About Learning

A **focus paper** presented by the
Nova Scotia School Boards Association

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NSSBA
Nova Scotia School Boards Association

Key messages about learning

- *Deep learning* is learning that lasts.
- People learn deeply when they participate in experiences that shape how they think, how they feel, and what they can do.
- Most schools today are not designed to give students the experiences they need to learn deeply and to practice the skills for life beyond school.
- Learning environments need to reflect what we know about learning from research in the learning sciences.
- Technology can connect learners and enable learning. It needs to be understood and harnessed.

NSSBA
Nova Scotia School Boards Association

Founded in 1954, Nova Scotia School Boards Association (NSSBA) is the provincial voice for school boards across the province. NSSBA engages with its members and partners to raise awareness of public education in our province while helping students achieve their potential. All of the services offered by NSSBA are designed to enhance the effectiveness of its eight member school boards.

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About this paper

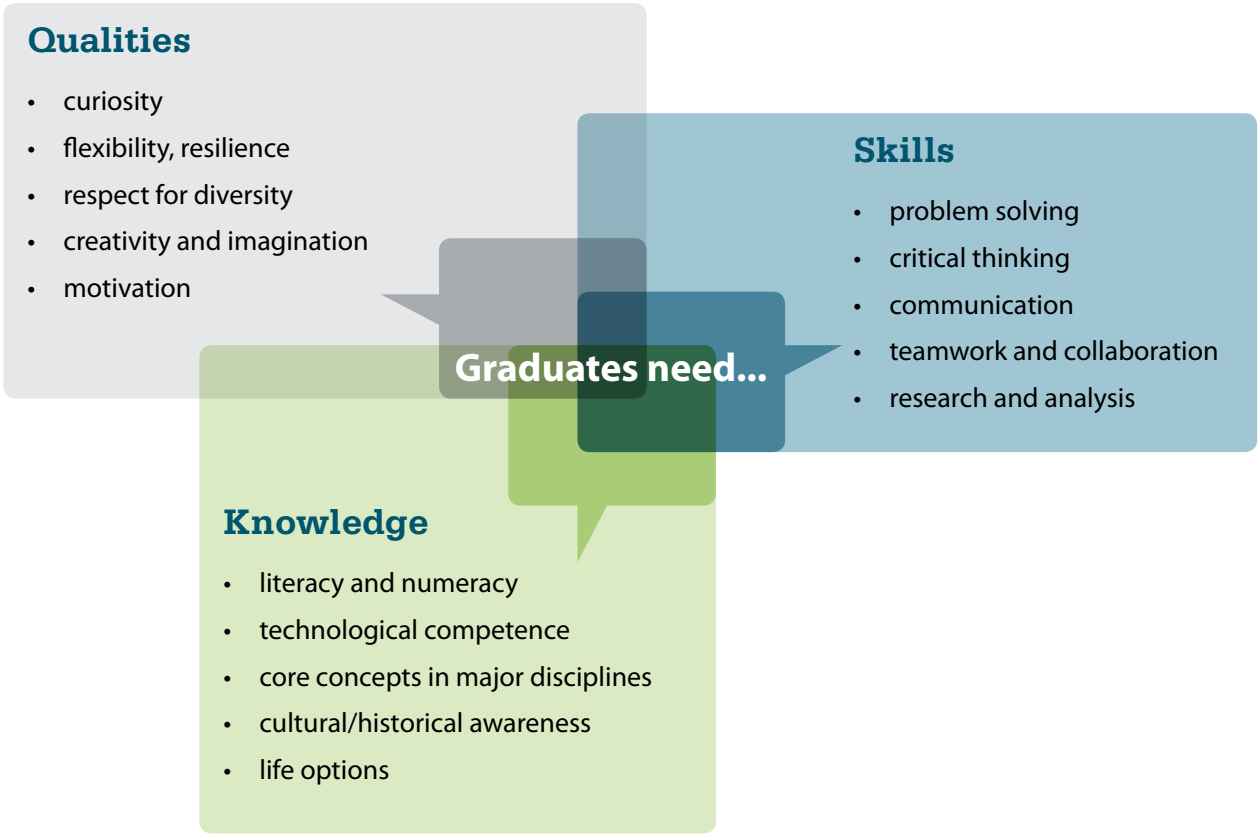
It is a truism to say that learning is at the heart of school. What is less understood is that traditional approaches to teaching and traditional schools limit the opportunities for students to learn deeply and to apply their learning in the world. This paper describes what needs to change in schools to create the conditions for all students to learn what they need and to use what they know.

About Learning is one of four papers in a series published by the Nova Scotia School Boards Association (NSSBA) to inform the Minister's Panel on Education and to engage all Nova Scotians in reimagining public education (see Appendix A). All four papers are available online at **nssba.ca/research-resources.**

Figure 1

Qualities, skill, and knowledge that graduates need

Figure 1 repeats a central message found in all four papers. It describes a concise set of goals or outcomes for public education.



Changing how we do school

The qualities, skills, and knowledge in Figure 1 are not new. Nova Scotians have always valued them—at least for some students. But the following principles raise the bar on public education and challenge us to transform the way we do school:

- *Every* student needs these qualities, skills, and knowledge. They are not just for a high-achieving few.
- All of the qualities, skills and knowledge are important and work together as a foundation for modern living, learning, and earning.
- Qualities are cultivated, skills are acquired, and knowledge is gained through the work that teachers and students create together.

These principles call into question many of the ideas that have traditionally guided program design, grouping of students, and teaching strategies. The traditional view is that learning happens in classrooms under the direction of teachers who use text books as a primary resource. The transformative view is that learning is a social process that involves students and teachers in partnerships with each other and with experts beyond the school, supported by digital technologies (see Figure 2, next page).

No public schools remain totally locked into the traditional view of schooling. Some schools make planned efforts to transform, and pick a place to start—perhaps assessment practices, technology plans, or student engagement. But the old practices often remain alongside efforts to change.

Figure 2 **Comparing traditional and transformative views about school**

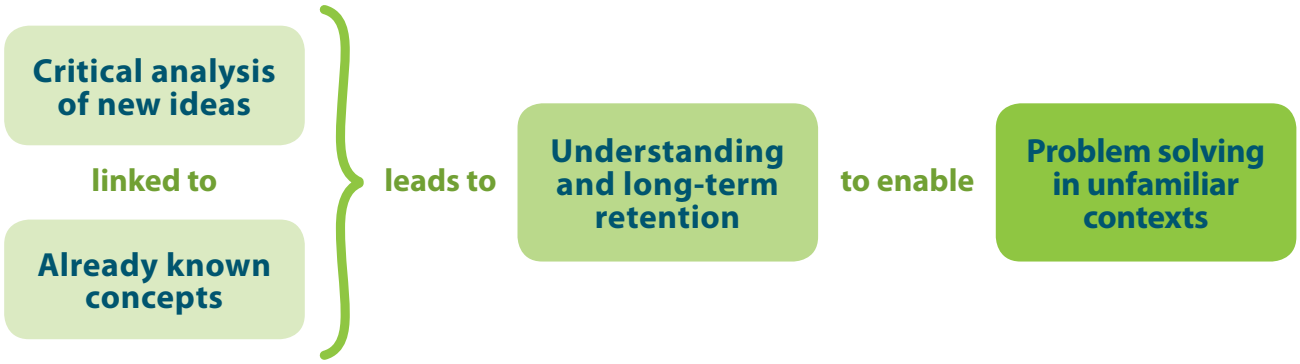
	Traditional View	Transformative View
Learning	• Individual endeavor of the student • Grouping of students for the convenience of teaching	• Learning is a social process • Requires collaboration • Project teams
Teaching	• Teacher is the authority • I teach, you learn • Many curriculum outcomes to be covered	• Teacher is confident and trusted by students • Teachers and students are learning partners • Essential concepts are studied for deep understanding
Assessment	• Marks for tests, assignments and examinations • Right answers	• Standards are set by students and teachers • Ongoing peer and teacher feedback • Variety of solutions to important problems
Resources	• Text books, libraries	• Original and digital resources • Open Internet access
Learning environment	*Physical environment:* • The classroom and other school facilities • Field trips	*Physical environment:* • Any physical location where learning takes place
	Context: • The curriculum and course outline defines what is to be learned • Teacher develops lesson plan • Students are individually responsible for learning	*Context:* • Topics and questions pursued by students require understanding of academic disciplines (e.g., history, math) • Teachers and students co-design investigations • Collaboration results in shared learning
	Culture: • Imposed codes of behavior • Diversity is observed but is not essential to students' work.	*Culture:* • Students and teachers create shared norms within a community of learners • Diversity and inclusiveness are valued

Deep learning for all

The concept of *deep learning* is central to the transformative view of school. Deep learning occurs when students question ideas critically and link them to concepts and principles they already know. Deep learning leads students to understand and use what they learn to solve unfamiliar problems or problems in different contexts. (See Figure 3.)

Figure 3

The process of deep learning



Deep learning involves students in critical thinking, problem solving, and understanding, which are essential skills for all school subjects. Students know when they have learned deeply, and describe it in words like these:

- "I know I've learned because it's a part of me."
- "I know I've learned because I don't need to remember."
- "I know I've learned because I'm changed."

The near-opposite of deep learning is *surface learning* in which students accept information that they are given or that they find on the Internet and memorize facts or basic operations for tests. The facts and operations are isolated pieces of information that have little use and are often quickly forgotten.

The work that we ask students to do and the ways in which we expect them to do it will determine whether a student develops deep understanding or only surface information. The student who says, "I don't need to understand, I only need to pass the test," is not a surface learner by nature. The student is simply acting in a particular context—for example, to prepare for a biology test in which he or she expects to be asked to label a diagram of a cell.

Nova Scotia's "math problem" is not that its 15-year-olds cannot do basic mathematical operations. Most of them can. The problem is that too few of them become competent problem solvers who are able to reason mathematically.[1] The challenge is to find ways for all students to build on what they already know; practice new mathematical concepts; reflect on their learning (think metacognitively); and use their learning to solve real-life problems.

The idea that all students can and should learn deeply runs counter to some pervasive attitudes in schools. Students often complain that the most interesting work at school is reserved for gifted students. Enrichment is offered only to those who already demonstrate their ability to complete good work. Nova Scotia's Discovering Opportunities program upends that thinking and offers inquiry and project-based learning for students who are struggling in junior high school. Parents and students involved in a Discovering Opportunities program have reported success and high satisfaction in interdisciplinary studies, with a high degree of collaboration among the teachers, and challenging projects that use and expand their understanding. But sadly, a student noted, "Some people (in the school) think we are the dumb class."[2] Students who are unsuccessful in traditional classrooms are perhaps only the most obvious casualties of a system that is limiting the potential of all students. It is probable that enriched learning—like the kind some schools now offer to their highest and lowest-achieving students—is what all students need.

As discussed in NSSBA's focus paper, *About Innovation,* the problem is one of scale. In design research, researchers work directly with practitioners to test and refine theories about learning and teaching. Design research has produced exciting results—for example, the theory and practice of knowledge building.[3] Canadians are recognized leaders in design research, but it can be difficult to take the exciting results from small-scale research and apply them on a larger scale. As a deputy minister of education once observed, "show me this (knowledge creation by children in Grades 4-6 in an Ontario school) in 100 schools; then I can think about public policy implications." Public policy requires evidence that a strategy or program can be replicated before it is scaled up to all schools.

1 Pierre Brochu, Marie-Anne Deussing, Koffi Houme, and Maria Chuy, *Measuring up: Canadian Results of the OECD PISA Study. The Performance of Canada's Youth in Mathematics, Reading and Science. 2012 First Results for Canadians Aged 15* (Toronto: Council of Ministers of Education, Canada, 2013), **cmec.ca/Publications/Lists/Publications/Attachments/318/PISA2012_CanadianReport_EN_Web.pdf**.

2 Personal communication. Results of a survey of parents and students.

3 Marlene Scardamalia and Carl Bereiter, "Knowledge Building Environments: Extending the Limits of the Possible in Education and Knowledge Work," in *Encyclopedia of Distributed Learning*, ed. Anna DiStefano, Kjell Erik Rudestam, and Robert Silverman (Thousand Oaks, CA: Sage Publications, 2003), **ikit.org/fulltext/2003_KBE.pdf**.

Teaching for understanding

The emerging consensus about what students need to know and be able to do is supported by calls for new or renewed connections between learning and teaching—a new pedagogy. Teaching is an art, a craft, and a science:

- The **art** of teaching involves caring for and responding to students. It is creative and intuitive.
- The **craft** of teaching involves the skills and practices that teachers apply.
- The **science** of teaching involves research and theoretical underpinnings that help teachers make informed choices when they design work for students.[4]

These features are not exclusive to any particular method of teaching, nor are they new. Fullan and Langworthy[5] say that what is new in pedagogy is the idea of learning partnerships between and among all combinations of people in the learning environment: teachers and students; students and students; and teachers and teachers.

Sharon Friesen of the University of Calgary reflects this idea of partnerships in the five core principles that guide effective teaching: [6]

Core principles

1. Effective teaching practice begins with the thoughtful and intentional design of learning that engages students intellectually and academically.
2. The work that students are asked to undertake is worthy of their time and attention, is personally relevant, and deeply connected to the world in which they live.
3. Assessment practices are clearly focused on improving student learning and guiding teaching decisions and actions.
4. Teachers foster a variety of interdependent relationships in classrooms that promote learning and create a strong culture around learning.
5. Teachers improve their practice in the company of peers.

The learning partnership makes explicit that teaching and learning are reciprocal processes—students learn with teachers and with each other; teachers learn with students and with other teachers. These principles are the foundation of specific learning designs, including:

- problem-based learning
- project-based learning
- inquiry-based learning
- knowledge building

4 Mark K. Smith, "What is Pedagogy?" (2012), in *The Encyclopaedia of Informal Education*, **infed.org/mobi/what-is-pedagogy**.

5 Michael Fullan and Maria Langworthy, *A Rich Seam: How New Pedagogies Find Deep Learning* (London: Pearson, 2014), **michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf**.

6 Sharon Friesen, *What did you do in school today? Teaching Effectiveness: A Framework and Rubric* (Toronto: Canadian Education Association, 2009), **cea-ace.ca/publication/what-did-you-do-school-today-teaching-effectiveness-framework-and-rubric**.

The work that students do is likely to be interdisciplinary, to support student collaboration, and to reach beyond the school walls. High-quality work begins with important questions or problems. In this respect, effective learning designs should not be confused with the types of projects that frustrate many parents and students, where parents are expected to do the project with their kids and sometimes do the whole thing. The value of inquiry learning is in what the students have learned; how committed they are to pursue their own understanding; the quality of their work; and its value to others. It is also evident in the joy that so often accompanies work that students find worthwhile.

The new pedagogies do not promote one teaching method over another. Rather, as Fullan (2014) proposes, they are about *pedagogical capacity*—the capacity of all teachers to select and fully use the right strategy for the learning at hand. In addition to the five principles for effective teaching, Dr. Friesen offers a four-level rubric that can guide principals and teachers in their development of the practices that deeply engage all students in learning.[7] The rubric provides a framework for building greater pedagogical capacity in a school.

7 Friesen, *What Did You Do In School Today? Teaching Effectiveness: A Framework and Rubric.*

Assessment

Assessment of both student and teacher performance are among the most contentious issues in education today. Assessment practices in classrooms are slowly shifting towards clear performance standards designed in partnership with students, who receive feedback and opportunities to continually improve their work. The struggle continues about whether final course marks should be based solely on the quality of the student's work or should also reflect (positively or negatively) the student's track record for attendance and for submitting assignments on time.

The debate about what province-wide assessments actually measure continues, and any discussion about assessing teaching performance rarely leads to fruitful conclusions. Province-wide testing is a limited but necessary way of providing information about the performance of the school system. So far, large-scale testing tells us nothing about the composite set of qualities, skills, and knowledge that we aspire to for all students. It remains to be seen whether large-scale assessments can be developed to accurately and fairly measure the competence of students. One of the yet-to-be-realized potentials of digital environments is the possibility of analyzing the work that students produce to assess the ideas they generate, the skills they demonstrate, and the concepts they use.

Resources and technology

Digital technologies are everywhere in public schools, but they are not necessarily well used.

It is hard to imagine life without the information technologies we use every day at work and at home. They have dramatically altered what we do and how we do it. Whatever the work—policing, construction, manufacturing, medicine, science, or historical research, for example—it likely demands higher thinking skills and technological literacy now than it did 20 years ago. In fact, the easiest jobs to automate (and move offshore) are those with the lowest skill requirements. In education we build information systems, put surveys online, report to the public, and have spent a lot of money to put hardware and software in schools and to make rules about their use. But we have been slow to harness digital wireless technologies to learn.

We need to put textbooks aside, open up the Internet, and let students and teachers use technology for research, analysis, drafting and crafting, and connecting with peers and experts around the world—in short, to do the work of learning. Adaptive technologies that enable students with disabilities to learn with their peers are already showing how this can be done with great effect.

Learning environments

The classroom was once considered to be the centre for learning. Today we understand that learning can occur "at any time in any place." The concept of *learning environment* includes the following:

- any physical space where learning happens
- the context for learning
- the culture in which learning takes place

Physical spaces

The physical spaces where learning happens can include home, the community, a school, or any number of destinations. Students who develop the habits of deep learning carry with them the capacity to learn wherever they go. Even so, schools can support learning by providing physical spaces that are comfortable, well equipped, and designed for the kinds of work that students are expected to do—especially collaborative work.

Context for learning

The context for learning may include, for example: opportunities for collaboration; access to experts; access to technologies; whether the subject is specialized or interdisciplinary; and the product(s) of learning. It can include the time of day or week, and whether learning takes place in a workplace, a school, or in the community. The context creates opportunities and constraints for the learning activities.

Culture

The culture of the learning environment is influenced by the quality of relationships, diversity of participants, and expectations about behavior. A deep and shared commitment to learning, combined with respect for each other and for the community as a whole, creates safe physical and psychological spaces where students can take risks in their learning and reach beyond their own expectations of what is possible. Learning environments like these bring joy and deep satisfaction to students and their teachers.

Call to action

Principals are the instructional leaders of their schools. They can do the following:

- Encourage parents, students, and teachers to talk about the proposed qualities, skills, and knowledge, and explore how to pursue them in the school.
- Support teachers and students as they apply the qualities, skills, and knowledge to transform the school into a centre for deep learning.

School districts have a wider view of the strengths and needs among schools. They can do the following:

- Ensure that stalled or low-performing schools are given principals with strong instructional know-how to lead the development of teaching practices that promote deep learning.
- Organize workgroups of teachers, students, and parents to develop expectations for teaching. (The Education Act requires teachers to hold teaching certificates and to "maintain their professional competence." This is the minimum professional standard of practice and not a benchmark for high-quality practice.)

Appendices

Appendix A — The NSSBA series on shaping a new vision for public education

Discussion paper

Shaping a New Vision for Public Education in Nova Scotia

- Asks questions like these:
  - Why do we need to transform our education system?
  - What do students need to know and be able to do?
  - How do young people acquire the skills, knowledge, aptitudes, and attitudes that will equip them to thrive in a rapidly changing world?
- Introduces ideas about 21st century learning
- Calls on all education partners (students, families, educators, government, and communities) to work together to shape the vision that will guide the transformation

Focus papers

About Engagement

- Describes three dimensions of student engagement: social; institutional; and intellectual
- Focuses on what we know about patterns of student engagement in Canada today; how to engage students in deeper learning; and what we can expect by increasing student engagement

About Learning

- Advocates for deep learning (learning that lasts and is useful)
- Describes the conditions that promote deep learning (changing how we do school)

About Innovation

- Proposes the development of a radically different model of education
- Argues in favour of turning high-performing classrooms and schools into hubs for innovation
- Describes how successful innovations can be replicated (scaling out and scaling up)
- Emphasizes the need for a disciplined approach

All four papers are available online at **nssba.ca/research-resources.**

Appendix B Acknowledgement

The Nova Scotia School Boards Association sincerely thanks Penny Milton for working with our association to write the papers in this series. Ms. Milton has written and presented widely on many aspects of social policy. She is a former, long-serving Chief Executive Officer of the Canadian Education Association (CEA) and former Deputy Minister of the Ontario Premier's Council on Health, Wellbeing and Social Justice. She has supported public education as a teacher, parent, elected school board member, and staff officer with teacher and school board associations. In 2013, she and Debra Pepler conducted the External Review of the Halifax Regional School Board's Support to Rehtaeh Parsons.

Ms. Milton holds a BSc (Hons) from the University of Nottingham, a Certificate in Technical Teaching from Letchworth College, UK, and a Masters in Management from McGill University.

Appendix C Recommended resources

Examples of student work

High School Science Field Study

A discipline-based inquiry that illustrates learning through student research in a real environment (10:58 minutes). (Galileo Educational Network).
galileo.org/classroom-examples/classroom-examples-high-school-science/ecological-field-study

Light—Grade 4

An example of knowledge building by Grade 4 students, illustrating that young children can work with their ideas (theories) and build deep knowledge among their community of peers.
ikit.org/kb_resources/?p=903#more-903

Snakes Are Born This Way

An integrated curriculum experience in which elementary students use dance, song, and percussion to demonstrate their knowledge (1:43 minutes). (Expeditionary Learning, 2012).
vimeo.com/51762436

Websites for professional learning

Expeditionary Learning

An American organization that works with schools to inspire the motivation to learn, engage teachers and students in new levels of focus and effort, and equip students and adults to become leaders of their own learning. Expeditionary Learning schools challenge students—even those starting with low skill levels—with high-level tasks and active roles in the classroom. This model works in urban, rural, and suburban schools and at every grade level.
elschools.org/our-approach

Galileo Educational Network

A Canadian not-for-profit organization dedicated to improving student, teacher, and leader learning by creating and researching 21st century learning environments.
galileo.org

Learning to Inquire—Innovations for Deeper Teaching and Learning

Video describing one school's journey to inquiry-based learning. (Canadian Education Association and Halifax Regional School Board).
cea-ace.ca/video/learning-inquire-innovations-deeper-teaching-and-learning

Networks of Inquiry and Innovation (NOII)

A voluntary, inquiry-based network of schools in British Columbia. Established in 2000 and funded by the BC Ministry of Education, the NOII is designed to improve the quality and equity of education in BC through inquiry, teamwork across roles, schools and districts, as well as a focus on applying coaching forms of assessment to help learners take greater ownership of their learning.
noii.ca

Schools for today

Connect Charter School (formerly Calgary Science School)
A school that promotes innovation and the ongoing development of exemplary learning, teaching, and leadership practices within an active inquiry-based learning community.
fz.calgaryscienceschool.com/wordpress

High Tech High
An integrated network of high schools, middle schools, and elementary schools in California, serving a diverse, lottery-selected student population. All schools embody the design principles of personalization, adult world connection, common intellectual mission, and teacher as designer.
www.hightechhigh.org

Seven Oaks, MET school, Manitoba
A Big Picture Schoolin Manitoba, with the vision that students would take responsibility for their own education.
www.7oaks.org/school/themet/Pages/default.aspx and **bigpicture.org**

Reports

Michael Brooks and Bob Holmes. *Equinox Blueprint: Learning 2030.* (Waterloo: Waterloo Global Science Initiative, 2014).
wgsi.org/equinox-summit/equinox-summit-learning-2030

Michael Fullan and Maria Langworthy. *A Rich Seam: How New Pedagogies Find Deep Learning***.** (London: Pearson, 2014).
michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf

Books

Ron Berger, Leah Rugen, and Libby Woodfin. *Leaders of Their Own Learning: Transforming Schools Through Student-Engaged Assessment.* (Jossey-Bass, 2014).

Eleanor Duckworth. *The Having of Wonderful Ideas: And Other Essays on Teaching and Learning,* 3rd ed. (Teachers College Press, 2006).

National Research Council. *How People Learn: Brain, Mind, Experience, and School: Expanded Edition.* (Washington, D.C.: National Academies Press, 2000).
Available for free download at **nap.edu/download.php?record_id=9853**