional learning and collaboration; regularly conducting assessments in order to align learning with needs and wants; identifying and involving expert teachers as mentors and coaches; integrating professional learning into existing school improvement initiatives; investing in technology-facilitated opportunities for professional learning; and providing flexible funding and opportunities for sustained engagement.(20)

In addition, one recent low-quality systematic review broadly addressed pedagogies for effective teaching of 21st-century skills.(21) The review identified core 21st-century skills and a new learning paradigm to foster

these skills in learners in order to succeed in the digital economy (e.g., traditional core skills, learning and innovation skills, career and life skills, and digital literacy skills).(21) The review identified professional learning approaches to teaching effectively in this new paradigm. Findings revealed that an effective teacher employs a range of skills (e.g., moving beyond core subjects and helping learners to think critically), methodologies (e.g., authentic real-life projects) and teaching tools (e.g., digital technologies). Effective professional learning approaches also require the educators to apply learning designs that move away from more teacher-directed to student-centred learning, which is interactive and focused on problem solving. The review identified four learning and innovations skills that will prepare learners to succeed in the 21st century: 1) critical thinking and problem solving; 2) communication; 3) collaboration; and 4) creativity (4Cs).(21) The authors suggest that educators should provide effective training in the 4Cs to ensure that their students are able to apply them in their future careers, as effective teaching fosters student achievement.

One primary study examined the role of school librarians in fostering 21st-century competencies specifically in K-12 science education.(22) Participating librarians in the Sci-Identity program, a science-based after-school program, offered instruction using various media formats to urban middle-school students.(22) The librarians used cooperative inquiry to co-design sessions with researchers. School librarians were found to facilitate in the inquiry-based process, helping students to make real-world connections to use the processes in and outside of the classroom.(22) Librarians can also act as a bridge between in-school and out-of-school contexts because they know about students' life interests beyond the curriculum (e.g., their interests in books, music, movies and games).

The remaining systematic reviews and primary studies focused on helping educators have the knowledge and skills to foster individual competencies. The results are summarized below and broken down by competency.

Critical thinking and problem solving

We found two systematic reviews and two primary studies specific to professional learning approaches for educators to foster students' critical thinking and problem solving. One older high-quality systematic review focused on thinking skills approaches on teaching (i.e., specifying what is to be taught and how it is to be taught).(23) Examples of thinking-skills approaches were instrumental enrichment, philosophy for children, cognitive acceleration through science education, reciprocal teaching, scaffolding and social constructivism, self-theories, and Somerset thinking-skills.(23) The review found that while thinking-skills approaches may have a positive impact on student achievement, the impact was not always consistent.(23) It was found that short-term results in student attainment were not always possible with thinking-based strategies, and that programs must be carefully selected and used persistently over longer periods of time.(23) The causes of improvement in student learning were found to be complex, and a more general emphasis on making aspects of teaching and learning explicit in classrooms may have similar benefits to those obtained through specific thinking-skills programs.(23) Implications for policymakers identified in the review were the provision of guidelines for the implementation and evaluation of thinking skills in the classroom that could facilitate schools to make informed choices.(23) Access to information was identified as another area for improvement in order to make clearer links between thinking-skills programs and what is currently known about effective teaching and learning, and national policy initiatives.(23) Implications for teachers were that when working on improving specific cognitive strategies, it was found that they can maximize their effectiveness by focusing on certain groups of students and identifying the most appropriate time for the development of particular thinking skills.(23) It was noted that there may be a delay of up to two years in seeing improvement in tests and exam results, making it difficult to distinguish between the impact of the thinking-skills programs and the effect of any subsequent teaching.(23) Lack of methodological and supporting details in the included studies was cited as a main limitation of the systematic review.

A second older medium-quality systematic review identified three key areas for the implementation of thinking-skills programs and approaches:

- 1) changes in pedagogical practice (e.g., teacher questioning, the grouping of students, and changes in planning and assessment);
- 2) the method by which teachers alter their attitudes towards students (e.g., teachers' perception of student ability, the facilitation of greater student responsibility, and autonomy in student learning); and
- 3) the incorporation of thinking-skills programs (e.g., continuing professional development and partnership with researchers as co-inquirers is often necessary to build capacity in teachers to deliver the programming).(24)

Findings from this systematic review also revealed key implementation considerations for both policymakers and teachers. Findings from the systematic review revealed the need for policymakers to pay attention to the implementation models. Models that do not allow for teacher experimentation may reduce their involvement and motivation.(24) Such implementation models may also reduce the effectiveness of the strategies in terms of student impact.(24) Effective implementation models were those in which the teacher was also a learner within the classroom context, helping to develop empathy for the students.(24) Although thinking-skills strategies appear to have the potential to support and encourage teachers to develop pedagogy that enables students to achieve greater understanding, engagement and higher achievement, it is a process that requires close partnerships and sustained involvement of teachers working together within and across schools.(24) As for teachers, the systematic review suggested that teaching thinking skills allowed teachers to gain greater insight into students' learning and improve their ability to assist them in meeting assessment requirements as well as promoting higher-order thinking (i.e., knowledge, comprehension, application, analysis, synthesis and evaluation).(24) Joint planning and peer observation were found to be effective implementation strategies for supporting innovative pedagogy.(24)

One primary study conducted in Newfoundland and Labrador focused on teachers' perceptions of critical and higher-order thinking in social studies and sciences. The study found that K-3 teachers were uncertain that all students were ready to think at a higher level, especially students with low academic ability.(25) Another theme to emerge from the study was that teachers' understanding of higher-order thinking was complex, and they were uncertain about how to teach and assess thinking, as well as how to include it along with curriculum demands.(25)

Another primary study, which was specific to the Ontario context, identified several factors hindering Grade 9 applied mathematics teachers in urban settings.(26) The challenges encountered by teachers fell into five main categories:

- 1) teacher professional development and pedagogical skills;
- 2) students' learning needs;
- 3) students' social and educational background;
- 4) administrative difficulties and resources; and
- 5) curricular issues.(26)

Teachers in all schools surveyed indicated that they were not given enough opportunities to participate in in-service programs (e.g., technology workshops), and they also discussed difficulties associated with maintaining a balance between participating in professional development activities and time management with regards to instructional activities.(26) Teachers also identified the frequently changing curricular requirements as a challenge and reflective of difficulties in achieving consensus in designing appropriate mathematics curricula for students.(26)

Innovation, creativity and entrepreneurship

We found one older medium-quality systematic review on supporting teachers in creative skills development.(27) The evidence suggested that 'creative' teachers tend to adopt a positive stance towards learner engagement, creativity and creative learning.(27) These teachers had a tendency to take a long-term

view of a learner's potential and continue to develop their skill and professional knowledge to facilitate the development of students' creative responses.(27) The systematic review also indicated that in order to develop their creativity, teachers must develop an awareness of learners' needs and involve them in the planning of their own learning.(27) Creativity was associated with a shift towards being 'less prescriptive' in lesson planning (i.e., allowing more room for individual student responses). Barriers to teachers' adoption of creative-teaching practices included the pressures of the 'performativity culture', time, curriculum, assessment, and the level of professional development undertaken.(27) 'Professional learning culture' within or between schools (e.g., opportunities for teachers to take risks in a supportive environment) and the involvement of external partners were found to help teachers facilitate creative learning environments.(27)

Learning to learn/self-awareness and self-direction

We identified one older low-quality review on social and emotional learning, which was associated with significantly improved social and emotional skills, attitudes, behaviour and academic performance.(28) Specifically, the review found that the school environment, teacher practices and expectations, and student-teacher relationships contributed to students' immediate and long-term behaviour change.(28) Teachers and school staff were found to effectively conduct social and emotional learning programs, suggesting that they can be integrated into classrooms without the need of outside supports.(28) The programs were also found to be effective across educational levels (elementary through to high school) and geographic settings (e.g., urban, suburban and rural).(28) The review noted that there is a gap between research and practice and that policymakers, educators and the public can contribute to healthy development of children by supporting the incorporation of evidence-based social and emotional learning programming into standard educational practice.(28) This process would involve multiple steps including: dissemination of information; program adoption that aligns with the local context; appropriate program implementation; program evaluation; and maintenance once intended goals have been reached.(28)

Collaboration

We found one primary study, which was conducted in the United States and addressed professional learning approaches to foster collaboration. The study examined content-based strategies (e.g., work is supported through a range of educational tools such as textbooks, iPad, laptop) and project-based strategies (e.g., independent or group work to explore a particular topic through a range of educational tools such as the internet, hand-held devices, and textbooks) to teaching and learning 21st-century skills.(29) The organizational culture within the school was key to 21st-century learning and creating opportunities for collaboration.(29) The main factors that supported a favourable school culture were:

- school programs facilitated by teachers;
- use of technology-based media (e.g., social media) by parents, teachers and administrators, as a communication and collaboration tool; and
- classroom characteristics (e.g., classroom management strategies that promote meaningful collaboration).(29)

Communication

We found one systematic review and six primary studies addressing professional learning approaches to foster communication. Within communication, all of the included studies focused on ICT and digital skills. One recent low-quality systematic review found that one-to-one laptop environments (i.e., schools where all students are provided with a computer) were associated with increased frequency and breadth of student technology use; increased student-centered, individualized, and project-based learning; increased quantity and genres of writing; and improved teacher-student and home-school relationship.(30) Teachers' beliefs and instructional approaches were important to the effective integration of technology in teaching and learning.(30) Teachers were found to often have initial concerns about the use of laptops for instruction, either due to limited technology skills, lack of sufficient technical support, uncertainty about the ways in

which the technology would affect them, or fear of losing control in the classroom.(30) When technical support and professional development were not sufficiently offered (e.g., teachers not receiving timely or adequate technology support), it was found that teachers' negative perceptions of laptop programs persisted.(30) When sufficient training and support were provided, teachers became more confident about their ability to solve minor technical problems, more efficient in their use of technology over time, and more willing to incorporate it in their classroom.(30) The review also noted the need to include teachers' voices in whether and how to adopt laptop programs, and that lack of teacher engagement was shown to result in low levels of teacher commitment to the program.(30)

The first primary study was conducted in the United States and focused on the association between K-12 teachers' pedagogical principles and technology integration practices, and found that:

- 1) teachers viewed technology integration as a process (e.g., a means of creating and supplementing learning rather than an independent concrete learning tool);
- 2) technology can provide an effective framework for lesson designs;
- 3) while technology use was pervasive in K-12 classrooms, teachers relied on technology to varying degrees for different areas (e.g., some had fully integrated technology into the classrooms, while others used technology only for specific purposes); and
- 4) teachers valued technology education.(31)

The second primary study was conducted in Canada and focused on the effects of teaching using the Emerging Literacy in Mathematics software on achievement and interest among Grade 1 students (e.g., teaching number sense, knowledge of mathematical patterns and relationships, and the beginnings of strategic thinking).(32) This software is an interactive multimedia tool that is research-based and available in both English and French.(32) The literature suggests that ICT may decrease challenges for teachers when trying to teach complex strategies (e.g., designing lessons that involve multiple strategies) by reducing preparation time and the training required for teachers to learn the content and strategies.(32) The pilot study found positive effects for student math abilities and dispositions towards mathematics with the Emerging Literacy in Mathematics software.(32)

The third primary study was conducted in the United States and assessed the integration of ICT by pre-service teachers.(33) The study highlighted strategies and policy directions aimed at improving ICT training for pre-service teachers for integration into classrooms.(33) Study results found that 85% of the pre-service teachers sampled successfully integrated ICT skills and knowledge in instructional practice with their K-12 students.(33) The study also found that 50% of the work samples and reflections by K-12 students showed the use of technology in the areas of creativity and innovation, communication and collaboration, and research and information fluency. However there is little evidence that students used technology to support critical thinking, problem solving, and decision-making.(33)

The fourth primary study was also conducted in the United States and identified several factors that promote professional learning communities and teacher networking, including ICTs (e.g., Facebook, Skype and Twitter) that facilitate the sharing of instructional strategies among teachers.(34) The most preferred networking approaches reported by teachers were: 1) using a professional website where teachers can access information; 2) attending regional meetings/conferences; and 3) attending regional professional development workshops.(34) Social networking was rated as a low-to-moderate preference among teachers.(34)

Finally, the fifth primary study examined 18 national education systems, of which Canada was not included. The study assessed if ICT support for 21st-century teaching is associated with an increased use of ICT in the classroom.(35) The study found that only three of the included education systems in the analysis (South Africa, Russia and Thailand) had significant associations between school-based support for ICT use in 21st-century teaching skills and an increased use of ICT in the classroom.(35)

Global citizenship and sustainability

We identified one systematic review and one primary study addressing professional learning approaches to foster global citizenship. The older high-quality systematic review found that the quality of dialogue between student and teacher was key to learning in citizenship education (e.g., encouraging students to express their views and create meaning from their life experiences as contextual knowledge and problem-based thinking). Discourse around shared values, human rights, and issues of justice was key.(36) Three broad approaches used by educators for citizenship were identified:

- transmission approach, which is an instructional style with inflexible program design that is focused on the knowledge content of citizenship education;
- process approach, which is a flexible style that uses a mix of methodologies that is focused on the school context; and
- transformational professional approach, which is flexible, community-context specific and focused on the re-professionalization of teachers as facilitators of learning (i.e., the teacher's role is that of an agent of social change).(36)

A whole-school strategy (e.g., citizenship education through school ethos, teaching policies, professional learning, external relation, leadership, and curriculum) was found to be a key part to facilitate or trigger leadership for citizenship education.(36) Teachers were found to require support to develop appropriate professional skills to engage in discourse and dialogue to facilitate citizenship education. In order to provide citizenship education teachers must develop a set of values consistent with a vision for citizenship education, a body of knowledge relevant for being an educator in contemporary society, and professional skills around a pedagogy for citizenship education.(36)

The primary study conducted in the United States identified the main elements displayed by educators with global citizenship skills: dispositions (multiple perspectives and commitment to equity); knowledge (understanding of current global events, interconnectedness and experiential understanding of multiple cultures); and skills (speaking multiple languages, classroom environment that values diversity and global engagement to facilitate global conversations).(37) Three signature pedagogies characterized globally competent teaching practices for integration into K-12 education:

- 1) intentional integration of global topics and multiple perspectives into and across the standard curriculum;
- 2) ongoing authentic engagement with global issues; and
- 3) connecting teachers' global experiences, students' global experiences, and the curriculum.(37)

These signature pedagogies provide frameworks for concrete practices teachers can adapt to infuse global citizenship education into their own contexts. These pedagogies can also guide policies that school districts and teacher education programs can consider in preparing and supporting teachers in this work.(37)

A summary of the key findings from the research evidence identified in this rapid synthesis is provided in Table 2. For those who want to know more about the systematic reviews and primary studies contained in the table (or obtain citations for the reviews), a fuller description of the synthesized evidence is provided in Appendix 1 and 2.

Table 2. Summary of key findings from systematic reviews and primary studies relevant to professional learning approaches to foster students' global competencies

Global competency	Key findings
Critical thinking and problem solving	<ul style="list-style-type: none"> • Benefits <ul style="list-style-type: none"> ○ One older high-quality systematic review examined the impact of thinking-skills approaches on teaching (i.e., specifying what is to be taught and how it is to be taught) and found that although thinking-skills programs and approaches had a positive impact on student achievement, the impact is not always consistent.(23) <ul style="list-style-type: none"> ▪ The same review found that strategies must be carefully selected, applied over a longer period of time, and a more general emphasis on making aspects of teaching and learning explicit in classrooms may have similar benefits to those obtained through a particular program.(23) ▪ The causes of improvement in student learning were found to be complex, and a more general emphasis on making aspects of teaching and learning explicit in classrooms may have similar benefits to those obtained through specific thinking-skills programs.(23) ○ One older medium-quality systematic review identified three key areas for the implementation of thinking-skills programs and approaches: 1) changes in pedagogical practice; 2) the method by which teachers alter their attitudes towards students; and 3) the incorporation of thinking-skills programs.(24) • Harms <ul style="list-style-type: none"> ○ One older medium-quality systematic review suggests that delivery models of implementation that do not allow for teacher experimentation, reduced the professional involvement and motivation of teachers, as well as the effectiveness of the strategies in terms of student impact.(24) • Stakeholders' views and experiences <ul style="list-style-type: none"> ○ One older high-quality systematic review suggests that policymakers could be involved in the provision of guidelines for the implementation and evaluation of thinking skills in the classroom, which would facilitate schools to make informed choices.(23) <ul style="list-style-type: none"> ▪ Similarly, access to information could also be improved in order to make clearer links between thinking skills programs and what is currently known about effective teaching and learning, and national policy initiatives.(23) ○ One primary study on teachers' perceptions of critical and higher-order thinking in social studies and science found uncertainty among K-3 teachers that all students are ready to think at a higher level, especially students with low academic ability.(25) <ul style="list-style-type: none"> ▪ The same study found that teachers had concerns that if higher-order questions were put on assessments and students could not answer them, they then would be responsible for re-teaching the material.(25) ○ One primary study identified several factors hindering Grade 9 applied mathematics teachers in urban mathematics educational settings, which included teacher professional development and pedagogical skills, students' learning needs, students' social and educational background, administrative difficulties and resources, and curricular issues.(26)
Innovation, creativity and entrepreneurship	<ul style="list-style-type: none"> • Benefits <ul style="list-style-type: none"> ○ One older medium-quality systematic review on supporting teachers in creative skills development suggested that 'creative' teachers tend to adopt a positive stance towards learner engagement, creativity and creative learning.(27) <ul style="list-style-type: none"> ▪ The review found that 'creative' teachers had a tendency to take a long-term view of a learner's potential and continue to develop their skills and professional knowledge to facilitate the development of students' creative responses.(27) ▪ The review also identified factors that inhibit teachers' adoption of creative pedagogies, which includes the pressures of the 'performativity culture', time, curriculum, assessment, and the level of professional development undertaken.(27) • Stakeholders' views and experiences <ul style="list-style-type: none"> ○ One older medium-quality systematic review identified 'professional learning culture' within or between schools (e.g., opportunities for teachers to take risks in a supportive environment) and the involvement of external partners to help teachers facilitate creative learning environments.(27)

<p>Learning to learn/self-awareness and self-direction</p>	<ul style="list-style-type: none"> ● Benefits <ul style="list-style-type: none"> ○ One older low-quality systematic review found that social and emotional learning has been associated with significantly improved social and emotional skills, attitudes, behaviours and academic performance.(28) <ul style="list-style-type: none"> ▪ Specifically, the review found that the school environment, teacher practices and expectations, and student-teacher relationships were found to contribute to students’ immediate and long-term behaviour change.(28) ▪ Teachers and school staff were found to effectively conduct social and emotional learning programs, suggesting that they can be integrated into classrooms without the need of outside supports.(28)
<p>Collaboration</p>	<ul style="list-style-type: none"> ● Benefits <ul style="list-style-type: none"> ○ A primary study on content-based learning (e.g., work is supported through a range of educational tools such as textbooks, iPad, laptop) and project-based learning (e.g., independent or group work to explore a particular topic through a range of educational tools such as the internet, hand-held devices, and textbooks) found that: <ul style="list-style-type: none"> ▪ content-based learning fostered open communication between students and between students and teachers, and classroom management strategies and teacher-posed questions promoted problem solving and critical thinking through classroom discussions; and ▪ in project-based learning environments the teachers function as facilitators by guiding students rather than leading them.(29)
<p>Communication</p>	<ul style="list-style-type: none"> ● Benefits <ul style="list-style-type: none"> ○ One recent low-quality systematic review found that one-to-one laptop environments were associated with increased frequency and breadth of student technology use, increased student-centred, individualized, and project-based learning, increased quantity and genres of writing, and improved teacher-student and home-school relationship.(30) <ul style="list-style-type: none"> ▪ The same review found that teachers’ beliefs and instructional approaches were key to the effective integration of technology in teaching and learning.(30) ▪ The review also found that by providing teachers with technical support and professional development, teachers became more confident about their ability to solve minor technical problems, more efficient in their use of technology over time, and more willing to incorporate it in their classroom.(30) ○ A primary study on K-12 teachers’ pedagogical principles and technology integration practices found that: 1) teachers viewed technology integration as a process; 2) technology can provide an effective framework for lesson designs (e.g., design-based learning); 3) while technology use is pervasive in K-12 classrooms, teachers relied on technology in varying degrees for different areas; and 4) teachers valued technology education in a changing world.(31) ○ A primary study on the effects of teaching using the Emerging Literacy in Mathematics software on achievement and interest among Grade 1 students found positive effects for student math abilities and dispositions towards mathematics, suggesting that ICT may decrease challenges for teachers when trying to teach complex strategies.(32) ○ A primary study assessed the integration of ICT by pre-service teachers and found that 85% successfully integrated technology skills and knowledge in instructional practice with their K-12 students.(33) <ul style="list-style-type: none"> ▪ The same study also found that 50% of the work samples and reflections by K-12 students showed the use of technology in the areas of creativity and innovation, communication and collaboration, and research and information fluency, however there is little evidence that students used technology to support critical thinking, problem solving, and decision-making.(33) ○ A primary study identified the three most preferred networking approaches for teachers to promote professional learning communities: 1) using a professional website where teachers can access information; 2) attending regional meetings/conferences; and 3) attending regional professional development workshops.(34) <ul style="list-style-type: none"> ▪ The study found that social networking was rated as a low-to-moderate preference among teachers.(34) ○ A primary study found that only three of the 18 national education systems included in the analysis (South Africa, Russia and Thailand) had significant associations between school-based support for ICT use in 21st-century teaching skills and an increased use of ICT in the classroom.(35)

<p>Global citizenship and sustainability</p>	<ul style="list-style-type: none"> ● Benefits <ul style="list-style-type: none"> ○ One older high-quality systematic review found that the quality of dialogue between the student and teacher was key to learning in citizenship education, and identified discourse around shared values, human rights, and issues of justice as key.(36) <ul style="list-style-type: none"> ▪ The same review found that in order to provide citizenship education teachers must develop a set of values consistent with a vision for citizenship education, a body of knowledge relevant for being an educator in contemporary society, and professional skills around a pedagogy for citizenship education.(36) ○ A primary study found three signature pedagogies that characterized globally competent teaching practices across participants: 1) intentional integration of global topics and multiple perspectives into and across the standard curriculum; 2) ongoing authentic engagement with global issues; and 3) connecting teachers’ global experiences, students’ global experiences, and the curriculum.(37) ● Stakeholders’ views and experiences <ul style="list-style-type: none"> ○ One older high-quality systematic review found that a whole-school strategy (e.g., citizenship education through school ethos, teaching policies, professional learning, external relation, leadership, and curriculum) was key to facilitating or triggering leadership for citizenship education.(36)
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Professional learning approaches and supports to help ensure educators have the knowledge and skills to assess, evaluate and report on students’ development of global competencies

Professional learning approaches and supports to help educators assess students’ development of global competencies

We did not identify any systematic reviews and primary studies on enabling educators to assess students’ development of global competencies. There are only a small number of countries that have assessment policies or guidelines for global competencies.(1) We found an older organizational report by the OECD which surveyed how member countries teach and assess 21st-century skills. The report found that while most OECD countries include 21st-century skills in their education systems (e.g., through regulation, guidelines and recommendations), there is a general lack of formative or summative assessment policies for 21st-century skills, which is most likely due to the lack of conceptual clarity and jurisdictional differences in how global competencies are addressed.(1)

Professional learning approaches and supports to help educators evaluate students’ development of global competencies

We identified one primary study conducted in the United States related to professional approaches to help educators evaluate students’ development of global competencies. The study focused on the Human Behavior Rate Scale, a 91-item academic and behavioural rating scale, which is a tool used to help teachers to identify K-12 students who are at risk for behavioural and academic challenges.(38) The aim of the study was to create a concise version of the tool (30 items) to measure 21st-century skills in K-12 students (Human Behavior Rating Scale – Brief).(38) The 21st-century skills included in the tool were persistence, curiosity, externalizing affect, internalizing affect, and cognition.(38) The Human Behavior Rate Scale – Brief collected teachers’ perceptions of 21st-century skills in their students and compared it to data collected four months later on their K-9 students’ achievements, which included standardized test results.(38) Teacher ratings of 21st-century skills in their students were found to be predictive of students’ test scores in the areas of reading and mathematics skills.(38) The findings suggest that the Human Behavior Rate Scale – Brief is a concise tool that teachers can use to evaluate and measure students’ development of 21st-century skills.

Professional learning approaches and supports to help educators report on students’ development of global competencies to foster global competencies

We did not identify any systematic reviews or primary studies on enabling educators to report on students’ development of global competencies. This may be a reflection of the recency of education system reforms aimed at global competencies, and many initiatives would likely be in the implementation phase and not in the formal evaluation and systematically reporting phase.

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APPENDICES

The following tables provide detailed information about the systematic reviews and primary studies identified in the rapid synthesis. The ensuing information was extracted from the following sources:

- systematic reviews - the focus of the review, key findings, last year the literature was searched and the proportion of studies conducted in Canada; and
- primary studies - the focus of the study, methods used, study sample, jurisdiction studied, key features of the intervention and the study findings (based on the outcomes reported in the study).

For the appendix table providing details about the systematic reviews, the fourth column presents a rating of the overall quality of each review. The quality of each review has been assessed using AMSTAR (A MeaSurement Tool to Assess Reviews), which rates overall quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. It is important to note that the AMSTAR tool was developed to assess reviews focused on clinical interventions, so not all criteria apply to systematic reviews pertaining to delivery, financial or governance arrangements within health systems. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, a review that scores 8/8 is generally of comparable quality to a review scoring 11/11; both ratings are considered “high scores.” A high score signals that readers of the review can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the review should be discarded, merely that less confidence can be placed in its findings and that the review needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1):S8).

All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

Appendix 1: Summary of findings from systematic reviews about professional learning approaches and supports to help ensure educators have the knowledge and skills to foster students’ development of global competencies

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
What professional learning approaches and supports help ensure educators have the knowledge and skills to foster, assess, evaluate and report on students’ development of global competencies?	Examining effective professional development strategies that help teachers learn and define pedagogies needed to teach 21st-century skills (20)	<p>This paper identified 35 studies that demonstrated a positive link between teacher professional development, teaching practices, and student outcomes.</p> <p>Effective professional development is defined as structured professional learning that improves teacher practices, and consequently student learning outcomes. The paper found seven widely shared features of effective professional development. First, effective professional development is content focused, in which teaching strategies are associated with specific curriculum content. Second, effective professional development emphasizes active learning, through activities like designing and trying out new teaching strategies. Third and fourth, collaboration, and feedback and reflection are encouraged. Fifth, models and examples, like lesson plans, sample student work, and video cases of teaching, are used to increase understanding of what best practices look like. Sixth, effective professional development often also provides coaching and support from experts who can share expertise about evidence-based practices. Last, effective professional development should run for an adequately long amount of time for teachers to learn, practise, implement and reflect upon newly gained knowledge.</p> <p>Barriers to effective professional development include inadequate resources, failures to align policies or respond to the specific needs of educators and learners, and dysfunctional school cultures.</p> <p>The paper made several policy and practice recommendations. These include: adopting standards for professional development; restructuring school schedules to allow for increased opportunities for professional learning and collaboration; regularly conducting assessments in order to align learning with needs and wants; identifying and involving expert teachers as mentors and coaches; integrating professional learning into existing school improvement initiatives; investing in technology-facilitated opportunities for professional learning; and providing flexible funding and opportunities for sustained engagement.</p>	n/a	No rating tool available for this type of document	n/a
	Evaluating the importance of digital skills in the 21st-century workforce (19)	<p>The review included 75 studies exploring the importance of digital skills in the modern workforce.</p> <p>Specifically, the authors examined the relation between 21st-century skills and digital skills and provided a framework of 21st-century digital skills aimed at the knowledge worker.</p> <p>Although digital competency was found to be a dominant component of 21st-century skills, the authors identified seven additional skills that are integral for success: creativity, technical management skills, information management skills, communication skills, collaboration skills, critical thinking skills, and problem-solving skills. In addition, it was found that, in contrast to digital skills, 21st-century skills are not necessarily underpinned by information and</p>	2016	4/9 (AMSTAR rating from the McMaster Health Forum)	Not reported in detail

Forum+

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>communication technologies. To support the seven core skills, five additional contextual skills were identified: ethical awareness, cultural awareness, flexibility, self-direction, and lifelong learning.</p> <p>As both 21st-century skills and digital skills are seen as crucial, the combination is not sufficiently defined in literature. To address this gap, the authors created a framework listing the skills conceptualizations and operational components of each article included in the study. For each skill, a conceptual definition and its key operational components were identified.</p> <p>A key limitation of this study is its scope focused on peer-reviewed articles within the past 16 years. As a result, relevant articles published before the year 2000 and relevant books or conference papers may have been excluded.</p>			
	<p>Assessing the impact of citizenship education on the provision of schooling (36)</p>	<p>This review included 14 studies examining the manner in which citizenship education is implemented in schools.</p> <p>Studies included in the review were analyzed based on six themes: learning and teaching; curriculum construction and development; school ethos and context; leadership and management; external relations and community; and teacher learning, knowledge and practice.</p> <p>Overall, the review found that the quality of dialogue and discourse relating to shared values, human rights, and issues of justice is central to learning in citizenship education. In addition, transformative, dialogical, and participatory pedagogies, based upon inclusive and respectful teacher-student and student-student relationships, were found to complement and sustain achievement. In a successful citizenship education program, it was found that students are encouraged to voice their views and make meaning from their life experiences, as contextual knowledge and problem-based thinking have been associated with increased citizenship engagement and action. Additionally, it was found that engagement of students in citizenship education requires educational experiences that are challenging, attainable and relevant to students' lives and narratives. The review reports that opportunities should be made for students to engage with values issues in all curriculum subjects and experiences. A coherent, whole-school strategy, including a community-owned values framework, was found to be a key part of leadership for citizenship education. It was noted that participative and democratic processes in school leadership require particular attitudes and skills on the part of teachers and students, and although listening to the voice of the student can lead to positive relationships, it may require teachers to let go of traditional parameters of control. Teachers have been found to require support to develop appropriate professional skills to engage in discourse and dialogue to facilitate citizenship education.</p> <p>The implications of this review were found to be significant for teacher education and professional learning. In order for teachers to acquire the capacity to provide citizenship education, the review postulates that they must develop a set of values consistent with a vision for</p>	2004	8/9 AMSTAR rating from the McMaster Health Forum)	0/14

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>citizenship education, a body of knowledge relevant for being an educator in contemporary society, and finally, professional skills around a pedagogy for citizenship education. Additionally, it was found that genuine participation in the learning process by teachers and students requires school-based decision-making that will likely differ at each institution based on local contexts, so any policy developed should encourage diversity rather than uniformity. Finally, the authors noted that citizenship education requires teachers to use and trust their own professional judgment, as they are working within a culture of professional responsibility rather than only a culture of technical accountability.</p> <p>In terms of practice, it was found that citizenship education should be an intrinsic part of whole-school development planning, and should be an integral part of the core task of schooling. For teachers, citizenship education was also found to require a greater focus on higher order critical and creative thinking skills, and the processes of learning itself, especially pertaining to the quality of relationships and dialogue. Lastly, it was found that, in order for quality citizenship education to be delivered, the structures of the curriculum, together with its assessment requirements, should support and enhance a learner-centred approach which honours student voices, develops positive interpersonal relationships, stimulates higher order thinking, and caters to individual differences.</p> <p>The authors note a limitation of this review being the fact that two of the authors of the review were also authors of two studies. This was addressed by the research team through a paired review and extraction process.</p>			
	<p>Evaluating the impact of thinking skills on effective teaching and learning (23)</p>	<p>This review included 23 studies exploring the impact of thinking skills on teaching and learning.</p> <p>The results of the review indicated that, while thinking-skills programs and approaches may have a positive impact on student achievement, this impact is not always consistent. In addition, it was found that short-term results are not always possible with thinking-based strategies. As such, strategies must be carefully selected and used persistently over a longer period of time. Finally, the causes of improvement in student learning were found to be complex, and a more general emphasis on making aspects of teaching and learning explicit in classrooms may have similar benefits to those obtained through a particular program.</p> <p>For policy-makers, the provision of guidelines for the implementation and evaluation of thinking skills in the classroom could enable schools to make more informed choices. Access to information could also be improved in order to make clearer links between thinking-skills programs and what is currently known about effective teaching and learning, and national policy initiatives. Research could be commissioned to establish which thinking-skills strategies are the most effective, efficient and cost-effective.</p> <p>When introducing strategies that focus on improving specific cognitive strategies, it was found that teachers can maximize their effectiveness by targeting certain groups of students and</p>	<p>2003</p>	<p>8/9 AMSTAR rating from the McMaster Health Forum)</p>	<p>0/23</p>

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Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>identifying the most appropriate time for the development of their particular thinking skills. Strategies aimed at developing a classroom ethos conducive to making learning more explicit and fostering dialogue about teaching and learning, on the other hand, can be promoted at any time. Positive outcomes on student motivation and self-esteem have been found before any tangible impact on attainment measured by standard assessments was observed. There may be a delay of as much as two years in the appearance of improved attainment in tests and exams, and consequently it may be difficult to distinguish between the impact of the intervention and the effect of any subsequent teaching.</p> <p>Lack of methodological and supporting details in the included studies presented as one of the main limitations of this study.</p>			
	<p>Implementing thinking-skills programs and approaches among teachers (24)</p>	<p>This review included 13 studies examining the body of evidence informing practice and supporting the effective implementation of thinking-skills programs and approaches.</p> <p>Three key ideas were deemed significant to the implementation of thinking-skills programs and approaches. First of all, changes in pedagogical practice, including teacher questioning, the grouping of students, and changes in planning and assessment, were highlighted as important areas of focus. Additionally, the method by which teachers alter their attitudes towards students was found to be critical during the implementation of thinking-skills programs, specifically pertaining to the teacher's perception of student ability, the facilitation of greater student responsibility, and autonomy in student learning. Finally, the incorporation of thinking-skills programs holds implications for professional development, as continuing professional development and partnership with researchers as co-inquirers is often necessary to build capacity in teachers to deliver this programming.</p> <p>For policymakers, the evidence from this review suggests that "technicist" delivery models of implementation will not only reduce the professional involvement and motivation of teachers, but may also reduce the effectiveness of the strategies in terms of student impact. Although thinking-skills strategies appear to have the potential to support and encourage teachers to develop pedagogy that enables students to achieve greater understanding, engagement and higher achievement, it is a process that requires close partnerships and sustained involvement of teachers working together within and across schools, and this has resource implications. Teaching thinking has been shown to allow teachers to gain greater insight into students' learning and improve their ability to assist them in meeting the requirements for assessment for learning, as well as promoting higher-order thinking. For teachers, joint planning and peer observation were found to be effective means of supporting innovative pedagogy. Tools designed to assist the research/evaluation process in an intervention can also be useful in improving the range and quality of feedback to students.</p>	<p>2002</p>	<p>6/9 AMSTAR rating from the McMaster Health Forum)</p>	<p>0/13</p>

Supporting Professional Learning Approaches to Foster Global Competencies in K-12 Education

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
	Understanding creative learning environments in education (27)	<p>Key limitations of this review include the fact that only English-language studies were included in the review, and the fact that the last search was conducted in 2002. Additionally, the authors cite the poor quality of reporting in the included studies, especially of qualitative data.</p> <p>This review included 58 studies examining the current literature relating to creative learning environments in education.</p> <p>The results of the review indicated that there are nine important factors which support creative skills development in children and young people: flexible use of space and time; availability of appropriate materials; working outside the classroom/school; ‘playful’ or ‘games-based’ approaches with a degree of learner autonomy; respectful relationships between teachers and learners; opportunities for peer collaboration; partnerships with outside agencies; awareness of learners’ needs; and non-prescriptive planning. The review also found evidence supporting the impact of creative environments on student attainment and the development of teacher professionalism. Regularly practiced dialogue was found to support and sustain a culture and community that thinks together, while the most favourable platform for creativity seems to be interpersonal exchange, with negotiation of conflict and comparison of ideas and actions being the decisive elements.</p> <p>One section of the review particularly focused on the specific roles of teachers which promote creative skills development in students. There was a reasonable amount of evidence from five studies suggesting that “creative” teachers tend to adopt a positive stance towards learner engagement, creativity and creative learning. It was found that they have a tendency to take a long-term view of a learner’s potential, and continue to develop their skills and professional knowledge to facilitate the development of students’ creative responses. Studies also indicated that, in order to develop their creativity, teachers must develop an awareness of learners’ needs and involve them in the planning of their own learning. The review also suggests that creativity is associated with a shift towards being ‘less prescriptive’ in lesson planning (i.e., allowing more room for individual student responses). Finally, it was revealed that factors which tend to inhibit teachers’ adoption of creative pedagogies include the pressures of the ‘performativity culture’, time, curriculum, assessment, and the level of professional development undertaken.</p> <p>Numerous methods were found to support the development of skills and confidence in teachers to facilitate creative learning environments. The review found that the presence of a ‘professional learning culture’ within or between schools – which provides opportunities for teachers to take risks in a supportive environment – greatly enhances effective sharing. It is also suggested that teachers hold a range of preconceptions about creativity and pedagogy which need to be unpacked as part of the professional learning process. Finally, involvement of external partners was found to be important in facilitating the productive dialogue, co-construction of knowledge, and reflection on practice needed to help teachers construct creative learning environments.</p>	2011	4/9 AMSTAR rating from the McMaster Health Forum)	Not reported in detail

Forum+

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
	Assessing the impact of enhancing students' social and emotional learning (28)	<p>This review included 213 studies exploring the impact of enhancing students' social and emotional learning.</p> <p>Social and emotional learning (SEL) has been associated with significantly improved social and emotional skills, attitudes, behaviour, and academic performance. In addition to person-centred explanations of behaviour change, the review noted that interpersonal, instructional, and environmental supports can produce better school performance through the following means: peer and adult norms that convey high expectations and support for academic success; caring teacher-student relationships that foster commitment and bonding to school; engaging teaching approaches such as proactive classroom management and cooperative learning; and safe and orderly environments that encourage and reinforce positive classroom behaviour. Overall, some combination of improvements in student social-emotional competence, the school environment, teacher practices and expectations, and student-teacher relationships, was found to contribute to students' immediate and long-term behaviour change.</p> <p>The review also notes that policymakers, educators and the public can contribute to healthy development of children by supporting the incorporation of evidence-based SEL programming into standard educational practice at the federal, provincial and local levels. With adequate funding, capacity can be built through the provision of policy supports, professional development, and technical assistance to promote educator knowledge and motivation for the best ways to identify, select, plan, implement, evaluate, and sustain effective SEL strategies. Effective leadership and planning have also been found to promote quality program implementation by ensuring adequate financial, personnel and administrative support, as well as providing professional development and technical assistance. Along with this planning and programming, there is also a need to establish assessment and accountability systems for SEL programs in relation to student outcomes.</p> <p>Some limitations presented in this review include the small amount and poor quality of outcome measures included within the included studies. More rigorous research on the presumed mediational role of SEL skill development is warranted.</p>	2007	3/9 AMSTAR rating from the McMaster Health Forum)	Not reported in detail
	Evaluating the impact of learning in one-to-one laptop environments (30)	<p>This review included 65 studies and 31 doctoral dissertations examining the effect of one-to-one laptop environments on student learning outcomes.</p> <p>The results reported on the impact of one-to-one laptop environments on students' academic achievement, its impact on teaching and learning processes, perceptions associated with the practice, and outcomes of their implementation. It was found that one-to-one laptop environments are associated with increased frequency and breadth of student technology use, increased student-centred, individualized, and project-based learning, increased quantity and genres of writing, and improved teacher-student and home-school relationships.</p>	2015	3/9 AMSTAR rating from the McMaster Health Forum)	Not reported in detail

Supporting Professional Learning Approaches to Foster Global Competencies in K-12 Education

Question addressed	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>It was found that teachers' beliefs and instructional approaches are crucial to the effective integration of technology in teaching and learning. A number of studies suggested that teachers often have initial concerns about the use of laptops for instruction, either due to limited technology skills, lack of sufficient technical support, uncertainty about the ways in which the technology would affect them, or fear of losing control in the classroom. When technical support and professional development were not sufficiently offered, it was found that teachers' negative perceptions of laptop programs persisted. However, when sufficient training and support were provided, teachers became more confident about their ability to solve minor technical problems, more efficient in their use of technology over time, and more willing to incorporate it in their classroom. Finally, a number of studies noted the importance of including teachers' voices in whether and how to adopt laptop programs. Lack of this engagement was shown to result in low levels of teacher commitment to the one-to-one laptop program, thereby harming program implementation.</p>			
	<p>Assessing pedagogies for effective teaching of 21st-century skills (21)</p>	<p>This paper includes a review of literature to clarify the meaning of effective teaching and its importance in pedagogy, and to identify 21st-century skills and the new learning paradigm that will foster these skills in learners. Additionally, this paper highlights the different domains of this new learning paradigm. The authors then provide a comprehensive discussion of the Learning and Innovations domain to outline the 21st-century skills addressed by this domain.</p> <p>The literature reviewed in this paper indicates that there are a multitude of ways of teaching effectively, and that an effective teacher employs a plethora of skills, methodologies and teaching tools to complete their work. Reviewed literature strongly suggests that teaching effectiveness promotes student achievement, thereby supporting its importance in pedagogy.</p> <p>The Partnership for 21st Century Skills (P21) characterized the new learning paradigm as a means by which students can achieve success in the modern-day world. Under this new paradigm, the <i>Framework for 21st Century Learning</i> was designed, which identifies skills necessary for student success in the digital economy (e.g., traditional core skills, learning and innovation skills, career and life skills, and digital literacy skills).</p> <p>Four skills comprise the Learning and Innovations Skills domain: critical thinking and problem solving, communication, collaboration and creativity (the 4Cs). Such skills will better prepare learners for this new global society, and should be prescribed as a learning outcome for students.</p> <p>The authors suggest that educators should provide effective training in the 4Cs to ensure that their students are able to apply them in their future careers. As such, the 4Cs, much like the basic academic skills of reading, writing and arithmetic, should be addressed in learning objectives and student assessments.</p>	<p>2014</p>	<p>1/9 AMSTAR rating from the McMaster Health Forum)</p>	<p>Not reported</p>

Appendix 2: Summary of findings from primary studies about professional learning approaches and supports to help ensure educators have the knowledge and skills to foster students’ development of global competencies

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
<p>What are the effects of strategies to ensure education professionals have the knowledge and skills required to support the development of global competencies within the classroom, school and school system?</p>	<p>Developing an innovation configuration map for 21st-century skills (29)</p>	<p><i>Publication date:</i> 2014 <i>Jurisdiction studied:</i> United States <i>Methods used:</i> Mixed-methods; literature review and Innovation Configuration Map (IC Map) synthesizing observation- and interview-based findings</p>	<p>A total of 10 teachers representing 1st grade, 2nd grade, 3rd grade, 5th grade, 7th grade, and 8th grade at a K8 California Distinguished School and Apple Education Distinguished school participated.</p>	<p>An Innovation Configuration Map (IC Map) was used to synthesize findings from classroom observations and focused interviews. The IC Map also served to elucidate the various components of a 21st-century teaching and learning environment that fosters the development of 21st century skills in students.</p>	<p>A literature review was conducted to identify 21st-century skills that are essential to prepare students for the future. Findings from the literature support the framework of the Partnership for 21st century skills (P21), whereby creativity and innovation, critical thinking and problem solving, and communication and collaboration are highlighted as skills necessary to prepare students for future success.</p> <p>The literature review helped inform the development of an IC Map, which provided synthesized observation- and interview-based descriptions of 21st-century skill development strategies/configurations in the context of a K-8 school in southern California. Two configurations were identified in the IC Map constructed in the primary study: content-based learning and project-based learning.</p> <p>In content-based learning, student work is supported through various means, including through the use of educational tools (e.g., textbooks, iPod/iPad, laptop). Students complete workbook activities and supplementary learning activities individually, and collaborate during centre time with peers. Students work together in these contexts to earn various classroom management rewards. Group projects designed by the teacher also promote peer collaboration. In this configuration, open communication exists about content between students and between students and teachers. Classroom management strategies and teacher-posed questions promote problem solving and critical thinking, with incorrect student answers and/or interpretations serving as class discussion prompts.</p> <p>In project-based learning, students work either independently or in groups to explore a particular topic. The internet, the learning management system, hand-held devices, textbooks, and literature serve as valid resources. This configuration is highly collaborative in nature, and students can convey their work in creative ways such as using multimedia and authoring tools (e.g., iMovie, keynote presentations, and iPad apps). In a project-based learning environment, teachers function as facilitators, merely guiding students rather than leading them.</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	Evaluating teachers' use of technology in the classroom (31)	<p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Mixed methods qualitative research design using an online survey and follow-up interviews</p>	K-12 classroom teachers were selected based on their full-time employment in a public, private, or religious school in a Midwestern state in the U.S. A total of 1,048 teachers from over 100 school corporations participated in the survey, and 111 teachers participated in a follow-up in-person or online interview.	An online survey featuring questions about classroom technology tools and professional development activities involving technology was administered. Follow-up interviews were conducted with 10% of the survey participants to assess the relationship between teachers' classroom use of technology and their pedagogical techniques.	<p>The two configurations presented in the IC map offer different ways in which 21st-century skill development can be promoted in students. The authors acknowledge that further research is needed to develop an assessment that can be used by administrators and educators to identify strengths and weaknesses in 21st-century skill-development methodologies.</p> <p>In this qualitative study, online survey questions and follow-up interviews were conducted with K-12 teachers to explore the association between teachers' pedagogical techniques and technology integration practices. A thematic analysis was undertaken to systematically describe the study's findings. Four themes were identified:</p> <ol style="list-style-type: none"> 1) defining technology integration as a process; 2) design as a tool of technology; 3) use of technology in the primary, middle, and secondary classroom is seen as pervasive; and 4) value of technology integration in the classroom is constantly changing. <p>Theme one highlights teachers' views that technology integration is a process, that is, a means of creating and supplementing learning rather than an independent, concrete learning tool. While many teachers noted that the use of technology in classrooms facilitates learning and promotes student engagement, it must be used efficiently, and only in appropriate contexts in order to meet instructional goals and create learning.</p> <p>Theme two indicates that participants used aspects of design-based learning understandings of technology to help students comprehend complex lessons. This theme supports the notion that technology can provide an effective framework for lesson designs.</p> <p>Theme three highlights the common thread among all the teacher participants' responses: technology use was pervasive in K-12 classroom settings. However, teachers relied on technology in varying degrees for different areas, with some citing full integration into their classrooms, and others who use technology only for specific purposes.</p> <p>Theme four elucidates the idea that teacher participants value technology in education in a changing world. This theme highlights the shift from the physical nature of technology to its role in the mental processes that take place in the classroom.</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	Assessing critical and higher-order thinking (25)	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> Canada</p> <p><i>Methods used:</i> Semi-structured interviews and structured focus group interviews with teachers</p>	Purposeful sampling was used to select 38 teachers in Kindergarten to Grade 9 classrooms from 14 schools in Newfoundland and Labrador, Canada. All teachers had considerable experience in teaching science and/or social studies, with 31/38 teachers having more than 10 years of teaching experience.	Teachers were interviewed to explore their beliefs and classroom practices in teaching and assessing thinking. Particularly, the central focus of the interviews was on teacher perceptions of critical and higher-order thinking, how critical and higher-order thinking was integrated into their social studies and science instruction, and how critical and higher-order thinking was evaluated in students.	<p>Methodological limitations such as low generalizability and the lack of direct observation warrant larger observational studies to explore teacher experiences with technology integration.</p> <p>In this primary study, teachers' interviews were analyzed to highlight their perceptions of critical and higher-order thinking in social studies and science, and how this impacts classroom instruction and student assessment. Five themes emerged from the semi-structured interviews and structured focus group interviews:</p> <ol style="list-style-type: none"> 1) teachers think it is important to consciously teach thinking; 2) teachers are uncertain if all students can learn to think at a higher level; 3) teachers adjust the cognitive levels and processes for paper and pencil classroom assessments based on students' everyday work; 4) teachers' understandings about higher-order thinking are complex, and they are uncertain about how to teach and assess thinking, and how to include it along with content demands; and 5) teachers do not see definite differences in thinking between girls and boys. <p>Theme one was constructed on the basis that all teachers agreed that teaching thinking in conjunction with subject content supports student development in such a way that they become independent thinking citizens.</p> <p>Theme two emerged from some K-3 teachers' uncertainty that all students are ready to think at a higher level, especially students with low academic ability.</p> <p>Theme three highlights teachers' concern that if higher-order questions were put on assessments and students could not answer them, they then would be responsible for re-teaching the material. Due to time constraints, lower-order questions tended to dominate assessments, whereas instructional, in-class activities provided more opportunities for higher-order thinking.</p> <p>Theme four emerged from teachers' ambivalence about what critical thinking means and how to teach and assess it.</p> <p>Theme five presents a common opinion among teachers that there are no definitive gender-based differences in thinking. Rather, such differences are a result of the individual student, and their relative preferences for certain subjects.</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	Describing the challenges teachers experience in teaching Grade 9 applied math (26)	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> Ontario, Canada</p> <p><i>Methods used:</i> Mixed-methods qualitative study; literature review and data collection from teachers' reflections, document analysis, interviews, and discussions about their experiences in the six in-service workshops</p>	Over 40 mathematics teachers from 11 schools belonging to four school boards in the Greater Toronto Area participated in this study. Selected teachers had a wide range of pedagogical experience, and belonged to different ethnic backgrounds. The main criterion for teacher selection was their current involvement in teaching Grade 9 applied mathematics.	Implementation teams consisting of at least three mathematics teachers, the department head, and an administrator were created in each school. Two university researchers and four graduate students visited each school to conduct interviews and lead six in-service workshops during the project.	<p>Teachers of all grade levels expressed that critical and higher-order thinking are essential aspects of education. However, methodological limitations such as low generalizability warrant further research in this field.</p> <p>A literature review identified several factors hindering mathematics teachers in urban mathematics educational settings.</p> <p>In the primary study, challenges encountered by teachers were structured into five categories: teacher professional development and pedagogical skills; students' learning needs; students' social and educational background; administrative difficulties and resources; and curricular issues.</p> <p>Teacher professional development and pedagogical skills were important concepts brought forth in discussions. Teachers in all schools stated that they are not conferred enough opportunities to participate in in-service programs (e.g., technology workshops). Teachers also discussed difficulties associated with maintaining a balance between participating in professional development activities, and time management with regards to instructional activities.</p> <p>Teachers acknowledged several factors that affect students' learning: lack of previous knowledge in mathematics; special needs; insufficient English knowledge; lack of motivation; and behavioural issues.</p> <p>Teachers expressed that the demographic distribution of the student population and their parents' economic status generated several issues, including 'hard-to-engage' immigrant parents.</p> <p>Several issues were reported by teachers relating to the efficiency of the administration, school context, and teachers' lack of resources.</p> <p>Many teachers were challenged by the frequently changing curricular requirements, which reflect difficulties in achieving consensus in designing appropriate mathematics curricula for students.</p> <p>The results of this study highlight various challenges viewed by educators involved in teaching applied mathematics in an urban setting. Such challenges highlight the importance of acquiring adequate pedagogical skills to support student diversity.</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	Examining teacher support networks and collegiality (34)	<p><i>Publication date:</i> 2013</p> <p><i>Jurisdiction studied:</i> United States</p> <p><i>Methods used:</i> Literature review and primary study using a quantitative approach with an exploratory descriptive/correlation approach</p>	Participants were selected from the 41 Health Science Capacity Building (HSCB) programs in California. A total of 424 educators (secondary educators and individuals from the career technical sector) were identified, of which 317 participated in the survey.	Health Career Teacher surveys were administered to the HSCB participants to investigate the support networks and collegiality of career technical teachers working in the field of health science.	<p>A review of relevant literature identified several factors that promote professional learning communities and teacher networking, including technologies (e.g., Facebook, Skype, and Twitter) that facilitate the sharing of instructional strategies among teachers.</p> <p>The primary study investigated networking strategies that health science teachers commonly use to access support and resources. Particularly, the study aimed to answer the following two questions.</p> <ol style="list-style-type: none"> 1) What networking approaches do health science teachers use to access support and resources? 2) What is the association between program and school factors and health science teachers' reported levels of collegial support? <p>The three most preferred networking approaches reported by survey respondents were: 1) using a professional website where teachers can access information; 2) attending regional meetings/conferences; and 3) attending regional professional development workshops. Social networking was rated as a low-to-moderate preference among teachers.</p> <p>Respondents who taught in programs with a greater number of teachers were more likely to report higher levels of collegial support and collective efficacy. Likewise, teachers who indicated that they worked more frequently with other teachers on interdisciplinary curriculum assignments reported higher levels of collegial support and efficacy. The number of students in the program and at the school was not significantly related to collegiality.</p> <p>Although the data gathered in the primary study produced interesting findings in terms of teacher networking and collegiality, methodological limitations such as small sample sizes warrant further investigation.</p>
	Evaluating the effectiveness of interactive software in teaching math skills (32)	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> Canada</p> <p><i>Methods used:</i> Literature review and small-scale quasi-experimental two-group post-test study</p>	Twelve teachers and their students from five schools within English and French school boards in an Eastern province of Canada served as the study population.	To examine the effectiveness of Emerging Literacy in Mathematics (ELM) software in promoting student achievement and engagement in mathematics, six experimental teachers taught with the aid of ELM, while six control teachers employed their usual teaching	<p>Findings from a review of related literature produced variable findings in regards to the effectiveness of computer-assisted instruction on student achievement.</p> <p>The primary study investigated the impact of ELM software on mathematics achievement and interest among Grade 1 students. Student data relating to mathematics achievement and dispositions toward mathematics were reported. Descriptive observations relating to quality of teaching and student engagement in the experimental and control classes were also described.</p> <p>The study's findings reveal that students in the ELM classes consistently outperformed their peers in the control classrooms on all</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
				<p>approach. Student data were collected at seven weeks post-ELM implementation. Additionally, mathematics instruction was observed in each of the experimental and control classes twice.</p>	<p>mathematics concepts and operations measured by the customized version of the standardized test.</p> <p>Analysis of the difference between the experimental and control students' dispositions toward mathematics reveal that ELM students reported less boredom and anxiety than control students.</p> <p>Classroom observations found that student responses to ELM implementation were generally positive, with many students reporting that they found the activities to be enjoyable and manageable in terms of their level of difficulty. Any issues that arose with the ELM software were technical in nature.</p> <p>The findings of this study suggest that ELM may improve student math abilities and dispositions towards mathematics. However, the authors acknowledge multiple limitations within their pilot study, including the short intervention duration, and limited statistical power.</p>
	<p>Examining teachers' understanding of 21st-century occupational roles (39)</p>	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> Nigeria</p> <p><i>Methods used:</i> Descriptive surveys evaluating the level of secondary school teachers' awareness of the 21st-century occupational roles in Rivers state, Nigeria</p>	<p>The sample consisted of 860 survey respondents selected through stratified sampling, simple random sampling and the purposive sampling techniques. The sample was selected from 247 public secondary schools and 57 private secondary schools of Rivers state with a total population of 304 principals and 9,413 teachers.</p>	<p>The administered surveys examined the extent to which secondary-school teachers are aware of the 21st-century occupational roles in Rivers state. The survey instrument employed in this study was the questionnaire entitled: Teacher level of awareness of 21st century occupational roles in Rivers state secondary schools questionnaire (TLATCORQ).</p>	<p>In this primary study, surveys were administered to a sample of secondary-school educators in Rivers state to explore three research questions relating to secondary-school teachers' awareness of 21st century occupational roles.</p> <ol style="list-style-type: none"> 1) What are the types of occupational roles which teachers play in the 21st century environment of Rivers state secondary schools? 2) What is the level of teachers' awareness of 21st-century occupational roles in Rivers state secondary schools? 3) What are the areas of teachers' roles affected by the 21st century environment in Rivers state secondary schools? <p>Survey results indicate that the occupational roles assumed by teachers in the 21st-century classroom are facilitator and life-long learner, collaborator, assessor and entrepreneur. Project manager and technology expert were not indicated as types of occupational roles of teachers in the 21st-century learning environment.</p> <p>From the survey data obtained, the teachers' level of awareness of their 21st-century occupational roles of facilitator, life-long learner, collaborator, assessor and entrepreneur were moderate, while that of project manager and technology expert were low.</p> <p>Findings suggest that the areas of teachers' roles influenced by the 21st-century environment are commitment, classroom management,</p>

Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
					<p>professional development, learning resources, technical competence, workload, content coverage and instructional strategies.</p> <p>The study’s results support the notion that the unique characteristics of the 21st-century learning environment have produced changes in teacher roles in the classroom. With the emergence of information and communications technology (ICT) in teaching and learning, the authors recommend taking measures to help teachers acquire competence in ICT use and classroom implementation.</p>
	<p>Examining the importance of information and communications technologies that support 21st-century teaching (35)</p>	<p><i>Publication date:</i> 2011</p> <p><i>Jurisdiction studied:</i> Chile, Taiwan, France, Japan, South Africa, Thailand, Estonia, Russian Federation, Slovakia, South Africa, Italy, Singapore, Slovenia, Lithuania, Thailand, Norway, Israel, Finland</p> <p><i>Methods used:</i> Survey</p>	<p>Grade 8 teachers in 18 national education systems were surveyed in this study.</p>	<p>All of the schools participating in this study provided school-level support for 21st-century skills and information and communications technologies (ICT) teaching activities to support 21st-century teaching activities in the curriculum and classroom.</p>	<p>The study examined national education systems to explore the relationship between institutional support for ICT and teachers’ use of ICT for developing 21st-century skills. Data from the 2006 Second Information Technology in Education Study survey was used to assess 18 national educational systems. Teachers were asked whether ICT was used for six specific 21st-century-type activities described in the survey, and it was found that three systems (South Africa, Russia and Thailand) demonstrated correlations between school-based support for ICT use in 21st-century teaching activities and the odds of using ICT in such activities. Among math and science teachers, it was found that there were no consistent patterns of association between support for and use of ICT on extended projects within the classroom; however, ICT support was associated with higher odds of using ICT overall in South Africa, Russia, Slovakia and Chile. As a developing state, South Africa demonstrates the most favourable results of any nation in the 2006 survey, with South African teachers reporting that any type of institutional support is often predictive of ICT use in the classroom. Similarly, in Thailand, collaborative ICT uptake in classrooms has been a result of teacher and departmental collaboration. The study suggests such approaches are best exercised by developing states with evolving educational infrastructure.</p>
	<p>Evaluating the validity of the Human Behaviour Rating Scale-Brief in measuring 21st-century skills in K-12 learners (38)</p>	<p><i>Publication date:</i> 2015</p> <p><i>Jurisdiction studied:</i> USA</p> <p><i>Methods used:</i> Survey</p>	<p>A total of 3,577 students ranging from 5 to 20 years of age were included. Participants were students who attended classes in one of six elementary schools, two junior high schools, and two high schools located in a</p>	<p>Researchers developed a brief, concise, and manageable 30-item tool, the Human Behavior Rating Scale – Brief, to measure the efficacy of curricular 21st-century skills teachings, which are influential in children’s and adolescents’ future educational,</p>	<p>The Human Behavior Rating Scale is a 91-item academic and behavioural rating scale aimed at helping teachers to identify K-12 students who are at risk for behavioural and academic challenges. The study created a concise version of the tool (Human Behavior Rating Scale – Brief, 30 items) to measure 21st-century skills (persistence, curiosity, externalizing affect, internalizing affect, and cognition). The brief measure was developed to encapsulate demographic variables such as race, learning disabilities and educational services required by K-12 learners. K-12 teachers completed the rating scale for their students five months into the school year, and the items from the long protocol were analyzed to create the shorter version of the tool. This was done by professional judgment, exploratory factor analysis and principal axis</p>

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			<p>Southeastern U.S. school district.</p> <p>191 K-12 teachers were also included in the study, including 161 female teachers, 29 male teachers, and one who was not reported. 42 of the teachers were African American, 145 were White, and four did not report race.</p>	<p>vocational, and interpersonal success.</p>	<p>factoring analysis. Correlations between the long and brief rating scales are overall strong, with minor variations for some demographic characteristics that were modified for the brief tool. The brief tool was found to be predictive of students' test scores in the areas of reading and mathematics skills four months later for K-9 students. Its internal consistency, content, construct and concurrent validity were found to match other psychometric measures, such as the Stanford 10 scale. However, the study suggests that the results should be interpreted with caution, as the tool evaluated was only sampled from data within one school district, and may not be universally applicable in assessing 21st-century skills of all K-12 learners.</p>
	<p>Examining the importance of employing school librarians as a link between K-12 science education and 21st-century teachings (22)</p>	<p><i>Publication date:</i> 2013</p> <p><i>Jurisdiction studied:</i> USA</p> <p><i>Methods used:</i> Ethnography</p>	<p>Thirty-nine sixth graders from four schools in an Atlantic-region U.S. school district were recruited into a science-infused after-school program (Sci-Identity) in the study. All four schools had a high percentage of students (57–77%) receiving Free and Reduced Meals (FARMS).</p>	<p>The intervention for this study involves the incorporation of the <i>Standards for the 21st-Century Learner</i> into the <i>Framework for K-12 Science Education</i> through school librarians. Sci-Identity after-school sessions were arranged weekly and co-implemented with four participating middle-school librarians. Students participated in activities and games that incorporated science education.</p>	<p>The study establishes that school librarians have a defined role within schools of helping student conduct ethical decision-making, and making effective use of technology, information technology and critical thinking. It then hypothesizes the link between these standards in librarians' roles and a theoretical framework of catering to young students' curiosities, interests and experiences, embracing students' diversity and fostering collaboration. The study examined how librarians could bridge standards and the given framework through a design-based research model to examine the learning process of young students as well as the roles and benefits of participating students within the Sci-Identity after-school program. The results of this study indicate that school librarians found ways to show multiple examples of being information specialists, instructional partners, teachers, program administrators, and leaders in facilitating science learning throughout the after-school program, primarily by encouraging authentic inquiry and collaborative practices. Among the four schools, it was found librarians facilitated an inquiry-based process that helps students make real-world connections for using the process in and outside of the classroom. Librarians were also found to know about students' everyday-life interests, such as the books students read, the music they listen to, the movies they watch, and the games they play, which were found to help bridge between in-school and out-of-school contexts. The study concluded that school librarians are strong assets in science learning as they are able to encourage young people, engage learners' everyday-life interests, and incorporate into science discussions the diversity of students' perspectives.</p>
	<p>Evaluating the National</p>	<p><i>Publication date:</i> 2008</p>	<p>A total of 223 pre-service teachers were</p>	<p>Pre-service teachers completed a required</p>	<p>The study sought to examine to what extent pre-service teachers integrate technology into course and lesson planning, and how these</p>

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Question addressed	Focus of study	Study characteristics	Sample description	Key features of the intervention(s)	Key findings
	Educational Technology Standards as a tool for learning and developing 21st-century citizenship skills (33)	<p><i>Jurisdiction studied:</i> U,S.</p> <p><i>Methods used:</i> Longitudinal study</p>	recruited for the five-year study. All teachers were students in a four-quarter graduate teacher education program at a university in the United States.	two-term instruction and technology course, taught by the primary researcher of the study. Pre-service teachers learned to use a variety of technologies as they participated in the Intel Teach to the Future curriculum and other technology-based workshops.	practices are reflected in the use of technologies by K-12 students in the classroom. Data from the National Educational Technology Standards (NETS) were also evaluated. Data analysis examined work samples from primary- and secondary-school teachers, including survey data and reflection-based responses indicating the technology hardware and software used within classrooms. Four of the NETS criteria were found to be useful in work sample analysis. Overall results indicated that 85% of pre-service teachers successfully integrated technology skills and knowledge in instructional practice with their K-12 students. However, it was found that regardless of school settings, teachers faced a consistent lack of adequate technological resources to meet student demand. It was found that NETS focused on students' digital citizenship skills and six core technological competencies. Roughly half of work samples and reflections from K-12 students indicated use of technology for creative and innovative purposes as well as communication and collaboration, research and information fluency. The study indicated little evidence that K-12 students used technology to support critical thinking, problem solving, and decision-making using the NETS evaluative framework.
	Understanding the importance of incorporating global citizenship into K-12 education (37)	<p><i>Publication date:</i> 2016</p> <p><i>Jurisdiction studied:</i> U.S.</p> <p><i>Methods used:</i> Qualitative multiple case study</p>	Ten North Carolina teachers who teach for global competence in math, music, science, English, social studies, and language classes across elementary, middle, and high schools were included. Participants were recruited through an application process including submissions of lesson plans, a description of global education experiences, and plans to incorporate global competencies into their classrooms.	Prior to the study, the in-service teachers designed lessons plans incorporating global competencies into their school lessons. Over the study period, the teachers were observed in the classroom to determine the efficacy of various global competencies teaching strategies.	'This qualitative multiple case study examine the incorporation of global citizenship into teaching strategies in different grade levels and content areas. In-depth interviews and classroom observation were used to determine underlying teachers' actions. The study found three signature pedagogies that characterized globally competent teaching practices across participants: 1) intentional integration of global topics and multiple perspectives into and across the standard curriculum; 2) ongoing authentic engagement with global issues; and 3) connecting teachers' global experiences, students' global experiences, and the curriculum. The study suggests that these signature pedagogies provide frameworks for concrete practices teachers can adapt to infuse global citizenship education into their own contexts, and for policies that school districts and teacher education programs can consider in preparing and supporting teachers in this work. The study also suggests these signature pedagogies can be used for selecting required professional development for educators to further global competencies in the classroom. It recognizes that feedback is vital to improving the quality of these pedagogical principles, and recommends that school boards dedicate context-appropriate resources, including funding for relevant technological resources, to advance these principles for developing global competencies.

Appendix 3: Summary of findings from systematic reviews about professional learning approaches and professional development

Topic	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
Professional learning approaches in education (not specifically about global competencies)	Examining the literature on using collaborative inquiry as a professional learning structure for educators (40)	<p>Collaborative inquiry is a learning structure in which educators collaboratively investigate and improve upon specific aspects of their professional practice. It is often conceptualized as a cyclical process where participants are constantly determining what knowledge and skills need to be addressed, developing and executing changes in teaching practices, and reflecting upon the results. Knowledge is co-constructed by participants through discussion and negotiation.</p> <p>This scoping review identified 42 sources. Most of the sources described the steps to organizing and running collaborative inquiry programs. Facilitators to the implementation of such programs include receiving support from school leaders and administrators, specifically devoting time and space to collaborative inquiry activities, and fostering supportive collegial dialogue. Implementation challenges included buying into the culture of collaborative inquiry, temporal constraints, and the limited data literacy skills of teachers (which are needed to determine student need and formulate specific paths of inquiry).</p> <p>Studies reported that collaborative inquiry improved content and pedagogical knowledge and skills, increased opportunities for teacher leadership, and fostered the development of a learning community. Collaborative inquiry also improved student achievement in writing, English and the arts. At the school-level, collaborative inquiry led to greater curriculum alignment and more collaborative school cultures. However, these claims were largely unsubstantiated, and were based upon anecdotal evidence from case study work rather than empirical data.</p> <p>Further research is needed to clarify the focus of collaborative inquiry initiatives, properly define ‘inquiry’ as it applies to collaborative inquiry, and determine methods to sustain collaborative inquiry programs.</p>	n/a	No rating tool available for this type of document	n/a
	Identifying the various types of teacher communities, the role of different stakeholders, and barriers and facilitators to success (41)	<p>The systematic review analyzed 40 studies through a narrative approach. Three types of teacher communities were identified: formal teacher communities, member-oriented teacher communities with pre-set agendas, and formative teacher communities.</p> <p>Formal teacher communities employed a top-down approach in which teachers were mainly executors of goals developed by policymakers and decision-makers. The structure of formal teacher communities was usually rigid, with regular meetings and continuous assessments. Newly gained knowledge and skills were mostly introduced and taught by outside experts. These communities were largely designed as short-term programs, with few communities continuing once the initiatives had officially ended.</p>	n/a	4/9 (AMSTAR rating from the McMaster Health Forum)	2/40

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Topic	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>Member-oriented teacher communities with pre-set agendas employ a bottom-up approach, and were often initiated by principals or teachers. Objectives included sharing ideas and perspectives about teaching, increasing knowledge of available information resources, implementing new teaching reforms, and receiving feedback on performance. These communities rely upon practical teaching experience as their main resource, and usually aim to be continuous rather than short.</p> <p>Lastly, formative teacher communities are established with no predefined goals or agendas prior to their first meeting, and exist for as long as the need for support exists.</p> <p>Conditions for successful teacher communities include effective leadership from the facilitator, and a collaborative and respectful group dynamic.</p> <p>The review noted that the term ‘teacher community’ is often used interchangeably with other terms like ‘professional learning community’ and ‘community of practice.’ Additionally, included studies differed in whether they viewed the establishment and sustainment of teacher communities as an end goal itself, or as a tool to reach other goals like increased student achievement.</p> <p>The review identified a lack of empirical research evaluating the effectiveness of teacher communities. Further avenues of research include examining the implementation of teacher communities in rural and disadvantaged areas, studying potential socio-cultural influences, and producing a common list of terminology and definitions.</p>			
	<p>Describing the role of teacher collaboration in improving educational outcomes (42)</p>	<p>The systematic review examined 82 studies with a narrative method. The review measured collaboration by the degree of team ‘entitativity’ present. Team entitativity is defined as the extent to which a collection of individuals possess the quality of being a team. Indicators include shared goals and responsibilities, task cohesion, identification as a team member, task interdependence, and outcome interdependence.</p> <p>The review found that the degree of teacher collaboration can range from superficial to deep, with deeper levels of collaboration requiring higher levels of team entitativity. Benefits of collaboration include improved educational performances, flattened power structures, and decreased feelings of isolation among teachers. Negative effects include threats to individual autonomy and independence. The review noted that strong levels of collaboration and team entitativity do not necessarily signify better outcomes; rather, the necessity of strong team entitativity depends on the context.</p> <p>Facilitating factors to collaboration include increased task interdependence, clearly defined roles and responsibilities, and structural supports. Barriers include strong cultures of individualism, autonomy and independence.</p>	<p>2012</p>	<p>4/9 (AMSTAR rating from the McMaster Health Forum)</p>	<p>1/82</p>

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Topic	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>Overall, the review found that the term ‘teacher collaboration’ was unclearly defined across the literature. Further research should seek to better define ‘teacher collaboration’ and its associated terms, and look at other contexts in which collaboration is practised (e.g. manufacturing, healthcare).</p>			
	<p>Identifying effective methods to mentoring new head teachers (43)</p>	<p>The systematic review identified 24 studies that evaluated head-teacher mentoring programs. The review identified several roles for mentors, who can serve as models, ‘acculturators’ (help new staff become accustomed to a particular professional culture), sponsors, providers of support, and educators.</p> <p>Much of the evaluations collected the perspectives of key participants, rather than information on job performance and costs. There were no studies that reported unhelpful effects. The most well-defined programs were seen as successful and helpful by a majority of participants; however, some studies were affected by low response rates. Identified benefits for mentees include improved professional skills (e.g., technical expertise, communication skills, problem analysis), improved psychological well-being, and increased opportunities for networking. Benefits for mentors include opportunities for professional development and performance, and greater reflection and awareness of different approaches to headship. Benefits for schools include improved school management.</p> <p>Factors that influenced the success of mentoring schemes include the availability of time, the effective matching of mentors and mentees, the qualities and attributes of mentors, and training provided to mentors.</p> <p>The review found cultural differences between participants from different countries. For instance, while participants of a mentoring scheme from England considered the relationship between mentor and mentee to be mutually beneficial and similar to peer support, participants of the same mentoring scheme from Singapore found that the relationship had more of a coaching dynamic, and that sessions largely focused on skill acquisition.</p>		<p>5/9 (AMSTAR rating from the McMaster Health Forum)</p>	
	<p>Assessing the impact of collaborative continuing professional development (CPD) on classroom teaching and learning (44)</p>	<p>This review sought to explore the evidence regarding the impact of CPD on teaching and learning of individually oriented and sustained CPD interventions, and to compare this with evidence about the impact on teaching and learning of sustained, collaborative CPD. Collaborative CPD was defined in programs where there were specific plans to encourage and enable shared learning and support between at least two teacher colleagues on a sustained basis, whereas individually oriented CPD referred to programs where there were no plans to use collaboration as a learning strategy. Two individual studies found some evidence of modest impact as a result of CPD intervention. Ten of 11 collaborative studies reported some evidence of improvement in pupil learning, and all of the studies found links between CPD and changes in teaching practices, attitudes or beliefs. One study regarding</p>	<p>2005</p>	<p>7/9 (AMSTAR rating from the McMaster Health Forum)</p>	<p>3/81</p>

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Topic	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		<p>individually oriented CPD involved observing teachers in classrooms; observation was a principal means of data collection across collaborative studies. Nine of the collaborative studies in this review involving CPD were associated with positive teaching and learning outcomes for both teachers and pupils. Overall, the review concluded that within schools, classroom-based CPD may be more effective than off-site CPD. Furthermore, it was found that collaboration between teachers which is focused around active experimentation may be more effective in changing practices than reflection and discussions about classroom practices. It was also found that paired or small group collaboration may have greater impacts on CPD outcomes than larger groups, improving both teaching and pupils' learning outcomes if widely implemented.</p>			
	<p>Assessing the techniques employed by specialists in CPD programs to ascertain positive outcomes for pupils and teachers (45)</p>	<p>This review used the results from 19 medium or high weight-of-evidence studies to explore the role of specialists in CPD programs in providing positive outcomes for pupils and teachers. CPD was defined as sustained (lasting at least 12 weeks) and collaborative (where there were specific plans to encourage and enable shared learning and support between teacher colleagues). Teacher outcomes were identified as effects on confidence, openness to new teaching approaches, and willingness to experiment and take risks, whereas pupil outcomes were changes in learning and achievement through problem solving, mathematical skills, literacy skills, improvement in classroom engagement, reasoning and ICT. It was found that all specialists using the CPD model combined new inputs with ongoing support networks to effectuate positive outcomes. These include workshops, observation, feedback and coaching, and planned and informal meetings for teachers' and pupils' discussion. Chiefly, specialists were integrated in ways to provide teachers with tools and an environment for learning, rather than prescribing learning content. Specialists met with teachers at least monthly across the given interventions. It was found that specialists facilitated growth and independence as well as experimentation in both teachers and students.</p>	2006	7/9 (AMSTAR rating from the McMaster Health Forum)	0/19
	<p>Assessing which elements of teacher training in the U.K. support professional development (46)</p>	<p>This review sought to understand which school-based elements of partnership in initial teacher training in the U.K. supported trainee teachers' professional development. Teacher trainee competencies in the U.K. are generally recognized as consisting of foundational studies in education (knowledge base of curricula subjects), generic teaching skills and knowledge, specialized pedagogical teaching skills (subject or age-group-specific to meet individual learner needs), and field experiences (teaching observation, practice and assessment). Results from the systematic review indicate that teachers' professional development is supported by regular constructive feedback. Frequent oral feedback was recognized as being important by trainee teachers, tutors and supervisors. Written feedback was more linked with long-term development and the identification of aspects on which the trainee should focus for professional improvement. Regarding organization and management, the preparation of lesson plans and cooperation were found to be naturally developed through the course of supervisor-trainee collaboration. Furthermore, in these settings tolerance toward constructive feedback and failures, diplomacy, communication</p>	2003	6/9 (AMSTAR rating from the McMaster Health Forum)	4/82

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Topic	Focus of systematic review	Key findings	Year of last search/ publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		skills and problem solving were a direct result of collaborative practices in performance feedback and learning. Reliability and reliance were rated the most important professional skills for teachers. The review suggests the need for more research in this field, as most of the available literature concerns organizational structures and management processes rather than individual professional development.			
	Assessing the importance of organizational structures, management processes and conceptual framework in initial teacher education (47)	This study sought to investigate how organizational structures, management processes and conceptual frameworks influence the quality of initial teacher education. Of the 18 included studies, five offered medium weight-of-evidence and none offered high weight-of-evidence. Among the five medium-weight studies, one study reported that there was no clear evidence that postgraduate certificates of education or a bachelor's degree in education resulted in better quality teachers. Another study reported that undergraduate students were more concerned with students' learning, whereas graduate students were more interested in lesson planning and classroom management. A third study found that teachers from alternative teacher certification programs were most prepared in subject matter, but were least prepared in pedagogical techniques and instructional fluency relative to their peers. With all studies in this systematic review being of low- to medium-weight evidence, the article discussed a paucity of research in this particular field. The review suggests that the standardization of qualifications is unnecessary and universally unattainable; furthermore, it suggests that the difficulties in collecting unbiased data were largely due to the politicized nature of the teacher education industry.	2005	7/9 (AMSTAR rating from the McMaster Health Forum)	2/18
	Understanding the effects of the roles of mentors or inductors for newly qualified teachers on their professional practice (48)	This review sought to assess the research on the induction of newly qualified teachers (NQTs) with special reference to teacher performance, professional learning and retention rates. Three of the six studies focusing on teacher performance showed evidence that improvements in teachers' performance was a direct consequence of induction techniques; however, the evidence among these studies was of low-to-medium quality. Survey data reported within the included articles demonstrates classroom management is the largest challenge faced by NQTs. Experienced support teachers surveyed in this data indicate that mentoring and induction helps mitigate some of these challenges, and that this was an area in which NQTs could have the most support from experienced teaching mentors. Overall, many of the studies focusing on teacher performance demonstrated a positive impact of induction practices on teacher performance, as they motivated teachers to encourage students and depersonalize classroom problems with tutor support. Similarly, all six studies focusing on professional learning showed evidence that NQTs valued mentoring and induction. It was found that emotional support during times of difficulty or stress helped NQTs build relationships with mentors and tutors, and also helped NQTs become empowered to find adequate solutions to challenging classroom problems. From the available evidence, the review determined that professional learning amongst NQTs would have been more effective if matching between NQTs and tutors was conducted on the basis of subject and similar experience in age/grade experience. Regarding retention rates, the	2007	7/9 (AMSTAR rating from the McMaster Health Forum)	3/10

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Topic	Focus of systematic review	Key findings	Year of last search/publication date	AMSTAR (quality) rating	Proportion of studies that were conducted in Canada
		available evidence indicated that NQT attrition rates were most problematic in the first year following employment. Three of the six studies focusing on retention noted a correlation between retaining NQTs and their induction or mentoring experiences; however, the overall evidence on this issue is of medium quality and warrants further attention. Overall, the article suggests a positive relationship between induction/mentoring practices and NQT performance, learning and retention through regular meetings between NQTs and tutors, adequate time for induction tutoring, and appropriate matching based on subject and teaching grade.			
	Examining the effectiveness of educator professional learning communities in improving academic, social, and behavioural outcomes in K-12 schools (49)	This is a Campbell Collaboration systematic review being planned. The aim of this review will be to assess the effectiveness of professional learning communities (i.e., groups of educators sharing and critically interrogating their practices in an ongoing, collaborative, inclusive, learning-oriented, and growth-promoting way) in K-12 schools, more specifically related to their effects on educator self-efficacy and other skills, and their impact on student and school-level outcomes (e.g. academic, social, and behavioural).	n/a	No rating tool available for this type of document	n/a



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