References Relevant to BC's Curriculum and Assessment Transformation

To inform BC's curriculum and assessment transformation, trends in national and international jurisdictions have been reviewed and authorities on curriculum and assessment design have been consulted. Following are some of the key resources supporting these transformation efforts.

Alberta Education. (2013). *Curriculum redesign*. Retrieved from https://education.alberta.ca/topic-search/?searchQuery=curriculum redesign

Curriculum Redesign is one of the initiatives helping to bring Alberta's vision of education to life. It is an opportunity to review Alberta's provincial curriculum to see the extent to which it is engaging and relevant, and enables students to reach their full potential.

Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries* (OECD Education Working Papers, No. 41). Retrieved from http://dx.doi.org/10.1787/218525261154

In this paper, the authors discuss issues related to the teaching and assessment of 21st-century skills and competencies in OECD countries. The paper presents a short discussion of the importance and relevance of 21st-century skills and competencies in the current policy debate and the definitions and conceptual frameworks that have been used in the literature. It proposes a new three-dimensional framework consisting of the dimensions of information, communication, ethics, and social impact.

ATC21S (2013). *Assessment and Teaching of 21st Century Skills*. Retrieved from http://atc21s.org/

Assessment and Teaching of 21st-Century Skills (ATC21S) is a research project that proposes ways of assessing 21st-century skills and encourages teaching and adopting of those skills in the classroom. According to the results of the research, learning to collaborate with others and connect through technology are essential skills in a knowledge-based economy. The project was funded with support from the European Commission.

Australian Curriculum, Assessment, and Reporting Authority (ACARA). (2011). *General capabilities*. Retrieved from http://www.acara.edu.au/curriculum/general-capabilities

General capabilities are a key dimension of the Australian curriculum, encompassing knowledge, skills, behaviours, and dispositions that, together with curriculum content in each learning area and the cross-curriculum priorities, will assist students in living and working successfully in the 21st century. The webpage describes general capabilities and provides key links.

Barber, M., & Hill, P. (2014). *Preparing for a renaissance in assessment*. London, England: Pearson.

In this book, the authors set out a "framework for action" that details the steps that should be taken for policy makers, schools, school-system leaders, and other key players to prepare for an assessment renaissance. In the 21st-century landscape, where the demands go beyond just knowledge and technical skills, there is a need for an "assessment renaissance" to allow for meaningful monitoring or measurement of the desired attributes. Barber and Hill suggest that "it will help secure high standards for all, remove current achievement ceilings and support a focus on …. skills vital for living and learning in the twenty-first century."

BC Ministry of Education. (2015). *Aboriginal worldviews and perspectives in the classroom*. Victoria, BC: Queen's Printer. Retrieved from https://www.bced.gov.bc.ca/abed/awp_moving_forward.pdf

This resource guide aligns with the calls to action of the Truth and Reconciliation Commission and the newly revised curriculum, emphasizing relevant, authentic inclusion of content regarding Aboriginal culture, language, and history. The resource guide supports educators and provides context as they incorporate the First Peoples Principles of Learning into their learning environments. It also aligns with the work currently happening around the province through Aboriginal Education Enhancement Agreements and networks of educators such as the Aboriginal Enhancement Schools Network.

Bennett, T. (2013). *Teacher proof: Why research in education doesn't always mean what it claims, and what you can do about it*. New York, NY: Routledge.

This book explores the science, and sometimes the lack of science, behind different theories of how students best learn and teachers teach. The author draws from a wide range of recent and popular education theories and strategies to highlight how much of what we think we know in schools hasn't been "proven" in any meaningful sense. Teachers are encouraged to decide for themselves what good and bad education really is.

Bennett, T. (2015). The changing nature of educational assessment. *Review of Research in Education*, 39, 370–407. doi:10.3102/0091732X14554179

This article concerns the evolution of educational assessment from a paper-based technology to an electronic one. Assessments delivered electronically can serve both institutional and individual-learning purposes. They are designed on the basis of cognitive principles and theory-based domain models and use complex simulations and other interactive performance tasks that replicate important features of real environments. They allow more natural interaction with computers, and assess new skills in more sophisticated ways.

Berger, R., Rugen, L., & Woodfin, L. (2013). *Leaders of their own learning: Transforming schools through student-engaged assessment*. San Francisco, CA: Jossey-Bass.

This book offers a new way of thinking about assessment, through student-engaged assessment. This approach to teaching and learning equips students to understand goals for their learning and growth, track their progress toward those goals, and take responsibility for reaching them.

Black, P., Burkhardt, H., Daro, P., Jones, I., Lappan, G., Pead, D., & Stephens, M. (2012). High-stakes examinations to support policy: Design, development and implementation. *Educational Designer*, 2(5). Retrieved from http://www.educationaldesigner.org/ed/volume2/issue5/article16/

This article sets out the essential elements of an assessment system that meets the goal of creating better assessments, taking into account the necessary constraints of cost. This entails planning assessment, including high-stakes testing, as an integral part of a coherent system covering learning, teaching, and professional development. All are focused on the classroom and treating assessment as a design and development challenge, first to introduce high-quality instruments that serve both formative and summative purposes, and later to counteract the inevitable pressures for degrading that quality.

Black, P., & Wiliam, D. (1998). *Inside the black box: Raising standards through classroom assessment*. London, England: School of Education, King's College.

"Firm evidence shows that formative assessment is an essential component of classroom work and that its development can raise standards of achievement." The authors offer an explanation of the meaning of educational assessment, as well as the different types of assessments and their intended purposes. The authors also suggest ways to make assessment meaningful and attractive to students in 21st-century learning so as to change their perceptions of assessment. They argue that just as effective teaching and learning need to change from the 3Rs, so does assessment need to change if it is to serve its moral purpose in 21st-century education.

Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S., & Hipkins, R. (New Zealand Council for Educational Research). (2012). *Supporting future-oriented learning and teaching: A New Zealand perspective.* Wellington, NZ: New Zealand Ministry of Education. Retrieved from https://www.educationcounts.govt.nz/__data/assets/pdf_file/0003/109317/994_Future-oriented-07062012.pdf

This report draws together findings from new data and more than 10 years of research on current practice and futures-thinking in education. It discusses some emerging principles for future learning, how these are currently expressed in New Zealand educational thinking and practice, and what they could look like in future practice.

Brownlie, F., & King, J. (2000). *Learning in safe schools: Creating classrooms where all students belong*. Markham, ON: Pembroke.

This book addresses cognitive, behaviour, literacy, and communication issues and offers instructional interventions to help teachers support students from culturally and linguistically diverse backgrounds within a Response to Intervention (RTI) framework.

Brownlie, F., & Schnellert, L. (2009). *It's all about thinking: Collaborating to support all learners*. Winnipeg, MB: Portage & Main Press.

In this book, the authors explore questions, such as: How can we help students develop the thinking skills they need to be successful learners? How does this relate to deep learning of important concepts? How can we engage and support diverse learners in inclusive

classrooms where they develop understanding and thinking skills? They offer classroom examples to help teachers develop communities where all students learn.

Bruce, D., & Marlin, A. (2012). *Literature review on factors affecting the transition of Aboriginal youth from school to work.* Toronto, ON: Council of Ministers of Education, Canada (CMEC). Retrieved from http://www.cmec.ca/Publications/Lists/Publications/Attachments/298/Literature-Review-on-Factors_EN.pdf

This literature review addresses the significant gap between the education and employment outcomes of Aboriginal and non-Aboriginal populations. It examines the challenges faced by Aboriginal youth in completing their education and the factors that impede or foster their successful transition from school to work.

Cameron, C., & Gregory, K. (2014). *Rethinking letter grades: A five-step approach for aligning letter grades to learning standards* (2nd ed.). Winnipeg, MB: Portage & Main Press.

In this book, the authors offer a five-step process for arriving at letter grades that moves away from collecting a string of marks and calculating a grade. They examine a wide variety of assessment tools and match the student evidence with a description of achievement.

Canadians for 21st Century Learning and Innovation (C21 Canada). (2012). *C21 presents: Shifting minds*. Retrieved from http://www.c21canada.org/wp-content/uploads/2012/02/C21-Canada-Shifting_Minds.pdf

The goal of C21 Canada is the integration of 21st-century competencies, instructional practices, and digital resources and services into Canada's learning systems at an accelerated pace. C21 Canada believes achievement of this goal is essential to meeting the economic, social, environmental, and financial aspirations of Canadians. Shifting minds means understanding that we need to shift what we teach and how we teach to engage, empower, and position learners for success, and shifting Canadians' attitudes to the imperative for 21st-century models of learning in public education.

Carr, N.G. (2010). *The shallows: What the Internet is doing to our brains*. New York, NY: W.W. Norton.

In this book, the author provides the historical context for the shaping of human thought by "tools of the mind" — including the alphabet, maps, the printing press, the clock, and the computer — interwoven with recent discoveries in neuroscience. Carr makes the case that every information technology carries a set of assumptions about the nature of knowledge and intelligence. For instance, the printed book served to focus our attention, promoting deep and creative thought. In contrast, the Internet encourages rapid, distracted sampling of small bits of information.

Case, R. (2010). Bringing critical thinking to the main stage. *Education Canada*, 45(2). Retrieved from http://www.cea-ace.ca/sites/cea-ace.ca/files/edcan-2005-v45-n2-case.pdf

In this article, the author states that critical thinking is a powerful method of teaching aspects of the curriculum — both content and skill. Inviting students to think critically about subject matter is effective in promoting both understanding of the content and mastery of the skills;

students are more likely to master the curriculum outcomes that they need to learn. Students who passively receive information are far less likely to understand what they have heard or read about than are students who have critically scrutinized, interpreted, applied, or tested this information. The article discusses two distinguishing features of this conception: a "curriculum embedded" approach and an emphasis on "teaching the intellectual tools" required for critical thinking.

Centre for Educational Research and Innovation (CERI). (n.d.). *21st century learning: Research, innovation, and policy — Directions from recent OECD analyses*. Organisation for Economic Co-operation and Development (OECD). Retrieved from http://www.oecd.org/site/educeri21st/40554299.pdf

This report from the CERI/OECD international conference "Learning in the 21st Century: Research, Innovation, and Policy" states that learning is central in knowledge-based societies and economies. In many countries there is a push to reflect this by ensuring that reforms of the education system focus more strongly on learning itself rather than simply changing structure and educational organization. The report aims to shed light on questions such as, what does "focus on learning" mean in concrete terms, why is it important, and is the knowledge base on learning strong enough to help policy makers shape their direction of educational change?

Christodoulou, D. (2014). *Seven myths about education*. New York, NY: Routledge.

In this book, the author presents a thought-provoking critique of educational orthodoxy using her own experience of teaching in challenging schools. She demonstrates through a wide range of examples and case studies how much classroom practice contradicts basic scientific principles. For instance, she challenges some widely held myths about things that are believed to be holding back pupils and teachers. She explains exactly why each is a myth, with reference to the principles of modern cognitive science. She builds a case by explaining how governments and educational organizations around the world have let down teachers and pupils by promoting and even mandating evidence-less theory and bad practice.

Chrona, J. (2012). *Competencies – Aboriginal perspectives* [Paper written for BC Ministry of Education].

The purpose of this paper is to present a summary of Aboriginal cultural constructs and worldviews relating to education that may have a direct bearing on the development and implementation of the core competencies that were developed for BC's K–12 public education system.

Cooper, D. (2011). *Redefining fair: How to plan, assess, and grade for excellence in mixed-ability classrooms*. Bloomington, IN: Solution Tree Press.

In this book, the author attempts to anticipate and answer every question that any teacher might have about putting differentiation into action. There is a great demand for personalized learning — in part because too many learners are disengaged, and partly because international assessments have increased the need for more effective teaching. This book serves to provide insight for teachers who are in great need of clear, comprehensive, and effective instructional ideas that are engaging to the majority of diverse students.

Cooper, D., & Adams, K. (2007). *Talk about assessment strategies and tools to improve learning*. Toronto, ON: Thomson/Nelson.

In this book, the authors simplify, demystify, and shift thinking around assessment for elementary students. The book gives teachers tools to help students improve their learning.

Commission on Behavioural and Social Sciences and Education. (2003). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Research Council.

The book focuses mainly on the work from cognitive psychology aimed at understanding the principles of knowledge organization that underlie people's abilities to solve problems in a wide variety of areas, including mathematics, science, literature, and social studies.

Council of Ministers of Education, Canada (CMEC). (2011, February 23). Canada's ministers of education move ahead on pan-Canadian priorities [Press release]. Retrieved from http://www.cmec.ca/278/Press-Releases/Press-Releases-Detail/Canada-s-Ministers-of-Education-Move-Ahead-on-Pan-Canadian-Priorities.html?id_article=256

This press release describes how provinces and territories are addressing the broad range of skills that young people will need to be fully engaged workers and citizens in a 21st-century knowledge society.

Critical Thinking Consortium (TC[2]). Retrieved from http://www.tc2.ca/

The Critical Thinking Consortium is a non-profit association of educational partners. Founded in 1993, its aim is to promote critical thinking in primary to post-secondary classrooms through professional learning, resource development, and research.

Danish Business Research Academy & Danish Forum for Business Education. (2008). *Thinking across disciplines: Interdisciplinarity in research and education*. Retrieved from http://www.dea.nu/sites/default/files/Thinking%20Across%20Disciplines%20-%20Interdisciplinarity%20in%20Research%20and%20Education_0.pdf

This forum defines interdisciplinarity as creating something new by crossing boundaries and thinking across them. Society faces several social challenges, such as climate and environmental changes, demographic changes, demands for more and better welfare and health benefits, and increased globalization. The report suggests that solutions can be found by thinking across the boundaries of economics, technology, cultural understanding, natural sciences, design, branding, medical science, IT, language, and innovation.

Darling-Hammond, L. (Ed.). (2014). *Next generation assessment: Moving beyond the bubble test to support 21st century learning*. San Francisco, CA: Jossey-Bass.

This book is intended as a resource for those interested in the most current research about how to create valid and reliable performance assessments. It explains how educators can improve practice by developing, using, and scoring performance assessments.

Darling-Hammond, L., Barron, B., Pearson, D., Schoenfeld, A., Stage, E., Zimmerman, T., Cervetti, G., & Tilson, J. (2008). *Powerful learning: What we know about teaching for understanding*. San Francisco, CA: Jossey-Bass.

In this book, the authors offer a clear, comprehensive, and engaging exploration of the most effective classroom practices. They use practical terms to describe teaching strategies that generate meaningful K–2 student understanding, and occur both within the classroom walls and beyond. They illustrate how students who are taught well are able to think critically, employ flexible problem solving, and apply learned skills and knowledge to new situations.

Darling-Hammond, L., Herman, J., Pellegrino, J., Abedi, J., Aber, L., Baker, E., … Steele, C. (2013). *Criteria for high-quality assessment*. Stanford, CA: Stanford Center for Opportunity Policy in Education.

This report provides a set of criteria for high-quality student assessments based on the changing demands of today's workforce, advances in other nations, and original analysis. These criteria can be used by assessment developers, policy makers, and educators as they work to create and adopt assessments that promote deeper learning of 21st-century skills that students need to succeed in today's knowledge-based economy. The five criteria include assessment of higher-order cognitive skills; high-fidelity assessment of critical abilities; assessments that are internationally benchmarked; use of items that are instructionally sensitive and educationally valuable; and assessments that are valid, reliable, and fair.

Davies, A. (2011). *Making classroom assessment work*. Bloomington, IN: Solution Tree Press.

In this book, the author combines ideas with practical strategies to implement quality classroom assessment. Teachers are encouraged to use assessment *for* learning to guide instruction, provide feedback, collect evidence of learning, present evidence of success, and produce accurate standards-based report cards.

Doyle, S. (2012). *Critical thinking: A concept paper* [Paper written for the BC Ministry of Education].

This paper explores the concept of critical thinking as presented in recent literature. It examines the following questions: What is critical thinking? How does it develop over time? What conclusions can we draw about how critical thinking should be addressed in curriculum and assessment?

Dweck, C.S. (2006). *Mindset: The new psychology of success*. New York, NY: Random House.

The author examines how one's established attitudes affect all aspects of one's life, providing an explanation of the differences between fixed and growth mindset, and stressing the need to be open to change in order to achieve fulfillment and success.

Education Scotland. (2013). *The purpose of the curriculum*. Retrieved from http://www.educationscotland.gov.uk/thecurriculum/whatiscurriculumforexcellence/thepurpose ofthecurriculum/index.asp

Scotland Education suggests that the purpose of the curriculum can be encapsulated in four capacities: to enable each child or young person to be a successful learner, a confident individual, a responsible citizen, and an effective contributor. The webpage provides a description of each of these capacities.

Elder, L. (2010, November 25). Achieving critical mass. *Times Higher Education*. Retrieved from
http://www.timeshighereducation.co.uk/story.asp?storyCode=414351&sectioncode=26

The author argues that teachers should embed critical thinking in the heart of the curriculum. Steps would include choosing a conception that is systematic, integrated, trans-disciplinary and based in intellectual but non-technical language; choosing a conception that fosters traits of mind, as well as intellectual abilities; committing to the very long run; and reaching for deep administrative commitment.

Epstein, R., Schmidt, S.M., & Warfel, R. (2008). Measuring and training creativity competencies: Validation of a new test. *Creativity Research Journal, 20*(1), 7–12.

The authors explore two studies with a total of over 300 participants using the Epstein Creativity Competencies Inventory for Individuals. In the first of these studies, the test was shown to be a valid predictor of two measures of creative expression. The test is derived from empirical research on the creative process in individuals, which suggests that creative expression can be accelerated through the strengthening of any of four measurable, trainable competencies: capturing (preserving new ideas as they occur), challenging (taking on difficult tasks), broadening (seeking knowledge and skills outside one's current areas of expertise), and surrounding (seeking out new stimuli or combinations of stimuli). In the second study, training such competencies improved test scores and led to a significant increase in creative output.

Erickson, L.H. (2007). *Concept-based curriculum and instruction for the thinking classroom*. Thousand Oaks, CA: Corwin Press.

The author of this book suggests that when curriculum and instruction require students to process factual information through the conceptual level of thinking, they demonstrate greater retention of factual information, deeper levels of understanding, and increased motivation for learning.

Erickson, L.H. (2008). *Stirring the head, heart, and soul: Redefining curriculum, instruction, and concept-based learning* (3rd ed.). Thousand Oaks, CA: Corwin Press.

The book describes a curriculum design for quality instruction and provides practical structures, planning tools, and specific classroom examples of effective teaching strategies to help students analyze and synthesize information for a deep understanding of big ideas.

Erikson, L.H., & Lanning, L.A. (2013). *Transitioning to concept-based curriculum and instruction.* Thousand Oaks, CA: Corwin Press.

In this book, the authors demonstrate how, through concept-based curriculum, a teacher can move beyond superficial coverage and lower-level skills practice to effect intellectually engaging pedagogy, where students engage in problem finding and problem solving. Insights include how to design and implement concept-based curriculum and instruction across all subjects and grade levels, and why content and process are two different (but equally important) aspects of any effective concept-based curriculum.

Foundation for Critical Thinking. (n.d.). *The critical thinking community.* Retrieved from
http://www.criticalthinking.org/

The International Center for the Assessment of Higher Order Thinking (ICAT) was founded to help colleges and universities design cost-effective ways to evaluate students' critical thinking abilities. ICAT provides assessment tools that 1) evaluate students' critical thinking skills, and 2) evaluate course designs. The resulting assessment includes a profile of students' reasoning abilities that can be effectively used not only as a benchmark against which progress can be measured, but also as a practical guide for critical thinking instruction.

Gini-Newman, G., & Case, R. (2015). *Creating thinking classrooms: Leading educational change for a 21st century world*. Burnaby, BC: Simon Fraser University.

In this book, the authors identify key contradictions and paradoxes and offer clear directions for bringing about meaningful change in schools in order to meet the demands of the 21st-century education. They offer a coherent response to the demands that teachers and administrators are facing.

Groff, J. (2012). *Practitioner guide from the Innovative Learning Environments Project: How can the learning sciences inform the design of 21st century learning environments?* Based on Dumont, H., Istance, D., & Benavides, F. (Eds.). (2010). *The nature of learning: Using research to inspire practice*. Organisation for Economic Co-operation and Development, and Centre for Educational Research and Innovation. Retrieved from http://www.oecd.org/edu/ceri/50300814.pdf

This guide presents what research has to say about how to optimize learning in classrooms, schools and other settings. It aims, first and foremost, to inform practice and educational reform. It will be of particular interest to teachers, education leaders, teacher educators, advisors, and decision makers, as well as the research community.

Halbert, J., & Kaser, L. (2013). *Spirals of inquiry: For equity and quality*. Vancouver, BC: BC Principals' and Vice-Principals' Association.

This handbook provides specific inquiry tools, research evidence, and examples from practice in BC schools, to help shift thinking and practice. Created in association with the BC Principals and Vice-Principals' Association.

Hargreaves, D. (2006). *Personalising learning 6: The final gateway: School design and organisation*. London, England: Specialist Schools and Academies Trust.

This pamphlet (one in a series) aims to show how the final gateway to personalizing learning — school design and organization — brings the other eight gateways together, and sets out an approach to addressing the challenges of school transformation.

Harpaz, Y., & Lefstein, A. (2000). Communities of thinking. *Educational Leadership, 58*(3). Retrieved from http://yoramharpaz.com//pubs/en_thinking/cot-in-educational-leadership.pdf

This article focuses on the nature of questioning and how the culture of questioning encourages creativity and leads to deeper understanding. The authors describe the initiation of the Community of Thinking school-reform program.

Hattie, J. (2011). *Visible learning for teachers: Maximizing impact on learning*. New York, NY: Routledge.

This book states that visible learning is not a recipe for success, not a new teaching method, not a professional development series, nor a band-aid remedy for what ails education in this new century. It is a way of thinking: "My role, as teacher, is to evaluate the effect I have on my students, to understand this impact, and to act on this knowing and understanding." Visible learning requires teachers to gather defensible and dependable evidence from many sources, and to hold collaborative discussions with colleagues and students about this evidence, thus making the effect of their teaching visible to themselves and to others.

Hess, K. (2004). *Vertically articulated content standards: Lessons learned.* Dover, NY: National Center for the Improvement of Educational Assessment. Retrieved from http://www.nciea.org/publication_PDFs/RILS_KH04.pdf

In this presentation, Hess outlines how to design developmentally appropriate grade-level expectations. From lessons learned in the design process, she notes some lessons learned that should be helpful to others who are engaged in the process for their individual schools or students. Lessons include the following: begin with some essential assumptions, validate the grade level development criteria, build protocols to support design, and notice how grade-level expectations change across grades.

Hess, K. (2012). *Using a research-based learning progression schema in the design of performance-based assessment tasks and interpretation of student progress*. Underhill, VT: Educational Research in Action. Retrieved from http://media.wix.com/ugd/5e86bd_ce985313c2a840568ee282dd4c0a5171.pdf

This report outlines a process for developing project-based assessment. The team reviewed learning progressions and student work analysis to help teachers better understand how learning could be facilitated over time with targeted instruction. In the areas of reading, writing, language use, and complexity of text structures, research-based learning progressions provided guidance for planning instruction, developing formative tools and performance assessments, and interpreting student performance. Analyzing student work drawn from assessment evidence to understand how learning progresses is noted as a key factor in effective collaborative planning, more focused instruction, and targeted formative assessment use.

Hess, K. (2013). *A guide for using Webb's Depth of Knowledge with Common Core State Standards.* Common Core Institute. Retrieved from https://education.ohio.gov/getattachment/Topics/Teaching/Educator-Evaluation-System/How-to-Design-and-Select-Quality-Assessments/Webbs-DOK-Flip-Chart.pdf.aspx

This guide was developed by the author for the Common Core Institute. It consolidates numerous tools that educators use to implement Webb's Depth of Knowledge (DOK) for curriculum and assessment. The examples are drawn from several classroom-tested DOK tools.

Hess, K., Carlock, D., Jones, B., & Walkup, J. (2009). *What exactly do "fewer, clearer, and higher standards" really look like in the classroom: Using a cognitive rigor matrix to analyze curriculum, plan lessons, and implement assessments*. Retrieved from http://schools.nyc.gov/NR/rdonlyres/D106125F-FFF0-420E-86D9-254761638C6F/0/HessArticle.pdf

In this article, the authors use two widely accepted measures of cognitive rigour — Bloom's Taxonomy of Educational Objectives and Webb's Depth-of-Knowledge Levels — to define cognitive rigour and present a matrix that integrates these models as a strategy for analyzing instruction and influencing teacher lesson planning.

Hipkins, R. (2006). *The nature of key competencies: A background paper.* Wellington, NZ: New Zealand Council for Educational Research. Retrieved from http://www.nzcer.org.nz/system/files/nature-of-k-round-paper.pdf

This paper explores the nature of the five key competencies proposed in the draft of New Zealand's revised national curriculum. The purpose of the paper is to contribute to the development of a shared understanding of the nature of the five key competencies: thinking; relating to others; using language, symbols, and texts; managing self; and participating and contributing, as they have now been described, by those who work in or with the school sector.

Hipkins, R. (2010). *More complex than skills: Rethinking the relationship between key competencies and curriculum content.* Wellington, NZ: New Zealand Council for Educational Research. Retrieved from http://www.nzcer.org.nz/research/publications/more-complex-than-skills

Drawing on the New Zealand experience, this paper outlines two possible implementation pathways for key competencies. The "skills" pathway could lead to modest improvements in teaching and learning but is unlikely to achieve longer-term goals such as strengthening citizenship, enhancing creativity, and fostering lifelong learning. The "participatory" pathway could support longer-term goals, as students are challenged to use knowledge, not just get it. Following this pathway requires a rethinking of how curriculum content is used, with implications for what is seen as evidence of learning. The paper draws on several common science topics and two of the key competencies as they were developed for the New Zealand curriculum (Thinking; Using Language, Symbols and Texts).

Jacobs, H.H. (Ed.). (1989). *Interdisciplinary curriculum.* Alexandria, VA: Association for Supervision and Curriculum Development.

To make interdisciplinary teaching and learning accessible for all, the authors describe a variety of curriculum integration options. They offer suggestions for choosing proper criteria for successful curriculum integration, dealing with the attitudes of key individuals and groups, and establishing validity. They also present a step-by-step approach to integration, proceeding from selection of an organizing centre to a scope and sequence of guiding questions to a matrix of activities for developing integrated units of study. The book also illuminates the value of higher-order thinking and learning skills and provides a vehicle for their integration into curriculum. The author's practical approach provides a valuable resource to help educators successfully integrate interdisciplinary learning.

Jacobs, H.H. (Ed.). (2010). *Curriculum 21: Essential education for a changing world*. Alexandria, VA: Association for Supervision and Curriculum Development.

This book makes a powerful case for overhauling, updating, and injecting life into the K–12 curriculum to transform schools into contemporary learning organizations. It includes the collective wisdom of 10 educational content and assessment experts — leaders who provide insight into program structures, technology, media literacy, globalization, sustainability, and habits of mind.

Kuhn, D. (2008). *Education for thinking.* Cambridge, MA: Harvard University Press.

In this book, the author presents the view that schools need a thinking curriculum that teaches students important reasoning skills and that engages students in activities worth doing. She suggests that the core of a thinking curriculum should be the use of inquiry and argument to investigate complex problems, since these activities are engaging and develop skills that will be valuable for the rest of a student's life.

Langer, J.A., Confer, C., & Sawyer, M. (1993). *Teaching disciplinary thinking in academic coursework*. Albany, NY: National Research Center on Literature Teaching and Learning.

This paper reviews a study that examined the language and interactions that occurred in classes where teachers felt they were providing an environment that fostered the teaching of reasoning skills as part of their coursework. In each discipline, the teachers' instructional styles differed, with one placing more emphasis on the content and the other on the students' ways of thinking about that content. Results indicated that (1) reasoning was taught and learned in academic classes; (2) such reasoning was subject-specific and embedded in the pragmatic routines of subject-driven lessons; (3) the specifications of such reasoning were implicit and therefore unavailable for overt use in lesson planning or as strategic knowledge to be taught; (4) this kind of discipline-specific reasoning may or may not be sufficient for successful participation in disciplinary learning; and (5) certain types of pedagogical approaches or styles may inhibit or support such discipline-appropriate thinking.

Lipman, M. (2003). *Thinking in education*. Cambridge, UK: Cambridge University Press.

In this book, the author states that education should be structured around communities of inquiry in order to teach students the skills of reasoning and good judgment. Lipman argues that these communities of inquiry should be built around questioning and problem solving in order to actively engage students in exploration and learning.

Lucas, B., Claxton G., & Spencer, E. (2013). *Progression in student creativity in school: First steps towards new forms of formative assessments* (OECD Education Working Papers, No. 86). Retrieved from http://dx.doi.org/10.1787/5k4dp59msdwk-en

In this paper, the authors offer a five-dimensional definition of formative assessment. The paper suggests a theoretical underpinning for defining and assessing creativity, and provides a number of practical suggestions as to how creativity can be developed and tracked in schools. Two clear benefits of assessing progress in the development of creativity are identified: 1) teachers are able to be more precise and confident in developing young people's creativity, and 2) learners are better able to understand what it is to be creative.

Manitoba Education and Training. (1997). *Curricular connections: Elements of integration in the classroom: A Resource for Kindergarten to Senior 4 Schools*. Winnipeg, MB: Manitoba Education and Training.

This curriculum document outlines how student learning outcomes may elaborate on connections with other areas of learning, such as other subject areas or community/home experiences. It also includes specific suggestions for connections.

Marzano, R. (Ed.). (2009). *On excellence in teaching*. Bloomington, Indiana: Solution Tree Press.

This book brings together the ideas and recommendations of many internationally renowned leaders in education working to help students make achievement gains. The authors provide a conceptual framework and offer strategies for improving instruction.

Masters, G. (2013). Reforming educational assessment: Imperatives, principles and challenges. *Australian Educational Review, 57,* 1–68.

This article reviews research into assessment, especially in schools. It analyzes the pivotal role of assessment in learning and argues for its reconceptualization by practitioners and policy makers to better support learning.

Mathison, S., & Freeman, M. (1998). *The logic of interdisciplinary studies.* Albany, NY: National Research Center on English Learning & Achievement. Retrieved from http://www.albany.edu/cela/reports/mathisonlogic12004.pdf

This paper describes the arguments, justification, and reasoning for using interdisciplinary approaches in school curriculum. The main focus is on frameworks, justifications, and reasons that may be built in part on empirical evidence but also on assumptions about teaching and learning.

McTighe, J., & Wiggins, G. (2013). *Essential questions: Opening doors to student understanding* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

In this book, the authors explain how posing "essential questions" helps teachers target standards as they organize curriculum content into coherent units that yield focused and thoughtful learning.

Miller, D. (2008). *Teaching with intention: Defining beliefs, aligning practice, taking action*. Portland, ME: Stenhouse.

In this book, the author states that effective, intentional teaching begins with a strong set of beliefs. Many teachers struggle to make sure that their classroom practice consistently reflects their core convictions, so they are encouraged to develop their own belief statements about teaching and learning. She reminds educators that truly transformative teaching is built from the ground up, and is rebuilt every year, by every teacher, in every classroom, with every new group of students.

National Education Association (NEA). (2010). *Preparing 21st century students for a global society: An educator's guide to the "four Cs."* Retrieved from http://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf

NEA developed this guide to encourage more members and leaders to incorporate critical thinking, communication, collaboration, and creativity into their own K–12 instruction.

Naylor, C. (2011). *21st century learning: Widening the frame of focus and debate: A BCTF research discussion paper*. Retrieved from http://www.bctf.ca/uploadedFiles/Public/Issues/21CL/21CL-DiscussionPaper.pdf

This paper adds to the discussion about 21st-century learning in British Columbia.

Ontario Institute for Studies in Education (OISE) & Canadian Education Association (CEA). (2011). *The Facts on Education: Should students be allowed to fail?* Retrieved from http://www.cea-ace.ca/publication/facts-education-should-students-be-allowed-fail

Research over the past 100 years clearly shows that grade retention does not benefit students experiencing academic or social adjustment difficulties, compared with similar students who are not held back to repeat a grade. In fact, grade retention has consistently been associated with negative outcomes, such as students who are required to repeat a grade being more likely to drop out of high school and less likely to attend post-secondary education. Grade retention is one of the most powerful predictors of dropping out of high school, regardless of when retention occurs, and retained students experience lower self-esteem and lower rates of school attendance. While some parents and teachers continue to believe retention is a viable option, no studies have been able to predict accurately which students will benefit from being retained, and the overall evidence is strongly against retention. Researchers advocate alternatives to grade retention, such as early intervention when students experience difficulties, reading programs, summer school, and tutoring, while working closely with parents.

Organisation for Economic Co-operation and Development (OECD). (2005). *The definition and selection of key competencies: Executive summary.* Retrieved from http://www.oecd.org/pisa/35070367.pdf

This document summarizes the results of the OECD's "Definition and Selection of Competencies" project, which provides a framework that can guide the longer-term extension of Programme for International Student Assessment (PISA) assessments into new competency domains.

Organisation for Economic Co-operation and Development. (2013). *PISA 2015: Draft mathematics framework*. Retrieved from http://www.oecd.org/pisa/pisaproducts/Draft PISA 2015 Mathematics Framework.pdf

This draft framework provides the theoretical background for the 2015 PISA mathematics assessment. It includes a definition of mathematical literacy and how this construct will be assessed.

Organisation for Economic Co-operation and Development. (2013). *Synergies for better learning: An international perspective on evaluation and assessment*. Retrieved from http://www.oecd.org/edu/school/synergies-for-better-learning.htm#2

This report compares the experience of 28 OECD countries, analyzes the strengths and weaknesses of different approaches, and offers policy advice on using evaluation and assessment to improve the quality, equity, and efficiency of education. It draws on a major study, the *OECD Review on Evaluation and Assessment Frameworks for Improving School Outcomes*.

Parsons, J., & Beauchamp, L. (2012). *From knowledge to action: Shaping the future of curriculum development in Alberta*. Edmonton, AB: Alberta Education. Retrieved from https://open.alberta.ca/dataset/bc0bd7df-2bfe-4b8b-8af0-db19b17a7721/resource/5f11d83e-3074-408b-bff7-bcc27987864a/download/5976960-2012-From-Knowledge-Action-Curriculum-Development-Alberta.pdf

This report presents research findings (the theory, quantitative and qualitative studies, and promising and innovative practices) from Alberta, Canada, and around the world related to curriculum and its development.

Partnership for 21st Century Skills. (2009). *Skills framework*. Retrieved from http://www.p21.org/our-work/p21-framework

This framework presents a holistic view of 21st-century teaching and learning that combines a discrete focus on 21st-century student outcomes with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century.

Paul, R., & Elder, L. (2012). *The nature and functions of critical and creative thinking*. Tomales, CA: Foundation for Critical Thinking.

This book elaborates on the essential idea that intellectual discipline and rigour are at home with originality and productivity, and also that these supposed poles of thinking (critical and creative thought) are inseparable aspects of excellence of thought. As one engages in high-quality thought, the mind must simultaneously produce and assess, both generating and judging the products it fabricates. Therefore, sound thinking requires both imagination and intellectual standards.

Pellegrino, J.W., Chudowsky, N., & Glaser, R. (Eds.). (2001). *Knowing what students know: The science and design of educational assessment.* Washington, DC: National Academies Press.

This report looks at classroom and large-scale assessments as they are used for the purposes of assisting learning, measuring individual achievement, and evaluating programs. The authors argue that it is essential to understand that one type of assessment does not fulfill all purposes. They offer three pillars supporting all assessments: a model of how students represent knowledge and develop competence in a subject domain, tasks that allow observation of students' performance, and a method for drawing inferences from students' performance.

Pellegrino, J.W., & Hilton, M. (Eds.). (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century*. Washington, DC: National Academies Press. Retrieved from https://www.nap.edu/catalog/13398/education-for-life-and-work-developing-transferable-knowledge-and-skills

The Committee on Defining Deeper Learning and 21st Century Skills defines 21st-century learning and its educational implications, stating that in the face of economic, environmental, and social challenges, education is even more critical. Children can meet future challenges if their schooling and informal learning activities prepare them for adult roles as citizens, employees, managers, parents, volunteers, and entrepreneurs. To achieve their full potential as adults, young people need to develop a range of skills and knowledge that facilitate mastery and application of English, mathematics, and other school subjects. Business and political leaders are increasingly asking schools to develop skills such as problem solving, critical thinking, communication, collaboration, and self-management.

Perie, M., & Huff, K. (2016). Determining content and cognitive demand for achievement tests. In S. Lane, M.R. Raymond, & T.M. Haladyna (Eds.), *Handbook of test development* (2nd ed.) (pp. 119–143). New York, NY: Routledge.

In this chapter, the authors explain the process and value of creating performance-level descriptors to support the development of assessments that can discriminate across performance levels.

Perkins, D.N. (2010). *Making learning whole: How seven principles of teaching can transform education*. Hoboken, NJ: Jossey-Bass.

This book introduces a practical and research-based framework for teaching. The author describes how teaching any subject at any level can be made more effective if students are introduced to the "whole game," rather than isolated pieces of a discipline. Perkins explains how learning academic subjects should be approached like learning baseball or any game, and he demonstrates this with seven principles for making learning whole: from making the game worth playing (emphasizing the importance of motivation to sustained learning), to working on the hard parts (the importance of thoughtful practice), to learning how to learn (developing self-managed learners).

Pink, D.H. (2009). *Drive: The surprising truth about what motivates us*. New York, NY: Riverhead.

In this book, the author explains that the secret to high performance and satisfaction in today's world is the deeply human need to direct our own lives, to learn and create new things, and to do better by ourselves and our world. Drawing on four decades of scientific research on human motivation, he exposes the mismatch between what science knows and what business does — and how that affects every aspect of our lives. He argues that while the old-fashioned approaches worked in the 20th century, they are precisely the wrong way to motivate people for today's challenges.

Planche, B. (2012). *The imperative of integrated learning*. Toronto, ON: York Region District School Board. Retrieved from http://www.yrdsb.ca/Programs/PLT/Quest/Documents/2012PlancheArticle.pdf

In this paper, the author explores the notion that no matter what systemic enhancements are made to improve planning, implementation, and assessment processes as a part of striving for more precision, we must remind ourselves that it is the individual learner who learns. Integrating learning requires educators to consider both content and learning processes for individual learners. Contextualized and connected learning includes capitalizing on real-world

contexts for learning and integrating emerging technologies as appropriate. The author also states that it is helpful to reflect on what has been learned from a considerable body of work regarding brain-compatible learning, as integrated learning and brain-compatible learning increasingly appear to be one and the same.

Politano, C., & Paquin, J. (2000). *Brain-based learning with class*. Winnipeg, MB: Portage & Main Press.

This book provides a practical view of Eric Jensen's 10 principles for teaching and learning: uniqueness, assessment, emotions, meaning, multi-path, brain-body, memory, nutrition, cycles and rhythms, and elimination of threat.

Popham, W.J. (2008) *Transformative assessment*. Alexandria, VA: Association for Supervision and Curriculum Development.

In this book, the author discusses the role that formative assessment can play in transforming education into a more powerful and positive process. He clarifies what formative assessment really is, why it's right for a school or classroom, and how to use this approach to improve teaching, learning, classroom climate, teacher professional development, and school performance. He describes what a learning progression is and what it isn't and shows how learning progressions are integral to formative assessment.

Premier's Technology Council. (2010). *Premier's technology council: A Vision for 21st century education.* Vancouver, BC: Author. Retrieved from http://www.gov.bc.ca/premier/attachments/PTC_vision%20for_education.pdf

According to this report, traditional skills like literacy, numeracy, and critical thinking need to be applied in different ways and supplemented with new skills and attributes in order for students to become full participants in a knowledge-based society.

Raptis, H. (2012). *Conceptualizing creative thinking and innovation* [Paper written for the BC Ministry of Education].

This paper outlines contemporary conceptions of creative thinking and innovation. In addition, it examines the varied ways in which researchers have probed these, the key components that have been identified, and the nature of developmental stages across the lifespan. The paper closes with a brief discussion of implications for schooling.

Raptis, H., & Fleming, T. (2001). Large-scale assessment outcomes in British Columbia, 1876–1999. *Canadian Journal of Education, 29*, 1191–1222.

In this report, the author states that throughout the history of schooling in British Columbia, large-scale student assessment outcomes have traditionally served to inform broader societal goals. Realistically, "assessment of" group learning (as opposed to classroom-based "assessment for" individual learning) will continue as the government's key focus. The authors raise several unanswered questions, such as the scope of assessment practices that include only numeracy and literacy, and the achievement of elementary versus secondary students between 1976 and 1999, questions to move the decades-old debate beyond its current stalemate.

Reclaiming Youth International. (1990). *Circle of Courage.* Retrieved from
https://www.starr.org/training/youth/aboutcircleofcourage

The Circle of Courage is a model of youth empowerment supported by contemporary research, the heritage of early youth work pioneers, and Indigenous philosophies of child care. The model is encompassed in four core values: belonging, mastery, independence, and generosity. The central theme of this model is that a set of shared values must exist in any community to create environments that ultimately benefit all.

Repko, A.F., Newell, W.H., & Szostak, R. (Eds.). (2012). *Case studies in interdisciplinary research.* Thousand Oaks, CA: Sage.

This case study considers research on how to tackle complex problems facing humanity that extend beyond a single disciplinary perspective and require interdisciplinary thinking and research for their resolution. It applies the model of the interdisciplinary research process outlined by author Allen F. Repko to a wide spectrum of challenging research questions. Self-contained case studies, written by leaders in interdisciplinary research and utilizing best-practice techniques in conducting interdisciplinary research, show students how to apply the interdisciplinary research process to a variety of problems.

Riconscente, M.M., Mislevy, R.J., & Corrigan, S. (2016). Evidence-centered design. In S. Lane, M.R. Raymond, & T.M. Haladyna (Eds.), *Handbook of test development* (2nd ed.) (pp. 40–63). New York, NY: Routledge.

The authors of this chapter describe evidence-centred design and provide a framework and an example to support the use of an evidence-centred design in developing valid and reliable assessments about student learning.

Ripley, A. (2013). *The smartest kids in the world — and how they got that way*. New York, NY: Simon & Schuster.

In this book, the author examines how other countries create "smarter" kids. She gets beneath the surfaces of several cultures where virtually all children are learning to make complex arguments and solve problems they've never seen before. They are learning to think and thrive in the modern economy. She follows three American students embedded in a foreign culture for one year. Through these young informants, Ripley meets battle-scarred reformers, sleep-deprived zombie students, and a teacher who earns $4 million a year. Their stories, along with groundbreaking research into learning in other cultures, reveal a pattern of startling transformation: none of these countries had many "smart" kids a few decades ago. Things had changed. Teaching had become more rigorous; parents had focused on things that mattered; and children had bought into the promise of education.

Ritchhart, R., Church, M., & Morrison, K. (2011). *Making thinking visible: How to promote engagement, understanding, and independence for all learners*. San Francisco, CA: Jossey-Bass.

This book offers educators research-based solutions for creating a culture of thinking. The book unravels the mysteries of thinking and its connection to understanding and engagement. It describes diverse learning environments to show how thinking can be made visible at any

grade level and across all subject areas through the use of effective questioning, listening, documentation, and facilitative structures called thinking routines.

Routman, R. (2008). *Teaching essentials: Expecting the most and getting the best from every learner, K–8*. Portsmouth, NH: Heinemann.

Based on her extensive work with students who have excelled against great odds, the author shares the principles and practices that help all students and teachers reach their full potential. She shows teachers and principals how to build an efficient and joyful practice — for example, by designing and implementing lessons and activities in a meaningful context; articulating high expectations for every student, including ELLs and struggling learners, and ensuring that they meet them; and implementing a school-wide coaching model for higher achievement and a more fulfilling collaboration with colleagues.

Royal Commission on Aboriginal Peoples. (1996). *People to people, nation to nation: Highlights from the report of the Royal Commission on Aboriginal Peoples.* Retrieved from http://www.aadnc-aandc.gc.ca/eng/1100100014597/1100100014637

This document introduces some of the main themes and conclusions in the final report of the Royal Commission on Aboriginal Peoples. That report is a complete statement of the Commission's opinions on, and proposed solutions to, the many complex issues raised by the 16-point mandate set out by the government of Canada in August 1991.

Schimmer, T. (2011). *Ten things that matter from assessment to grading*. Toronto, ON: Pearson Canada.

This book provides teachers and school administrators with a simple and accessible framework for getting started with assessment for learning.

Schimmer, T. (2016). *Grading from the inside out: Bringing accuracy to student assessment through a standards-based mindset*. Bloomington, IN: Solution Tree Press.

This book outlines specific steps your team can take to transform grading and reporting school-wide. While the transition to standards-based practices may be challenging, it is essential for effective instruction and assessment. Examples include grading dilemmas, vignettes from teachers and administrators, and ideas for bringing parents on board with change.

Schnellert, L., Widdess, N., & Watson, L. (2015). *It's all about thinking: Creating pathways for all learners in middle years*. Winnipeg, MB: Portage & Main Press.

This article unpacks two professional development initiatives that describe how inquiry co-constructed by and with teachers can take up diversity as generative. For instance, the Aboriginal Early Literacy and Curriculum for All projects involved iterative and critical examinations of practice and opportunities for educators to collaboratively consider and create practices that address contextual and social factors.

Schonert-Reichl, K.A. (2012). *Social and Emotional Learning (SEL) in British Columbia K–12 Curriculum: Competencies of personal responsibility and well-being, and social responsibility* [Paper written for the BC Ministry of Education].

This paper begins with definitions of the SEL competencies as defined by the Collaborative for Academic, Social and Emotional Learning (www.casel.org). The paper provides definitions for the BC Ministry of Education competencies and includes a discussion of why these matter in today's educational and societal climate, along with some of the latest scientific findings that provide an evidence base for the promotion of SEL in classrooms and schools. Recommendations are provided on how the promotion of students' personal responsibility and well-being, and social responsibility can be successfully implemented in BC classrooms and schools are provided.

Silva, E. (2008). Measuring skills for the 21st century. *Education Sector Reports, 11*.

This report is a product of Education Sector's Next Generation of Accountability initiative. The initiative seeks to strengthen public education by examining key elements of accountability — for instance, who should be responsible for student success and how they should be held responsible. Their work seeks to build on the strengths of current school accountability systems; more fully and effectively measure the depth and breadth of students' educational experiences; and encourage educators, parents, policy makers, and the larger public to pursue educational equity and excellence for all students.

Smarter Balanced Assessment Consortium. (2015). *Content specifications for the summative assessment of the Common Core State Standards for mathematics* (revised draft, July 2015). Retrieved from https://www.smarterbalanced.org/wp-content/uploads/2015/08/Mathematics-Content-Specifications.pdf

This draft document illustrates the use of an evidence-centred design to guide the development of a summative assessment.

Soland, J., Hamilton, L.S., & Stecher, B.M. (2013). *Measuring 21st century competencies: Guidance for educators*. Asia Society/RAND Corporation. Retrieved from http://asiasociety.org/files/gcen-measuring21cskills.pdf

This report discusses three broad categories of 21st-century competencies and provides guidelines for selecting assessments that measure these competencies. It also provides some examples of existing assessments.

Sousa, D.A. (2011). *How the brain learns* (4th ed.). Thousand Oaks, CA: Corwin Press.

This book provides information from the field of neuroscience about memory systems, brain organization, how the technology explosion can affect the brain, and the power of transfer, and includes information on topics such as how learning in the arts enhances cognitive processing and creativity.

Stiggins, R., & Chappuis, J. (2012). *An introduction to student-involved assessment for learning* (6th ed.). New York, NY: Pearson.

This book shows how to use assessment to accurately reflect student achievement and how to benefit — not merely grade — student learning. It focuses on integrating assessment with instruction through student involvement in the assessment process.

Torp, L., & Sage, S. (2002). *Problems as possibilities: Problem-based learning for K–12 education* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

This book offers opportunities to learn about problem-based learning (PBL) from a variety of perspectives, including assessing education in and through PBL, with examples from elementary, secondary, and university levels.

Tovani, C. (2011). *So what do they really know?: Assessment that informs teaching and learning*. Portland, ME: Stenhouse.

In this book, the author explores the complex issue of monitoring, assessing, and grading students' thinking and performance with fairness and fidelity. She describes the systems and structure she uses in her own classroom and shows teachers how to use assessments to monitor student growth and provide targeted feedback that enables students to master content goals. The recommendations are realistic and practical.

Wiggins, G., & McTighe, J. (2005). *Understanding by design* (2nd ed.). Alexandria, VA: Association for Supervision and Curriculum Development.

The authors of this book discuss how to create a rigorous and engaging curriculum that focuses on conceptual understanding. The book guides educators in the design of curriculum, instruction, and assessment. The authors also explain the rationale for "backwards design" and explore such key ideas as "essential questions" and "transfer tasks."

Zirbel, E.L. (2006). *Teaching to promote deep understanding and investigate conceptual change*. Retrieved from http://cosmos.phy.tufts.edu/~zirbel/ScienceEd/Teaching-for-Conceptual-Change.pdf

This paper describes what is required to provoke deep understanding and conceptual change in learners. It suggests ways to have students question their inherent conceptual knowledge and to correct misconceptions.