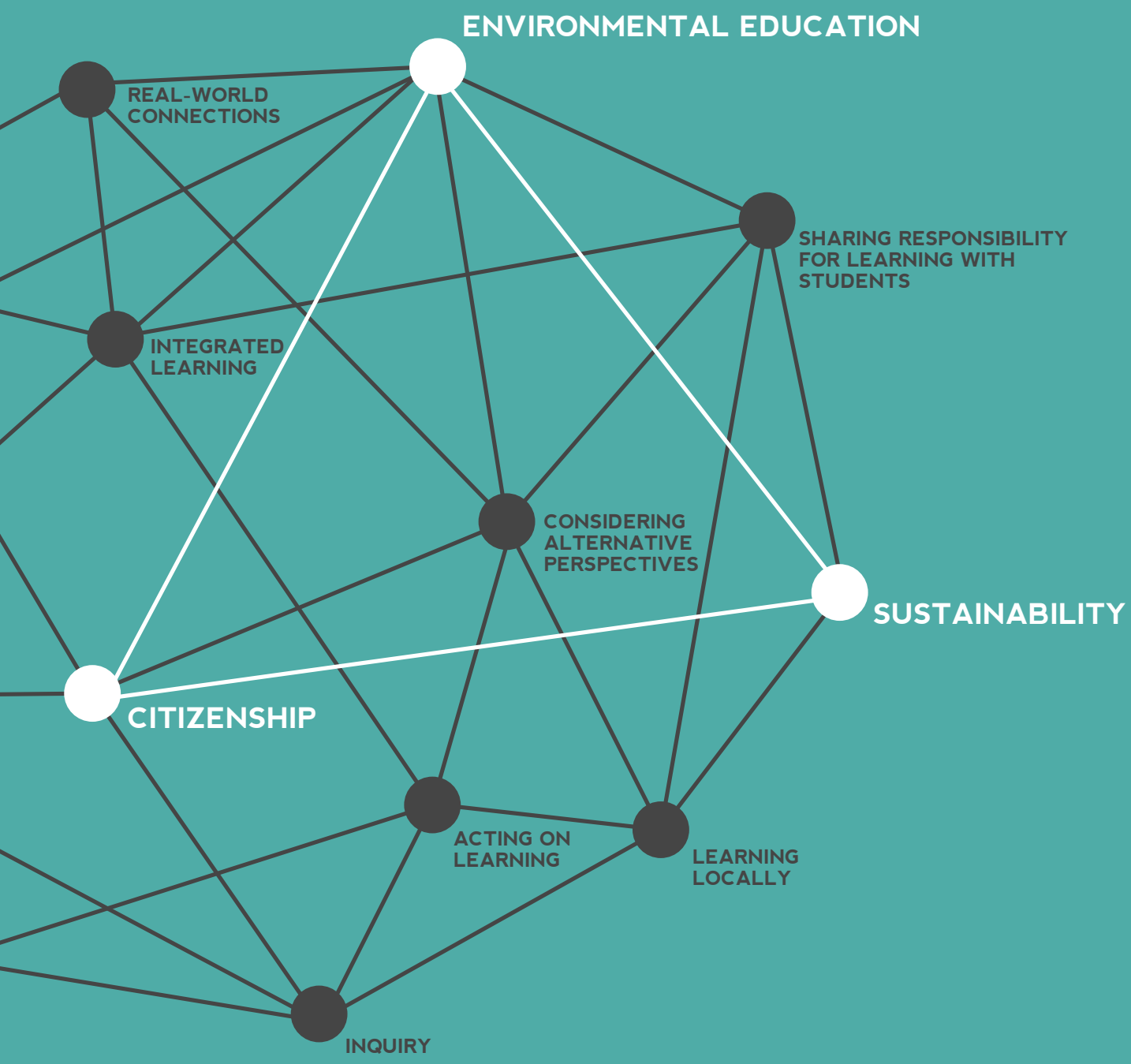
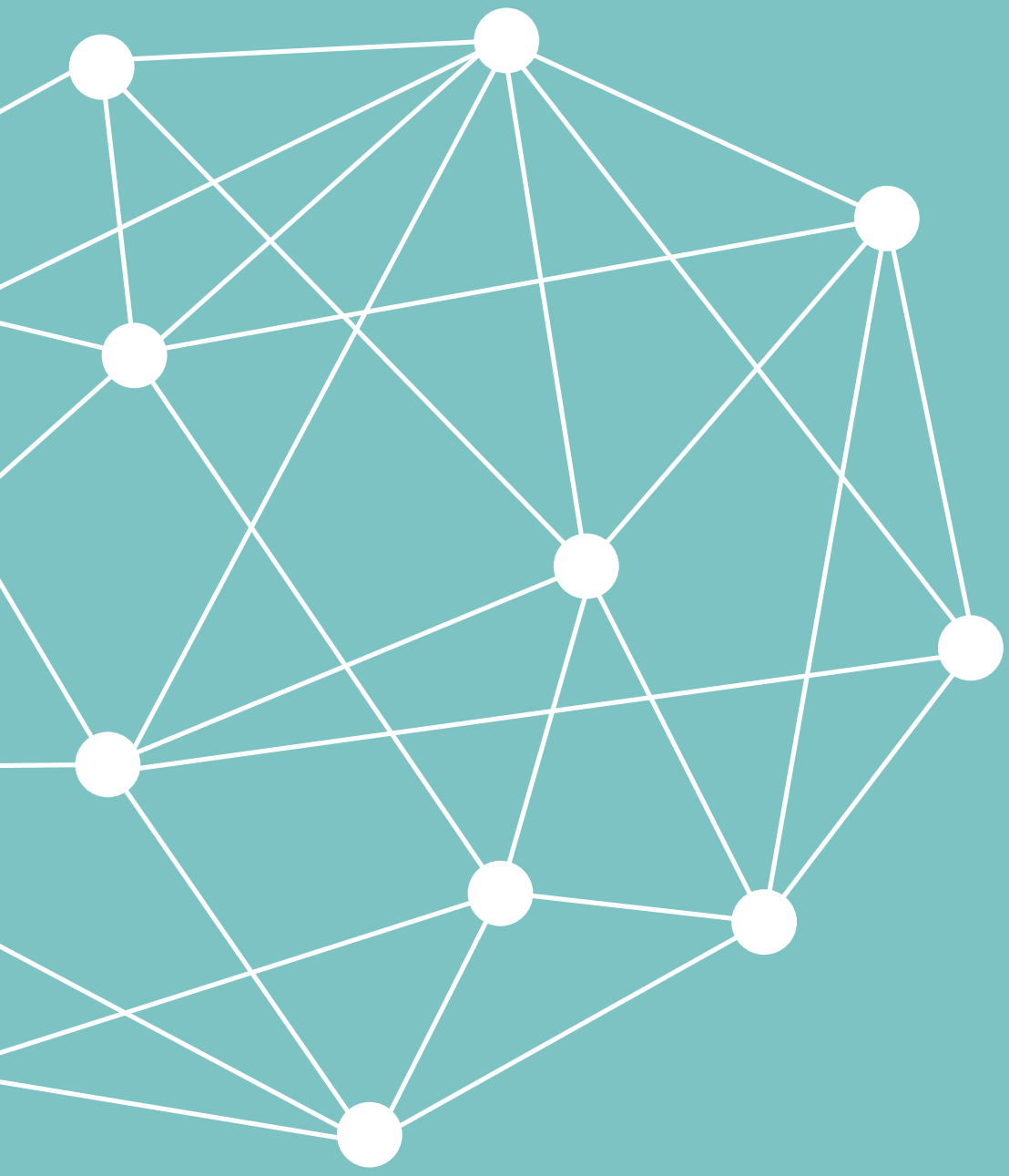


CONNECTING THE DOTS

Key Strategies that Transform Learning for Environmental Education, Citizenship and Sustainability

Stan Kozak
Susan Elliott

Learning for a Sustainable Future
LSF



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Connecting the Dots: Key Strategies That Transform Learning for Environmental Education, Citizenship and Sustainability

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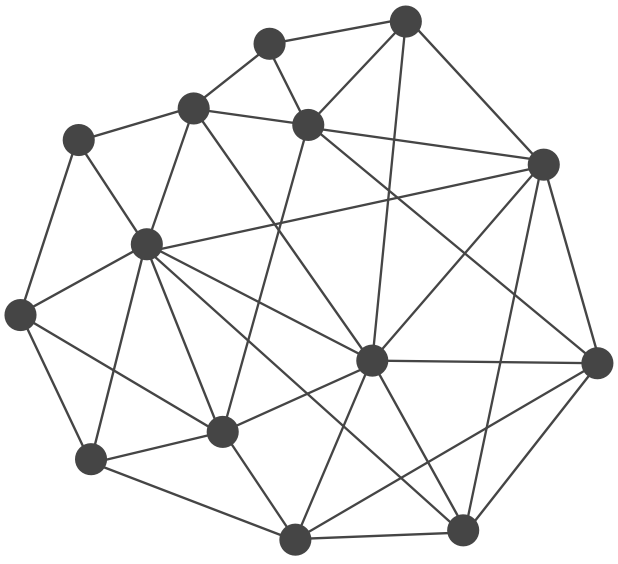

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Acknowledgements

Learning for a Sustainable Future expresses its appreciation for the broad support it has received for its work to transform Canada's education systems to achieve a sustainable future.

This project arose from a need to develop a resource to guide teachers in environmental education. From our research arose this interconnected system of learning. Through our extensive list of citations we have attempted to acknowledge all the sources that have influenced this project and invite updates for any we may have overlooked.

Some of the initial discussions for this project took place at meetings of the Educational Alliance for a Sustainable Ontario (EASO). In this context Cyndie Jacobs of the Ontario Teachers' Federation planted the seed for the title. The comments from members of EASO early in the project are appreciated.

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Support in the production of this document came from Anita Sekharan, who captured the systems perspective in her creation of the initial graphics in an early executive summary. Brandon Kidd took the document from a collection of chapters to one manuscript.

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In keeping with the view that "all ideas can be improved", we acknowledge the comments and questions that have come from the many educators we have been working with in various professional development capacities. Our professional inquiry into understanding the best ways to create learning experiences with and for our students continues. We acknowledge all who have contributed to this collaborative knowledge building of which we are a part and look forward to the exciting contributions that formal learning will make in achieving a sustainable future.

Preface

Never before have the demands placed on education been greater. The world's population has passed the 7 billion mark and continues to grow. Environmental limits are being exceeded. With these pressures in mind, the United Nations designated 2005 to 2014 as the Decade of Education for Sustainable Development. Its mandate is to make "changes to educational practice to best prepare citizens for active participation in democratic governance as a means of addressing the rising economic, social, and environmental challenges…" (UNESCO, 2002).

Connecting the Dots answers the question: what are the learning strategies for environmental education that we can employ to prepare our young people to take their place as informed, engaged citizens? Throughout the process, a secondary line of inquiry emerged: how are these strategies aligned with 21st century learning skills including collaboration, creativity, communication and critical thinking?

We delved into the literature to find strategies that develop the concepts, real-world connections and learning skills that build engaged citizenship. The result is this guide, which shows ways of organizing learning experiences — in other words, the "how to" of learning.

The research reviewed was representative rather than comprehensive, paying considerable attention to:

- Ontario Ministry of Education documents such as *Acting Today Shaping Tomorrow* (http://www.edu.gov.on.ca/eng/teachers/enviroed/action.htmll) and Standards in Environmental Education (http://www.edu.gov.on.ca/eng/teachers/enviroed/standards.html)
- Outdoor Education with particular reference to the Council of Outdoor Education of Ontario and its publication *Pathways* (http://www.coeo.org/)
- Publications from the North American Association of Environmental Education (http://www.naaee.org/)
- Environment as an integrating context literature including http://www.seer.org/pages/eic.html
- Place-based learning literature including http://www.promiseofplace.org/
- Education for Sustainable Development literature including http://portal.unesco.org/education/en/ev.php-URL_ID=27234&URL_DO=DO_TOPIC&URL_SECTION=201.html
- The Centre for Ecoliteracy (http://www.ecoliteracy.org)
- The rich source of experiences and perspectives from *Green Teacher Magazine* (http://greenteacher.com/) and the no longer published *Clearing Magazine* (http://clearingmagazine.org/)

We believe these strategies represent the best that environmental education has to offer to formal learning. They are the "dots" that connect to form a system approach to learning.

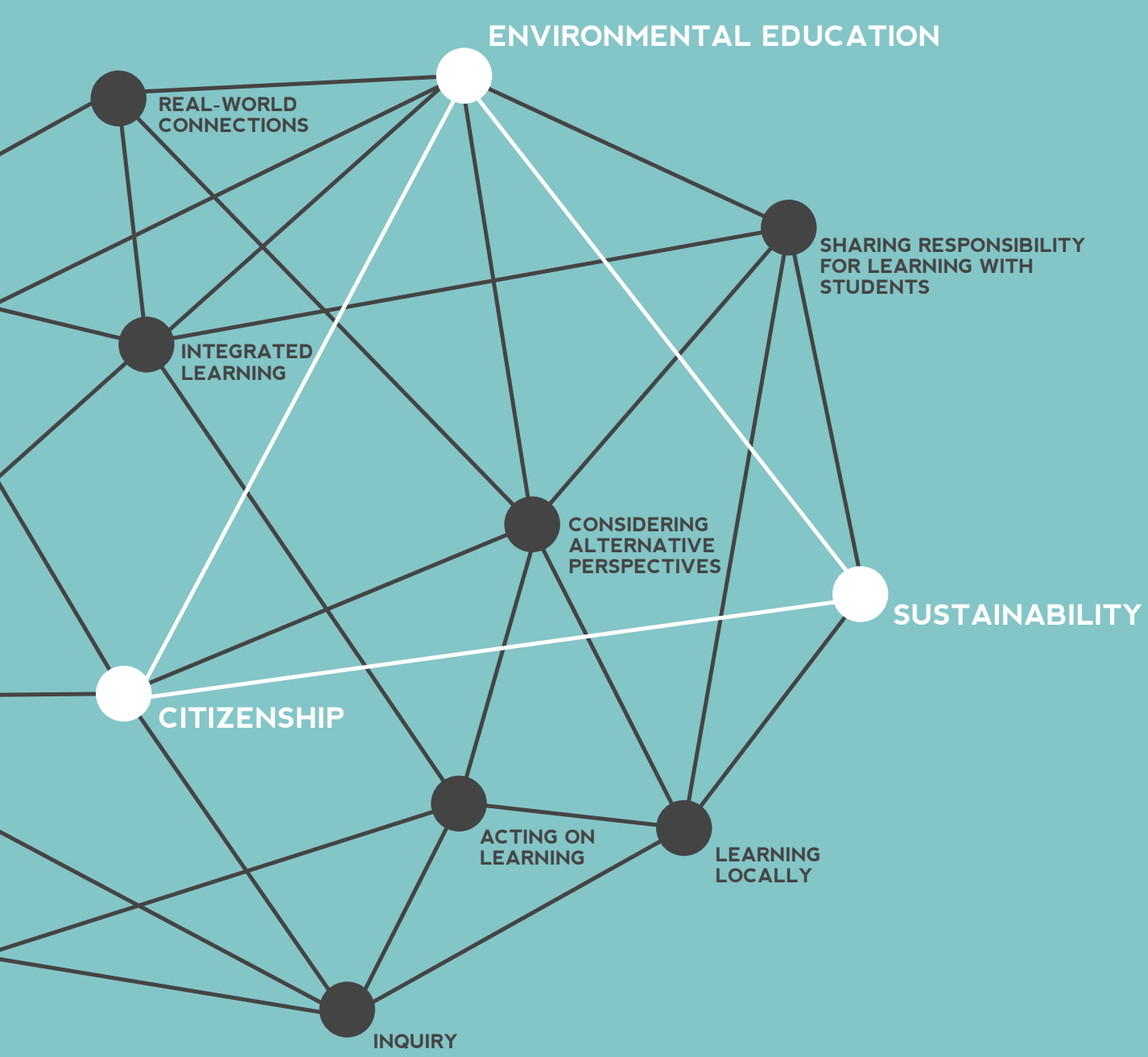
Each learning strategy "dot" can:

- Link environmental, economic and social issues within subjects and across subjects
- Link students to each other, their home life, their schools and their community
- Link knowledge, skills and perspectives through student engagement and action
- Provide a meaningful context to address numeracy, literacy, character and other educational expectations.

Each chapter defines the strategy, explains why it should be used and illustrates its scope. Examples of practice are presented ranging from initial to deep application.

We don't yet have all the answers. This creates an opportunity for teachers to become learners. It also brings more freedom for teachers to learn with our students, improving teaching, our communities and our future.

> *"Schools have a vital role to play in preparing our young people to take their place as informed, engaged, and empowered citizens who will be pivotal in shaping the future of our communities, our province, our country, and our global environment."*
>
> Ontario Ministry of Education,
> *Shaping Our Schools, Shaping Our Future*, 2007



INTRODUCTION FROM ECOSYSTEM TO "EDUSYSTEM"

Connecting the Dots provides a systems view of learning. Each strategy is a doorway to create learning experiences reflecting the complexity of life.

Chapter Outline

1. Linking Learning Strategies and Active Citizenship
2. A System of Seven Interconnected Learning Strategies
3. Visualizing a Systems View of Learning through Interconnected Strategies
4. Moving from Traditional Teaching to Transformative Learning
5. Principles to Guide Transformative Learning

1. Linking Learning Strategies and Active Citizenship

Which learning strategies engage students as active citizens in supporting environmental, social, and economic sustainability?

This question is the challenge for educators in the 21st century.

The key learning strategies we have identified from environmental education are common to other fields of education research and reform. These include:

- Constructivism and brain-based learning research
- Special education and instructional design for differentiation
- Girls and science research
- Boys and reading research
- Authentic instruction/assessment
- Motivation and retention studies.

The convergence between environmental education and these other fields of research is encouraging. It provides clear direction for all teaching and learning. Educational researchers and practitioners are coming to similar conclusions from many different directions.

In this context we agree with David Orr's assertion that "all education is environmental education" (Orr, 1991).

As the need for change in education practice rises, our understanding of learning is changing too. The approach is more holistic and contextualized. New technologies support this interconnectedness. To a large extent, technology reduces the traditional role of teacher as a conveyor of information.

New technologies:

- Democratize access to information
- Enable collaborative learning among individuals separated by space
- Allow the formation of communities of learners who can collaboratively build knowledge
- Provide tools to support ever-broader participation in citizenship activities.

Learning is being transformed — driven by need, informed by what we know about learning and enabled by technology.

Connecting the Dots explores strategies that engage students as active citizens in supporting environmental, social and economic sustainability.

2. A System of Seven Interconnected Learning Strategies

The strategies interact to transform learning and meet the increasing demands of citizenship in a changing world. They include:

- **Learning Locally** where the community becomes the classroom and learning is grounded in experiences right outside the school door, involving the natural, built and cultural environments

- **Integrated Learning** that crosses subject lines and skills and allows for the development of deep understanding that includes environmental, social and economic dimensions

- **Acting on Learning** that acknowledges the need in learners to apply what they have learned to enhance the community and the learning experience itself

- **Real-world Connections** that make learning authentic through sourcing information, communicating to audiences and working with community partners

- **Considering Alternative Perspectives** that purposely presents differing views requiring critical thinking

- **Inquiry** where learning follows what the student needs to know and results in the "uncovering" of curriculum through the skillful facilitation by the teacher

- **Sharing Responsibility for Learning** that leads to able, independent learners.

Environmental education draws on the dynamics of ecosystems to understand ecology. A systems view of learning calls on educators to think about the whole learning experience in terms of its parts, processes, and their interactions. To better understand the power of teaching, a systems view of learning is required.

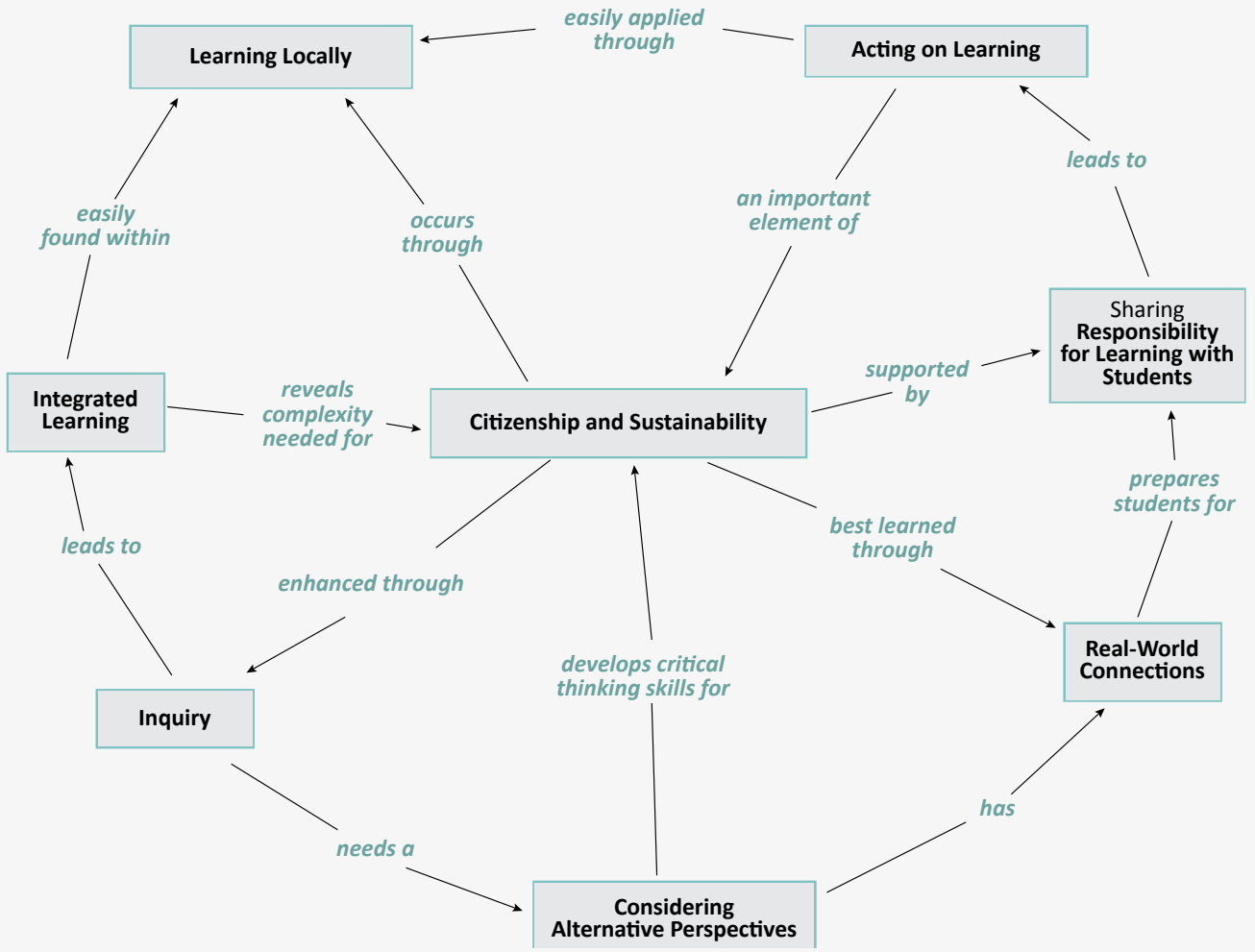
Valuable insights can be gained from a systems approach:

- The whole may have properties that are different than the parts
- The parts or processes influence each other
- A missing part or process may have great impact
- Feedback can be used to influence how a system operates
- Because of its complexity the impact of feedback may be delayed
- Having many feedback mechanisms supports system stability

(American Association for the Advancement of Science AAAS, 1993).

The practice of environmental education brings a greater understanding of learning and education as an interconnected "edusystem."

3. Visualizing a Systems View of Learning through Interconnected Strategies Concept Map



This concept map shows the systems nature of the seven strategies that can be applied to create dynamic learning experiences. Many relationships exist among these strategies beyond those illustrated here. Concept maps in this document were prepared using Cmap software (http://cmap.ihmc.us/).

4. Moving from Traditional Teaching to Transformative Learning

Transformative learning involves a shift in a basic premise of thought, feeling or action — a shift that dramatically alters a way of being in the world, including relations with other humans, and nature. (The Transformative Learning Centre, 2013) Achieving ecological, social and economic sustainability requires such a shift.

Transformative learning is needed to develop engaged, responsible citizens, learning individually and collectively. Through it, the energy, insights and abilities of individual learners are shared and the learning of all participants is advanced. Realizing this potential provides so much hope and excitement for our schools; students and teachers experiencing learning and community action, linked together to the betterment of both!

Transformative learning is not used to the total exclusion of some elements of traditional teaching and instruction. There are always appropriate reasons for direct instruction. Transformative learning, however, requires formal learning to include our relations with others and with nature.

This chart is a useful tool in comparing traditional and transformative learning practices. Adapted from Miller, 1988.

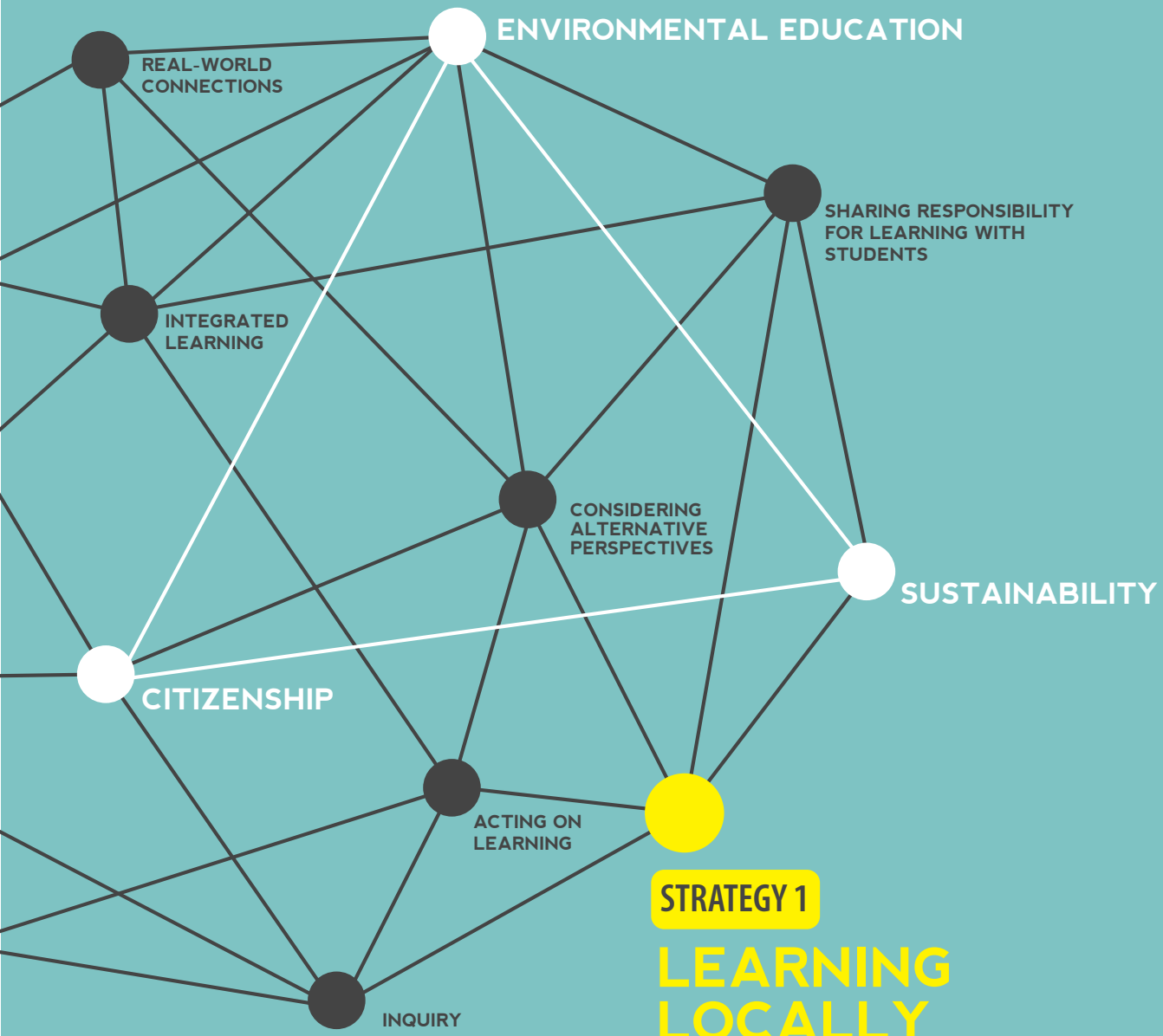
	Traditional Learning	**Transformative Learning**
Purpose	• primarily for employment and post-secondary learning • the good employee	• responsible citizenship • the good citizen
Orientation to the Status Quo	• the world or its current mechanisms are fine and the role of education is to pass on what society knows and values	• change or transformation is required to meet rising challenges • society does not have the answers
Goals for Learners	• knowing the right answers through recall	• critical thinkers who are able to challenge information based on facts, evidence and examined values; and pursue creative solutions
Temporal Perspective	• the past and present	• past, present and the future
Choice of Learning Pathways	• standardized • learner fits into school • few pathways are available • divergence discouraged	• personalized and idiosyncratic • school adapts to the needs and interests of the learner • many pathways for learning available
Teacher's Role	• authoritative • command and control learning	• coach, facilitator, co-learner
Student's Role	• predominantly passive • sitting, listening, following instructions	• active • seeking, interpreting, analyzing, judging, applying individually and with peers • knowing what to do when the direction is not clear
Curriculum	• cover the curriculum through unit delivery	• uncover the curriculum through learning projects and inquiries
Focus of Learning	• information transfer to the student	• knowledge construction by the student(s)
Scheduling	• learning is timetabled by subject • reductionist	• some level of open scheduling on the basis of projects or inquiry needs • holistic
Materials	• textbooks and black line masters common	• real-world open sources and formats (deeply integrated technology tools)
Location and Time	• in school and during the school day	• in school and community, flexible learning time
Evaluation	• assessment of learning emphasized	• assessment as, for and of learning is emphasized

"A preoccupation with teaching has left us largely ignorant of learning."
—Ison, 1990

5. Principles to Guide Transformative Learning

- All ideas are improvable (Scardemalia, 2002).
- Every learner is a whole person, needing to be a contributor to his or her community (the learner-citizen).
- Each individual has the right to determine who he or she wants to be and to pursue who he or she can be. The educator's task is to aid them on that life journey.
- We learn better with others through the teacher-student-peer group dynamic.
- Learning in and for the community (natural, structural, social) enhances both.

[Transformative] Education is a means for people to become self-actualized members of society, seeking meaning, contributing to developing their own potential and creating solutions together. A sustainable world without participation and democracy is improbable, and perhaps even impossible.
—Wals & Jickling, 2002



STRATEGY 1

LEARNING LOCALLY

Learning Locally or using the community as classroom is a strategy available at every school. The opportunities vary according to the school's location and the time of year. Nevertheless there are rich opportunities waiting outside every school door.

Strategy Outline

1. What Is It?
2. Visualizing Learning Locally Concept Map
3. Why Use It?
4. How to Implement Learning Locally
   a. Location-Location-Location
   b. Nature's Calendar of Events
   c. Learning through Schoolyard Diversification

"Never globalize a problem if it can possibly be dealt with locally."
—Garrett Hardin, 1985

1. What Is It?

Learning Locally takes advantage of the natural, built and cultural amenities that exist in the community — just outside the school doors, often a short walk away. Using local experiences for learning takes the classroom outside the walls and into the community.

2. Visualizing Learning Locally — Concept Map

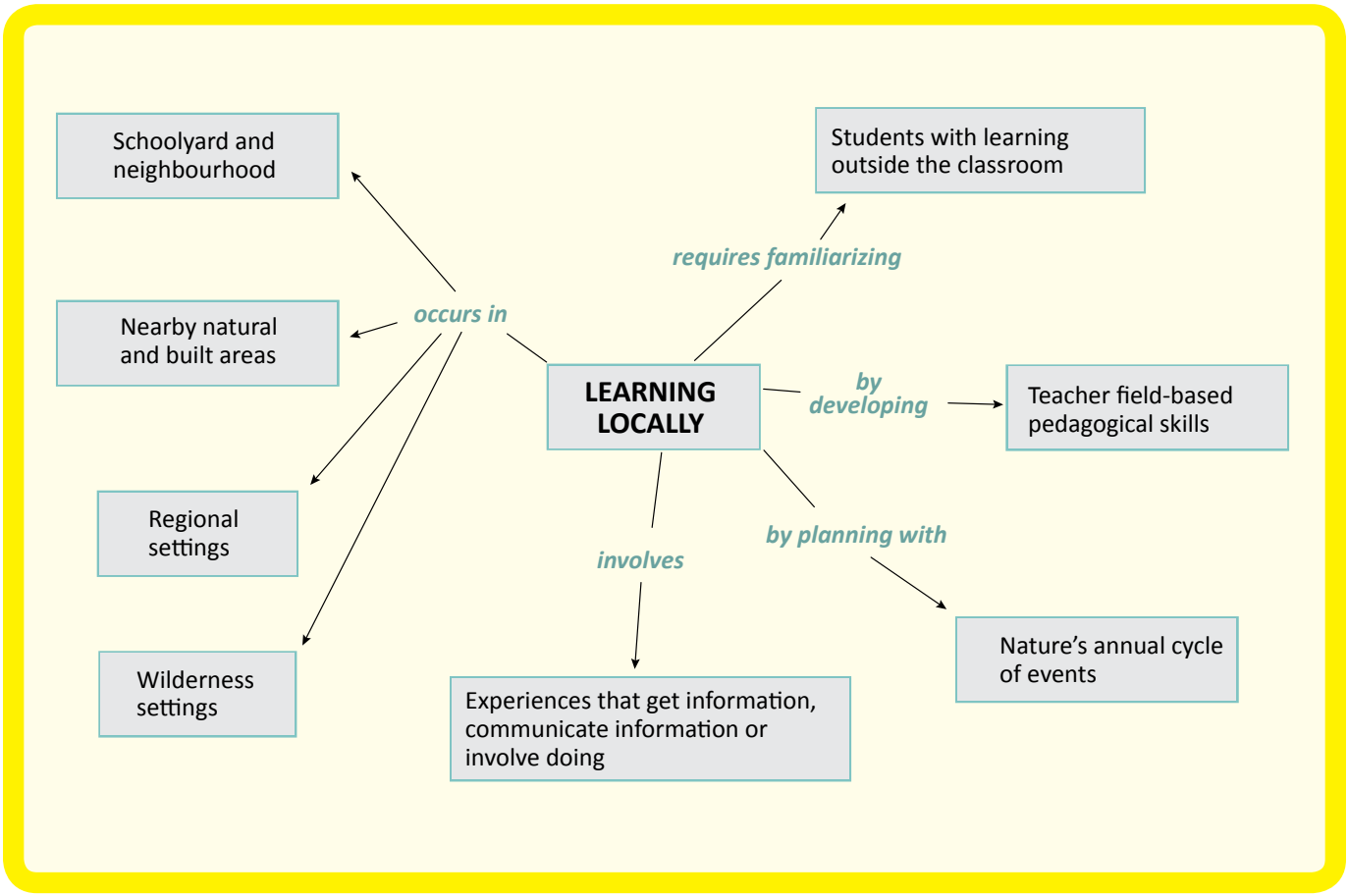


PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

Preparing to experience solo spots in a wooded neighbourhood ravine.

3. Why Use It?

- Learning that takes place in local settings contributes to improved thinking and problem-solving skills. Decision-making in authentic contexts is most relevant to learners (British Department for Education and Skills, 2006)
- The world beyond the classroom provides a more inclusive learning environment for all kinds of learners. It provides opportunities for active, experiential learning that contribute to positive emotions and long-term memory retention (Hardiman, 2010).
- Programs with a significant amount of learning time spent outdoors contribute to improved behaviour and physical wellbeing (Center for Research and Design, 2007).
- Using local experiences for learning allows students to explore the complexity of the world beyond the classroom.
- Local experiences are relevant to all subject areas. They motivate many learners and provide them with inspiration for writing, reading or discussion.
- Local experiences build on student knowledge of their land and their relationship to it (Sanger, 1997). This encourages students to continue learning and participate further in their communities.
- Many adults cite childhood experiences in nature as one of the main contributors to their later concerns for the environment. Contact with natural areas has emerged as one of the most significant influences in shaping responsible environmental behaviour in all the studies reviewed (Simmons, 1998, 19).
- Learning Locally helps dispel the view that the environment is a bus trip away. It illuminates aspects of the environment right where students live; its richness, its problems and its possibilities.
- It costs less, often reduces the need for permission protocols and involves fewer administrative procedures.
- Introducing a child to a natural or built area in the neighbourhood can open a world of wonder for them to explore outside of school hours expanding the time horizon of learning.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

Planning to and reinvigorating schoolyard gardens can incorporate a lot of learning.

4. How to Implement Learning Locally

a. Location-Location-Location

Learning Locally emphasizes what is close to the school for the very young and extends beyond as students develop. Learning experiences within walking distance can be a common occurrence in all grades.

i. The Schoolyard and the Immediate School Neighbourhood

Schoolyards and immediate neighbourhoods have more to offer in terms of learning opportunities than most teachers realize. Many schoolyards include some green space, sports facilities, and ornamental gardening at the front of the building. Within several blocks of school, neighborhoods generally provide a more diverse landscape. Every class has, within steps, a wide range of learning opportunities.

There is no cost barrier since no busing is required. The schoolyard and neighbourhood are available all the time. Students and teachers are familiar with the site so risk is limited. Administrative requirements are minimized as walking trips close to the school generally need only one permission form at the beginning of the year. If there is an incident that requires support, it is only steps away.

EXAMPLES

Seasons (Grades K to 3)
Students were asked what season they were in. To help determine the answer they went outside to collect evidence to make a decision.

Neighbourhood Squirrels (Grade 2)
A student commented on squirrels observed while coming to school. The teacher took the class out to observe the habits of local squirrels in the neighbourhood to determine the needs of these living things. Data was collected to apply in mathematics learning.

Leaves on a Schoolyard Tree (Grade 3)
Small groups of students were each assigned to a schoolyard tree to use mathematical problem solving to determine how many leaves were on it without actually counting them all.

Messages to Neighbours (Grade 6)
After touring a local natural area, messages were prepared for school neighbours and delivered through sidewalk chalk murals with written captions.

Neighbourhood Survey (All Grades)
While walking through the neighbourhood as a class, students stopped and interviewed neighbours to determine what they liked about the area and what changes they would like to see.

ii. Nearby Natural and Built Areas

A municipal park, vacant lot or acreage, stream or river, local woodlot or field are often near a school. Similarly, the built components of our communities — a downtown, commercial areas, industrial areas, parking lots or transportation hubs — are nearby and provide links to many curriculum expectations.

Children can walk farther as they grow older. Most six year olds can easily accommodate a two-kilometre walk with plenty of stops. Walking trips also have a positive health impact. The 2013 HealthyActive Kids Report Card identifies 60 minutes per day of moderate exercise as optimal for school age children. (Health Canada, 2002 and Healthy Active Kids 2013)

A Jane's Walk provides students an opportunity to appreciate where they live and share their insights with others in the community.

PHOTO CREDIT: JOHN CAFFREY

EXAMPLES

Guided Neighbourhood Walks (All Grades)
Each year Jane's Walks get students to appreciate and share what they know about their neighbourhood. A variety of techniques, including social mapping, engages students in interacting with their local environment in new and exciting ways. (http://www.janeswalk.org/information/programs/school-edition/)

What Does It Mean to be a Citizen in Our Neighbourhood? (Grades 2 and 3)
Teachers posed the questions, "How do we care for the world?" and "How does the world care for us?" to guide this year-long learning project. Answers came from an eight-week neighbourhood study that included mapping, personal stories, walking trips and service learning, directed by student inquiry. (http://www.promiseofplace.org/Stories_from_the_Field/Display?id=94)

Nature in the Neighbourhood (Grades 4 to 6)
Nature is not confined to parks and conservation areas that are only accessible by bus. The *Nature in the Neighbourhood* children's book has promoted an approach that helps students observe and interact with living things within walking distance of any school.

Questing and Geocaching (All Grades)
Questing is a game to develop a sense of place. Participants follow clues based on a specific place's attributes. The game leads to a "treasure", usually a message in a sealed container. Geocaching is similar but a GPS unit is used to find the cached container. These learning activities bring attention to a particular natural, cultural or built place. They present opportunities to address expectations in many subject areas. To create your own quest, see http://www.vitalcommunities.org/valleyquest/howto.cfm.

iii. Regional Natural Settings and Centres

As students get older, their horizons expand and this may warrant travel farther afield to sites such as provincial and national parks, regional environmental learning centres, hiking trails or different urban and rural experiences. Regional sites give teachers access to specialized staff, facilities and equipment relevant to the learning experience. For many children their only experience at these sites will be through school.

iv. Wilderness Experiences and Extended Trips

There is no substitute for experiencing wilderness. It provides adventure-based learning that requires planning for all parts of the trip. Through these experiences many students learn about themselves and how to live and work with others to achieve a goal. Eating what they prepare, sleeping somewhere other than their own beds, adjusting to different routines, and learning to understand that the power of wilderness is beyond our control, helps develop respect, appreciation and responsibility.

b. Nature's Calendar of Events — Exciting, Predictable, Rich.

No matter how often the seasons repeat there is joy and wonder in experiencing this cycle. For educators, the beauty is that natural events can be predicted within a week or two. A number of programs take advantage of the changing of the seasons.

Primary students learn about the sun by measuring the length of shadows each month throughout the school year.

PHOTO CREDIT: STAN KOZAK

EXAMPLES

Nature Watch (All Grades)
Students at all levels can participate, observing frogs, first ice formation, plants or worms at key times of the year. Information collected in the field is submitted online and used to determine changes that may be taking place (http://www.naturewatch.ca).

Journey North (All Grades)
Spring starts in the southern parts of North America and gradually proceeds north. As it does natural events unfold and we get to observe first robin sightings, tulip bloom dates, or monarch butterfly arrivals. Through these observations, students are attuned to changes in the world around them. Results are submitted online and used to generate maps showing changes in the spring season across the continent (http://www.learner.org/jnorth).

Step Outside: Your Guide to Nature's Events (All Grades)
In this program, educators receive nature guides emailed three times per month indicating what is happening in nature often right outside the school door. From there it is a case of taking students outside to experience the changes in plants, animals and weather that are occurring. These guides provide ideas for schoolyard observations and activities (http://www.r4r.ca/en/step-outside).

A schoolyard garden is an exciting opportunity to address learning expectations in many subjects.

CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

c. Learning through Schoolyard Diversification

There are many examples of how major schoolyard makeovers enrich learning and experience. Even teachers with schoolyards that still look like natural and cultural deserts can turn this to a learning advantage through small manageable projects.

EXAMPLES

Flowerbeds (All Grades)
Take over an abandoned flowerbed in front of the school. Have students research what native plants might be incorporated, source materials, apply for funding and organize the day for planting.

Visioning Their Schoolyard (All Grades)
Have students involved in envisioning what the schoolyard could look like. Small groups can choose a site, brainstorm, research and create models to present to school administration, parents and the community.

Pocket Gardens (Grade 1 to 3)
With few resources, the teacher-librarian created a pocket garden the size of a typical door. The focus was learning about plants and growing food. The small plot held possibilities for learning about plants for butterflies and spring bulbs.

Tapping Maple Trees (Grade 2)
Tapping a sugar maple tree in the schoolyard turned out to be an exciting and tasty project. Sap was boiled in the staffroom and the students experienced "sugar on snow".

Wild Corner (All Grades)
Designate a part of the schoolyard as a "wild corner". Post it to keep out maintenance people. Watch the changes over time.

A walking tour of downtown Guelph led to the discovery of many links to medieval times. Drawing the buildings required careful attention to detail.

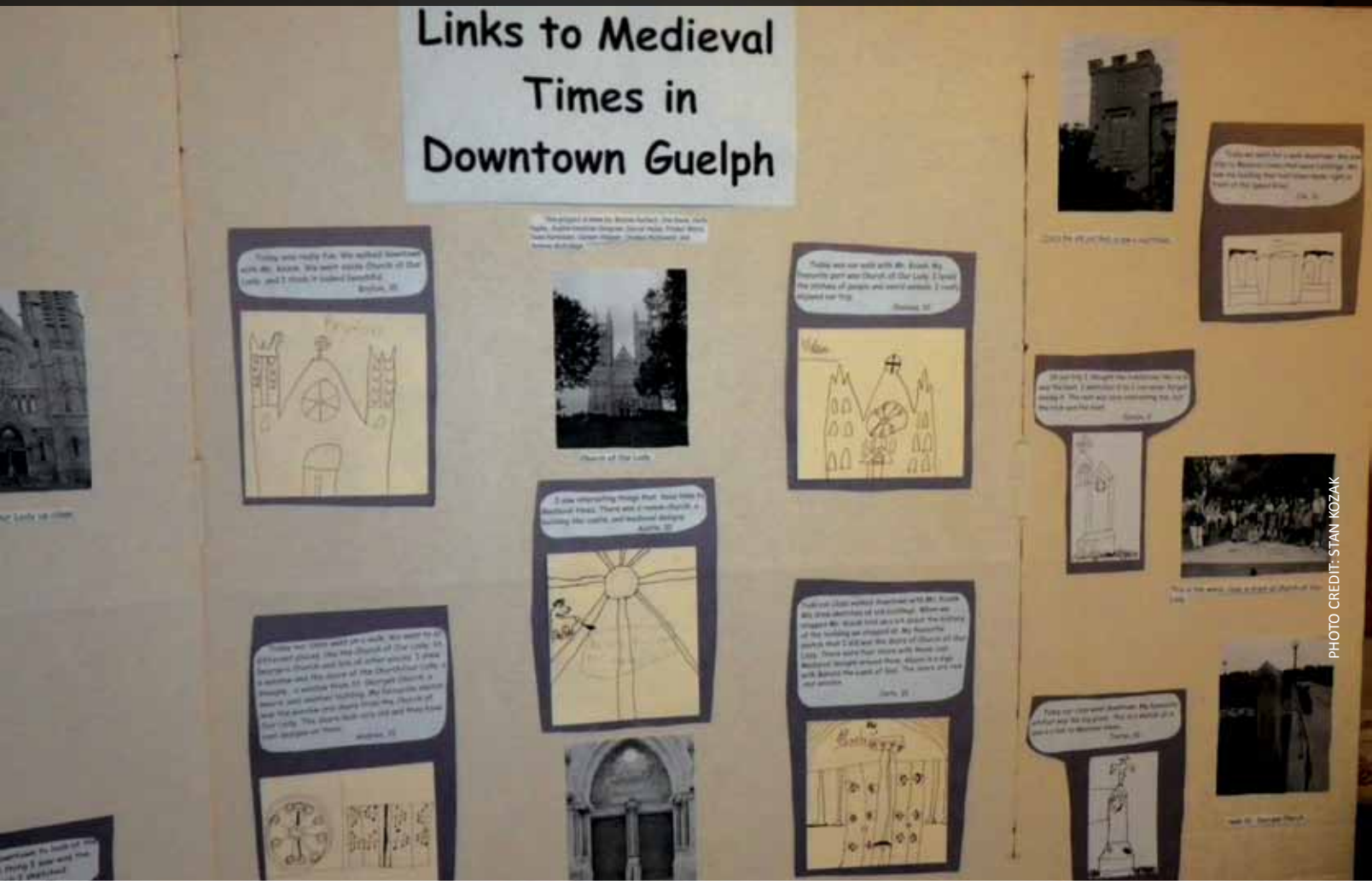


PHOTO CREDIT: STAN KOZAK

Developing Field-based Pedagogical Skills — Tools for Teaching Outside

Preparing for effective learning outside the classroom calls for all the same skills as those needed indoors, and a few more.

i. Plan for all three stages of learning in the out-of-class setting

- Before the outing—preparation and what to expect.
- The experience itself—use a variety of learning experiences (high energy, observation, quiet listening, active work, individual to small group to whole class).
- On return—reflection, debriefing, research, follow-up projects. These are important and if they do not occur the field experience is underutilized and devalued.

ii. Have a clear focus

- Ensure that you have identified for yourself and your students the main intent for the learning experience. It might be as simple as identifying student questions and observations for further research or having an unstructured play experience in a natural setting.

iii. Use the learning richness that the site provides

- Meaning can be brought to all subjects in field situations. Vary the subject perspectives, for example, focusing on literature, science, history or art at different times.
- Use appropriate teaching strategies — direct learning, inquiry, activity-based in a field setting. Set up learning centres in an outdoor area just as you would in class, but this time featuring real things that can be seen, touched and moved.

iv. Identify and meet student needs

- Encourage questions. Address the individual concerns that students bring —when is lunch, where is the bathroom, how long do we have to walk?
- Address any fears associated with being outdoors.
- Create activities that allow students to explore and adjust to new settings before initiating a learning activity, just as you would with new materials in class.
- Call on students to share relevant experiences and knowledge.

v. Modeling master learner perspectives

- Learn to be comfortable outdoors — practice it.
- Exhibit good learner behaviour — curiosity, questioning, sense of adventure.
- Have at least some basic level of familiarity/experience with native plants and animals.
- Admit and embrace not knowing everything and utilize these opportunities to advance inquiry.
- Be appropriately dressed. “There is no bad weather, only bad clothing” (Scandinavian saying).
- Protect your voice. Establish pre-arranged signals to bring the group together and to listen. Speak with a normal voice so that students get in the habit of listening.

vi. Flexibility

- Nature sends teachable moments on its schedule, not yours. When a bird or a cloud of interest appears use them to support learning.
- Identify opportunities to just let children play in an outdoor setting; set safety boundaries and let them at it.
- Keep a small knapsack with some learning props and activities at the ready — books or poetry to read on site, adventure challenge props, index cards and felt pens to sketch or make observations.
- Have alternate plans/activities if the weather changes abruptly or travel problems arise.

vii. Behaviour management

- Students want to have fun and this is good, so plan for it as part of the learning.
- Many students behave differently outdoors than in class due to the novelty of the experience. Establish clear expectations cooperatively and aim to learn outdoors more often.
- Set physical boundaries for activities in different locations.

viii. Safety and student care

- Most sites require a pre-visit to identify hazards and learning opportunities.
- Identify for students the possible hazards — wasps, dog droppings, hazardous discarded items.
- Identify the signs of heat stress and hypothermia.
- Discuss the appropriate responses to mosquitoes and flies. In some seasons do not take students into areas that have serious biting insect problems.

ix. Use travel time

- Plan for learning activities as students move along between learning sites. Maximize their learning time in the outdoors.

x. Prepare your adult volunteers

- Outline expectations you have for them.
- Identify when they should call upon you for assistance.
- Clarify appropriate student–volunteer relationships with students.

"One thing we know is that kids' writing is much more interesting, complex, and detailed if they've had rich experience."

Place-based education evaluation collaborative, 2007

" …wherever you are… you can still look up at the sky –see dawn and twilight beauties, its moving clouds, its stars by night. You can listen to the wind, whether it blows with majestic voice through a forest or sighs a many-voiced chorus around the eaves of your house or the corners of your apartment building. Even if you are a city dweller, you can find someplace, perhaps a park or golf course, where you can observe the mysterious migration of the birds and the changing seasons … you can ponder the mystery of a growing seed, even if it be only one planted in a pot of earth in the kitchen window."

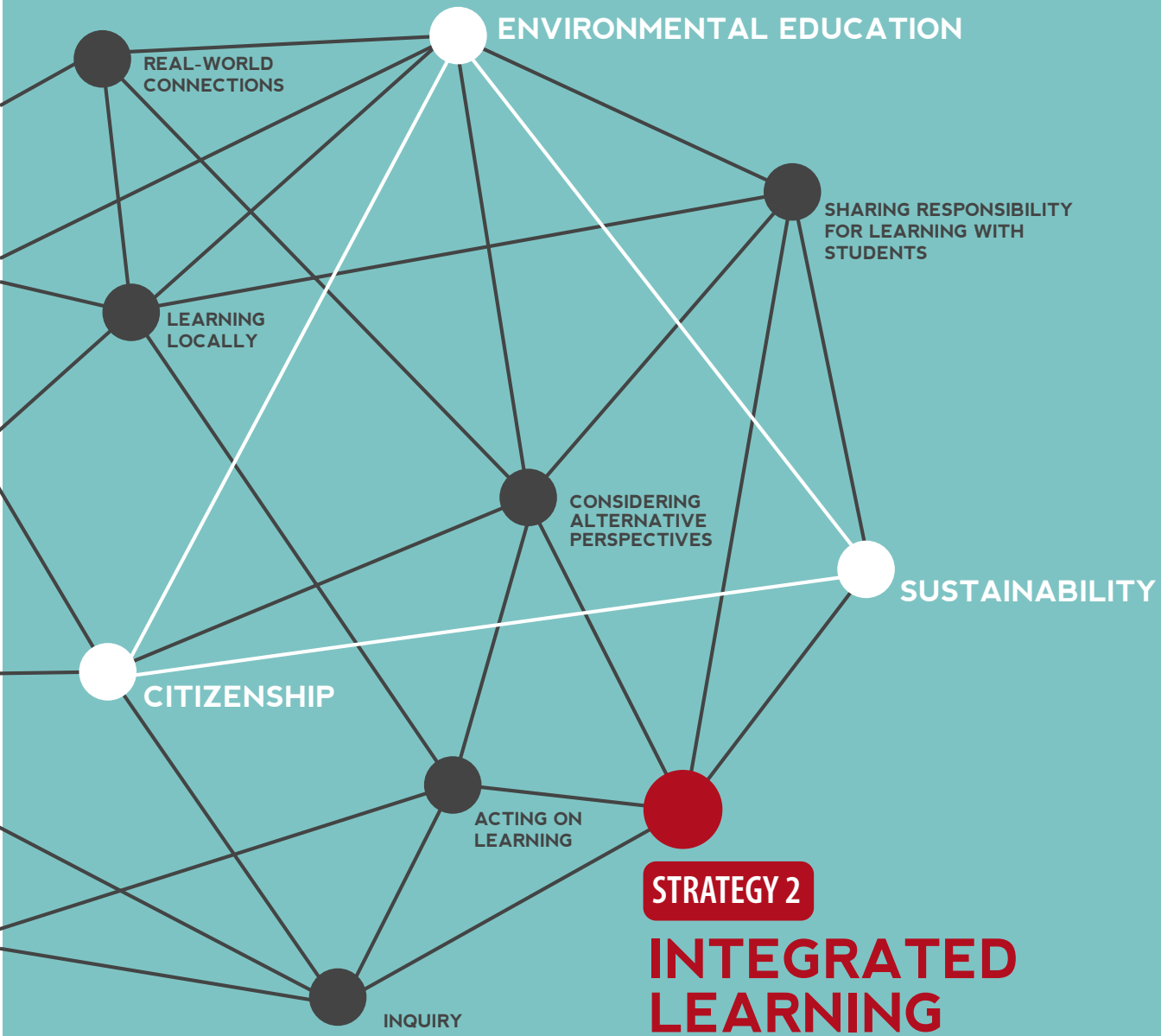
Rachel Carson, 1956

The Journey North program follows Spring as it advances from south to north and prompts learners to make predictions and observations.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

PHOTO CREDIT: STAN KOZAK

Locally found materials can be used to creatively demonstrate knowledge of the parts of an insect.



STRATEGY 2

INTEGRATED LEARNING

Integrated or interdisciplinary learning is an approach that brings together content and methods from more than one subject discipline, supporting connections that deepen understanding (Lake, 1994). Subject-based timetables and subject specialization in higher grades can make its application more difficult, but not impossible.

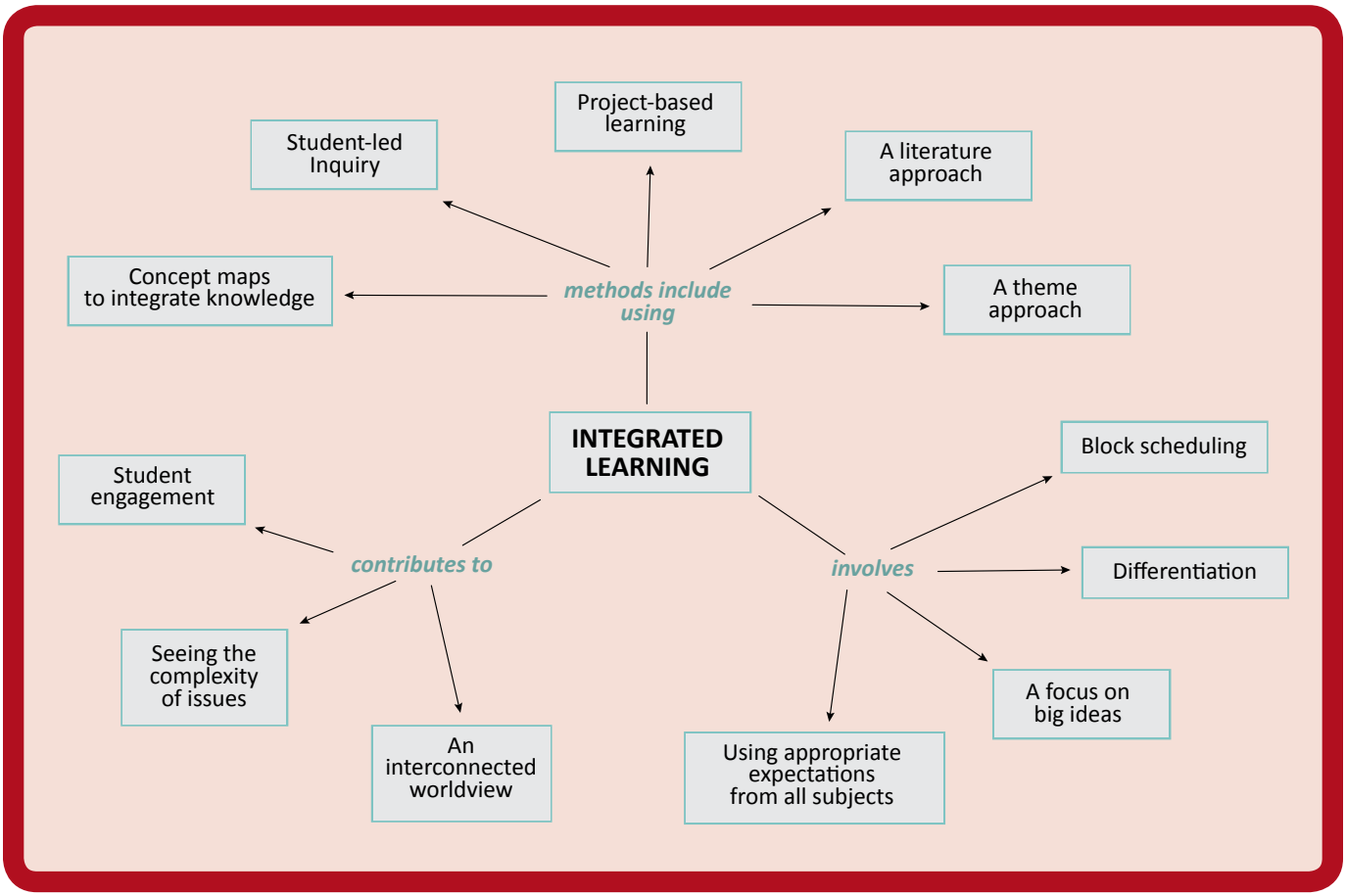
Strategy Outline

1. What Is It?
2. Visualizing Integrated Learning Concept Map
3. Why Use It?
4. How to Implement Integrated Learning
   a. Using a Theme to Address Expectations from Different Subjects
   b. Using Literature to Launch into Expectations from Different Subjects
   c. Starting with a Skill to Address Expectations from Many Subjects
   d. Pursuing a Concept through Many Subjects
   e. Project–based Learning
   f. Inquiry
   g. Facilitating Integrated Learning through Key Concepts
   h. Using Concept Maps
   i. Block Scheduling

1. What Is It?

Pursue any issue and opportunities arise to address expectations across multiple subjects. Using these learning opportunities is the essence of Integrated Learning. At basic levels of integration, distinct subjects are readily identifiable. In fully integrated investigations or projects, subject boundaries are transcended.

2. Visualizing Integrated Learning Concept Map



3. Why Use It?

- Makes curriculum manageable by addressing many subject expectations in a meaningful way
- Contributes to deeper understanding of topics and issues, and the interrelationships inherent in complex, real-world systems
- Provides opportunities to differentiate instruction. The inclusion of multiple disciplines enables students to engage their particular interests or abilities
- Teaches expectations in the context of Integrated Learning experiences. Students see the purpose of the learning and apply it immediately.

"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

—John Muir, 1911

4. How to Implement Integrated Learning

The degree of integration — the extent and number of subjects involved in the learning experience — spans a continuum. Levels of integration have been described from multi-disciplinary (some integration), to inter-disciplinary (more integration) to trans-disciplinary (most disciplines integrated) (Drake & Burns, 2004). The examples provided here range from least to most integrated. Integrated Learning can be implemented through an inquiry model for deep, connected learning (Drake and Reid, 2010).

a. Using a Theme to Address Expectations from Different Subjects

Theme-based learning experiences have a central topic that links learning. Learning centres or activities in thematic integration usually stand alone. But opportunities to link them can be identified and the teacher can facilitate these relationships.

The dominance of subject disciplines in secondary schools is a significant challenge to integration. There are a number of approaches that secondary school educators have taken to successfully bring Integrated Learning to their students.

EXAMPLES

The Monarch Magic Program (Grade 4)
The integrating theme was butterflies. Subjects included language, media, music, science, art, drama, social studies and physical education. The learning culminated with the creation of a small schoolyard butterfly garden (SAGE, 2005).

Integrated Environment Unit (Grades 5 to 8)
Students at Georgetown Elementary School participated in a six-week integrated unit on the environment. In multi-age groups, they worked at six subject-based workstations for 45 minutes each day and participated in two day-long community field trips. Students experienced community roles, applied the writing process for a purpose, worked cooperatively and managed their time (Douglas et al, 1995).

Ten Up (Grade 10)
This was a combination of four teachers, four subjects, 80 students and 3 hour block scheduling. In this semester-long "school within a school" program, students received 4 credits integrated through the theme of social organization. The program allowed for student collaboration on real-world problems, negotiated teaching, an emphasis on experiential learning, deep and sustained project work, access to community learning resources, and development of a systems thinking perspective (Ast,1995).

Five-Subject Interdisciplinary Research Project (Grade 12)
Teachers in five subjects collaborated for two months to give students the opportunity to do an interdisciplinary, in-depth research project culminating in an oral presentation and written essay. The learning across subjects led to an understanding of interconnections, use of observation, analysis and collaboration. (Milosovich, 1995)

The Energy Loop Engages the Whole School (Grades 10 to 12)
L'École Secondaire Catholique de Casselman has had a Specialist High Skills Major program in Arts and Culture that promoted a whole school project, the Energy Loop. Many departments in the school prepared a learning activity for the day, that all students visited. Through these student-produced presentations, the whole school was part of a focused interdisciplinary exploration of a theme.
Sessions included:

- An art exposition with pieces made of recycled materials that express a message
- A science exposition on aspects of nature (e.g., atomic structure, evolution, inventions using recycled materials, effects of chemicals)
- A religion class selling energy-saving bulbs at very low cost in the community
- A teacher presenting her home as an example of applied energy efficiency practices
- A food class demonstrating the importance and chemistry of composting in a workshop format
- A drama class creating a play linking current and future generations
- A music class providing musical accompaniment and language classes preparing product advertisements used in the production (Chantal Bertin, 2009, personal communication).

Two to Four Credit Secondary School Integrated Programs
In this innovative model two, three or four courses are combined for a semester so that the group of students involved stay together for part or all of the school day. Many different themes have been used to integrate the subjects involved. Four-credit integrated programs create a school within a school in which the teacher and students form a flexible independent unit. Freed from the constraints of the timetable, learning often takes place in the community, uses out-of-school resources and experiences, and develops strong relationships among participants.

Community Environmental Leadership Program – CELP (Grade 10)
This semester-long interdisciplinary program requires students to learn to work well in groups. They take the initiative to get tasks done such as leading programs for younger students. During the program they explore their interests in environmental and social issues.

The students receive four credits (English; Career Studies and Civics, Outdoor Activities-Health and Physical Education, and Interdisciplinary Studies). Learning projects address expectations from the courses and often students are not aware of which subject they are "in" at any one time. Learning projects include an extended wilderness trip, a week of cycling within the community, visiting and interviewing community members engaged in civic and environmental issues and the delivering of a fieldtrip program to Grade 5 students (See http://www.ugdsb.on.ca/celp/index.aspx).

Four features that contribute to the success of the secondary school integrated program model:

1. **Continuity** — time and responsibility to see a project through to its completion
2. **Authenticity** — a student's sense that the learning is real and valuable
3. **Community** — students relying on others in their school community to get the job done
4. **Responsibility** — being in a position where they are responsible to themselves, others in the program and the wider community (Horwood,1994).

b. Using Literature to Launch into Expectations from Different Subjects

Literature-based Integrated Learning is an effective entry point because many students enjoy learning through stories.

Appropriate literature choices:

- Address an engaging topic or issue
- Are age appropriate
- Are based on accurate facts
- Provide opportunities to address curriculum from a number of subject areas (Students can dramatize it, illustrate it, start a project related to it, lead the class to explore beyond the school, take follow-up action, retell, write, or find related topics to debate).

The Biodiversity Campaign project was a natural context to authentically address and apply learning expectations from four subject areas: English, Visual Art, Biology and Geography.

PHOTO CREDIT: STAN KOZAK

Reading and writing get significant attention in the school day and require motivating content. Environmental topics engage most learners. Stories offer a doorway to the real world and an integrating approach that most teachers can incorporate into their planning.

EXAMPLES

Safari (Grades K to 3)

A number of picture books about safaris exist. Reading about a safari sets the stage for a schoolyard or neighbourhood journey where the class sets out to discover the living things easily accessible for their observation (e.g., worms, sow bugs, crows, ants, butterflies or a range of plants from dandelions to maple trees). Associated learning activities can include; journal writing, class story preparation and reading, mural creation, clay modeling, or research on individual living things. This kind of investigative learning keeps students engaged and excited for weeks and promotes skill development.

Season of the Moon by Jean Craighead George (Grade 5)

This series of four titles features the events taking place in nature during the 13 moons of the lunar calendar (e.g., Moon of the Bear, Moon of the Owl, etc.). Each book is an invitation to observe more carefully what is going on in the natural world and take the time to step into it. Based on the author's model, teachers have encouraged students to create their own written stories for one of the moons of the year (Somerville, J, 2010, personal communication).

Visual art was used in the field to consolidate what grade 4 students had learned about aquatic habitats.

PHOTO CREDIT: STAN KOZAK

Halfway Man by Weyland Drew (Grade 10)
This novel helps prepare students for wilderness tripping and experiencing nature. Linked to the storyline, students learn about first person narrative voice, journaling to develop an authentic voice and storytelling. They prepare an environmental autobiography (students write about one formative experience in nature they remember). They also investigate themes such as trust versus fear, issues such as land rights/use linked to civics, aboriginal culture and the decentering of one's own culture, and discuss aspects of leadership (Dalziel, Janet. 2009, personal communication).

c. Starting with a Skill to Address Expectations from Many Subjects

Some children may be able to express understanding more effectively through drawings than verbally or in writing.

EXAMPLE

Leading with Art (Elementary)
Art was used as a tool to learn about animals. Students and the teacher:

- Found insects in their natural habitats, chose what was of interest to them and created drawings that were representations of their individual experience and understandings
- Used art to illustrate many experiences they had throughout the day –plan for the day, record observations from a walk and even solve math problems in which their drawings were supplemented with writing (Stein et al, 2001).

d. Pursuing a Concept through Many Subjects

Concept-based integration occurs when many subject perspectives are linked in the examination of an abstract concept.

EXAMPLE

Relationships (Grade 5)
The concept of relationships was used as the link for learning activities in a number of subjects. The overall aim was to critically explore human-environment relationships and integrate sensory experience into student learning. The teacher developed curricular activities that were based on the concept of relationships where the students:

- Ventured into the outdoors and were asked to document how they related to a living animal or plant
- Engaged in guided journaling that included writing and/or drawing to indicate in some way what they saw, heard, felt, or thought
- Used activities in art and science to explore the concept of relationships in an ecological context (Faria, 2008).

e. Project-based Learning

In Project-based Learning (PBL), concepts and skills are learned and used to advance a project.

Project-based Learning follows defined steps:

1. Defining the project
2. Gathering information
3. Analyzing the information
4. Creating the project
5. Communicating about the project
6. Evaluating and celebrating the project.

Project-based Learning projects:

- Are central, not peripheral to the curriculum
- Focus on questions or problems that "drive" students to encounter (and struggle with) the central concepts and principles of a discipline
- Involve students in a constructive investigation
- Are student-driven to a significant degree
- Are realistic, not school-like (Thomas, 2000).

EXAMPLES

Creating a Field Guide (Grade 6)
Students created a field guide for living things in a nearby natural area and, in so doing, involved art, literature and science. Use of the guides provided a great incentive to get outdoors (Grinstad, 2001).

A Community Problem Leads to Street Theatre (Grade 8)
Geography, writing and drama in the form of street theatre, were used in a Grade 8 classroom to explore a community's struggle with its growing waste problem.
Students:

- Gathered information through fieldtrips to the local waste-sorting plant, telephone interviews and online searches
- Analyzed the information to discover the key community challenges
- Wrote individual two-minute street theatre plays with help from drama staff at the local university.

The big day arrived and students were bused to the local mall to present to small gatherings of shoppers.

f. Inquiry

Inquiry-based learning is directed by the interests and questions of the students involved, with the teacher acting as a facilitator. The scope of the learning often becomes trans-disciplinary. The teacher follows and shapes the learning experience identifying appropriate opportunities to address curriculum expectations and build in opportunities for assessment and evaluation.

EXAMPLE

Pursuing the Question - How Does Human Activity Impact the Diversity of Living Things? (Grades 7 and 8)

The question was used as a context to address relevant knowledge, skills and attitudes from a number of subjects. The teacher proposed learning and assessment activities that contributed to answering the big question. The learning activities were also planned to support a relevant culminating task. The learners saw that the inquiry had purpose. It answered the question and they did something significant with their understanding (Drake and Reid, 2010).

g. Facilitating Integrated Learning through Key Concepts

Focusing on key concepts or big ideas is a way of simplifying the curriculum planning process.

EXAMPLE

Big Ideas about Plants (Grade 3)

Content from the Grade Three Science and Technology Growth and Changes in Plants topic (Ontario Ministry of Education, 2007, 70) can be expressed in terms of six key concepts to assist the planning of learning experiences:

- All plants have needs in order to stay alive
- All plants have parts to help get what they need to live
- All plants have a life cycle
- Plants and animals depend on each another
- People use plants and depend on them in many ways
- People both help and hurt plants.

With these content ideas expressed in advance, the teacher can shape learning so that students address all of them.

h. Using Concept Maps

Concept mapping has been identified as an important Education for Sustainable Development tool (Ahlberg and Kaivola, 2006 and Afamasaga-Fuata'l, 2009). They visually track knowledge concepts and learner perceptions and provide a visual representation of a student's understanding of concepts and relationships. (Novak and Canas, 2009). Their utility has been noted both for assessment and building of knowledge to understand real-world phenomena (Ahlberg, 2005).

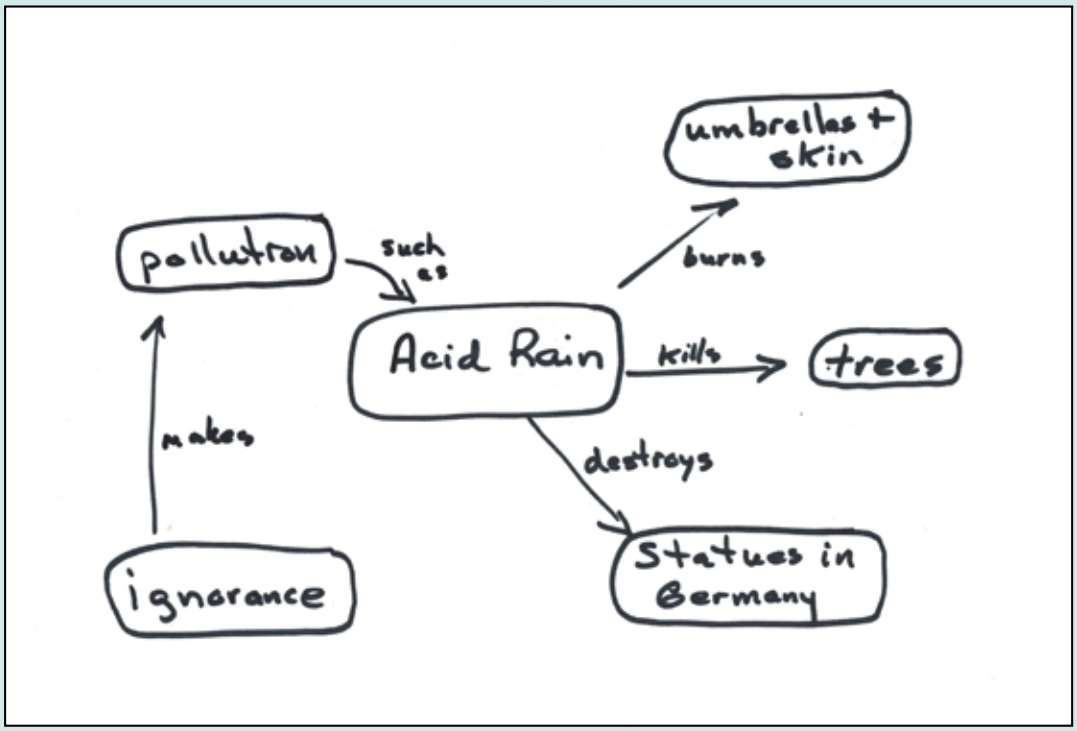
Concept maps usually cross subject boundaries as they reflect our understandings of complex relationships that exist in the world. As such, they are effective in helping understand problems and challenges.

Concept maps:

- Support systems thinking
- Indicate what students know about a topic and can serve as an assessment tool
- Provide direction for students to pursue their learning
- Expand understanding by showing links that were not previously obvious.

EXAMPLE

Student's Initial Concept Map for Acid Rain (Grade 9)

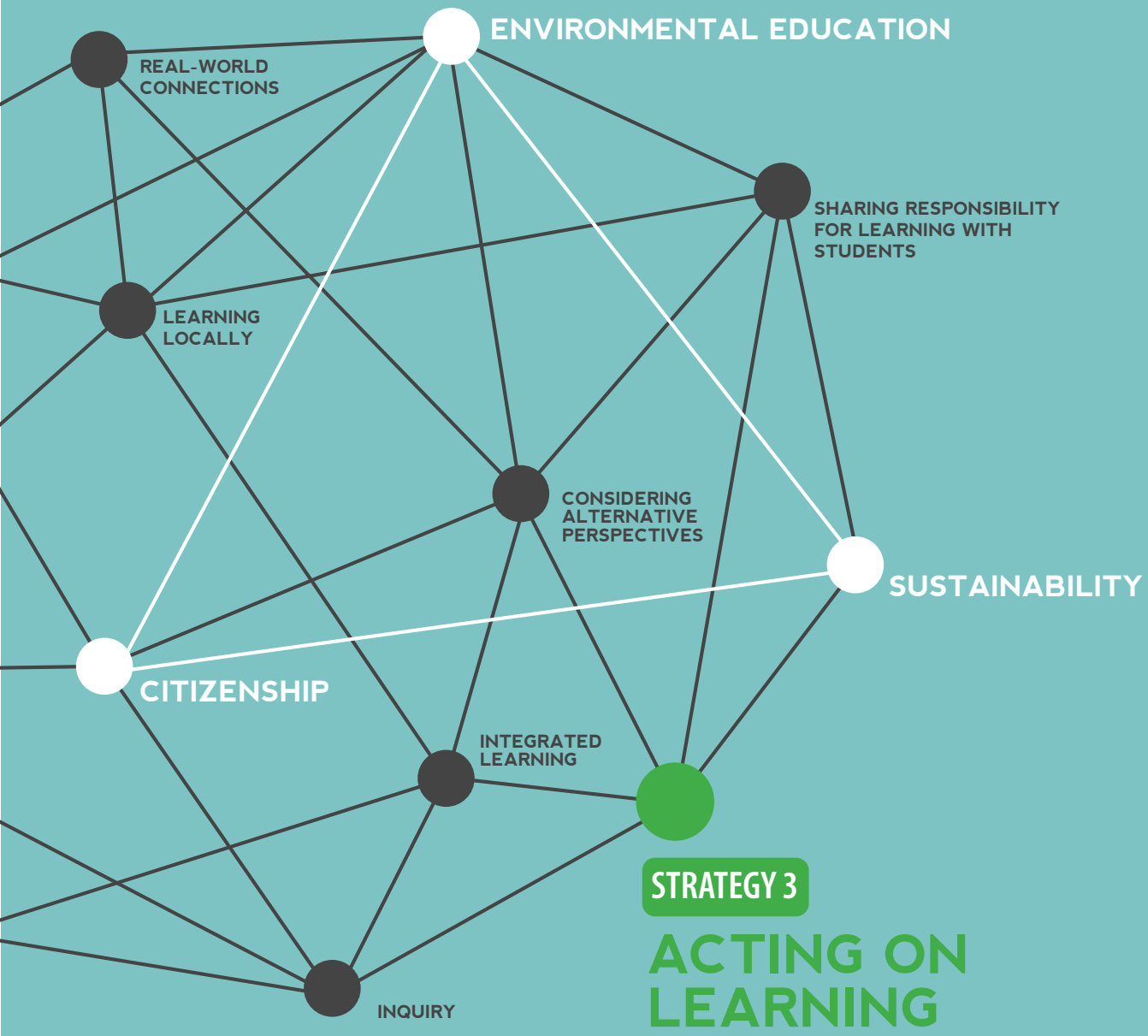


Note the misconceptions, such as the idea that acid rain can burn skin or umbrellas. The student correctly links acid rain to pollution but has little understanding of the mechanism of its impact on living and non-living things.

i. Block Scheduling

Traditional school timetables often show the school day divided into subject-based segments as short as 20 minutes. As facilitators of learning, teachers should consider how to create significant blocks of uninterrupted learning time that support integrated learning experiences. One or two half-day periods in a weekly class schedule for integrated or inquiry-based learning can have a significant influence on learning throughout the week.

> *"If we teach connectedness and integration, they learn that. If we teach separation and discontinuity, that is what they learn. To suppose otherwise would be incongruous."*
>
> —Humphreys et al, 1981



STRATEGY 3

ACTING ON LEARNING

When students act on their learning, school becomes relevant and the seeds of active citizenship are planted.

Strategy Outline

1. What Is It?
2. Visualizing Acting on Learning Concept Map
3. Why Use It?
4. How to Implement Acting on Learning
   a. Student Volunteering
   b. Service Learning/Action Projects
   c. Types of Service Learning Projects/Action Projects
   d. Planning for Service Learning/Action Projects
   e. Walking the Talk: Modeling Sustainability

1. What Is It?

Acting on Learning "moves beyond investigation of an issue to identifying solutions and working towards a desired change — in personal lifestyle, in school, in the community, and on the planet" (Laing, 1998, 170). If something is worth knowing, it is worth acting upon. Action projects are practical, real and relevant to the students involved. They are not planned simply as a learning exercise. They include community service ranging from volunteering to service learning.

Acting on Learning Occurs on Three Levels (Hammond, 1996):

Learning about Action

This is classroom-based and theoretical. Its purpose is to prepare students for taking on action projects. The intent is to provide students with the techniques and resources to be successful. It includes learning action skills and strategies, and reviewing the history of action work. If left at this level the transfer and success in real-world applications is less likely since students do not get the practical experiences dealing with real-world problems.

Learning through Action

At this level students select, plan and implement the project. The experience enhances their sense of competence and the learning experience is meaningful.

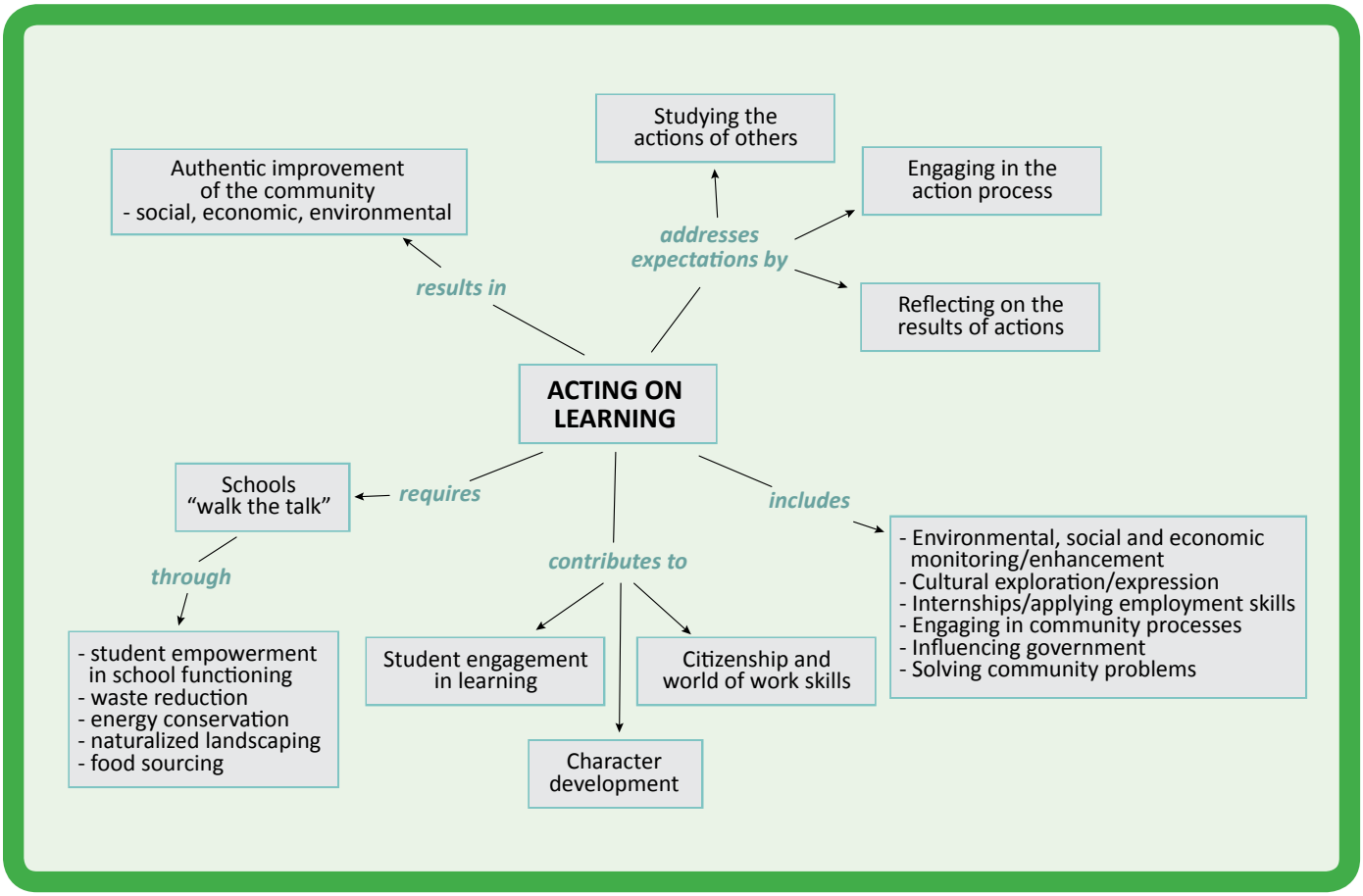
Learning from Action

In this post-action learning phase, students assess the significance of project outcomes and the processes that were involved. Consideration is given as to how the learning may be of use or applied in similar or other circumstances.

A great sense of accomplishment is achieved when learners help a nearby natural area after studying it.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

2. Visualizing Acting on Learning Concept Map



3. Why Use It?

- Students put what they have learned into action and gain greater understanding through the process
- Student engagement is enhanced as they move from passive detachment to active involvement (Stapp, Wals & Stankorb, 1996)
- Investigating a real topic of concern, and particularly the opportunity to do something about it, stimulates student achievement (Wiley, 1998, 32)
- Benefits accrue to both the students and the community. Active participation is considered an important element of citizenship (Ontario Ministry of Education, 2013, 10)
- The skills, knowledge and attitudes for active citizenship are cultivated. Students experience that change is possible through their efforts, cultivating a hopeful outlook. For some children this can address anxiety
- These experiences provide career insights and prepare students for the world of work. The skills cultivated through Acting on Learning overlap the skills of employment (Conference Board of Canada, 2000)
- Acting on Learning is transformative. It includes work towards social and environmental justice with students involved as active collaborators in complex, multi-disciplinary community action projects, which they themselves initiate and lead (Russell, 1999, 4).

4. How to Implement Acting on Learning

Acting on Learning can range from a one-time experience to full-year projects that address many subjects. Acting on Learning can be achieved in a number of ways. Student volunteering is the easiest to pursue. Service learning projects differ from volunteering; they involve reflection on the learning experience. Schools can also address the "hidden curriculum" by working to "walk the talk." Attention is paid to having school practices be consistent with the values and intent of the curriculum, from purchasing practices to management.

a. Student Volunteering

Many students find volunteering a positive experience in this limited use of the Acting on Learning strategy. The level of student commitment to volunteer projects varies since in some cases students are "voluntold" by the classroom teacher. Nevertheless volunteer experiences can be planned to match what is being learned, thereby adding considerably to student understanding.

EXAMPLES

Litter Clean-up (Elementary)
Primary students clean up litter in the schoolyard and neighbourhood in conjunction with their learning about community.

Habitat Restoration (All Grades)
Students participate in community tree planting activities that are part of a habitat restoration initiative in conjunction with their learning about habitat requirements of various species.

Schoolyard Naturalization (All Grades)
Students provide the labour for a school-wide, schoolyard naturalization project that has been designed and planned by others.

b. Service Learning/Action Projects

Service learning has more impact than student volunteer projects. Service learning projects include the following features in their design:

- Service learning is related directly to curriculum expectations. Students, teachers and community partners identify the goals that will be part of the experience
- Student reflection, during and after the service or action, is an essential component
- The service project meets a real need in the community
- The service learning project gives significant roles to students in the selection of the project, its planning and its management (Fertman, 1994).

"Only in action does knowledge become wisdom."
— Dalai Lama

c. Types of Service Learning/Action Projects

i. Cultural Exploration and Sharing Projects

Students identify an aspect of their local culture, an event or site in the community to celebrate. They participate in research with community members. They choose a format to communicate what they have learned and get responses to their work (Smith, 2002).

EXAMPLE

Appreciating Medieval Influences (Grade 4)
Students identified buildings in their communities with medieval influences. Using digital photographs and their own line drawings they prepared displays showing the sites and shared these at the public library. The project addressed social studies, science and technology, language, and visual arts learning expectations.

ii. Environmental Communication, Monitoring and Enhancement Projects

Environmental service learning projects include schoolyard naturalization, monitoring changes in the local environment, making the community aware of its natural heritage, and identification and restoration of degraded natural areas.

EXAMPLE

Measuring the Ecological Health of the River (Secondary)
Working in co-operation with other schools in their watershed, secondary school students measured the ecological health of the river in their community and shared the results. They submitted reports to local officials, informed the public through displays and suggested plans to address particular problems.

These students are assisting the municipal government by painting messages about storm water through the Yellow Fish Road program.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

iii. Social Awareness and Enhancement Projects

In these projects students identify a group within the community and design a program to meet a need.

EXAMPLE

Peer Teaching (Grade 11)
Each year students in the da Vinci 4 credit program take on the responsibility of organizing and presenting a two-day field trip for Grade 4 students. Working in program delivery teams, these secondary students each have the responsibility for a portion of the program. After delivery to each Grade 4 class, they use reflective discussion and modify the program for the next class. See Eco-Artists at http://www.ugdsb.on.ca/jfrx/Davinci/.

iv. Internships and Entrepreneurial Projects

These projects focus on economic activity in the local community. Students can set up a business to meet a need and direct the proceeds to a worthy cause, or they can help establish a local co-operative enterprise.

EXAMPLE

Cooperative Business Venture (Secondary)
As part of an integrated secondary school program, business studies students identified an economic need or opportunity in the community and then established a co-operative business venture to address it. The project included preparing a business plan that was evaluated with some of the same criteria used by the local credit union to determine if a loan was warranted.

"The 'hidden curricula' of schools convey the values that are really important to the school, even when they contradict the lessons of the classroom (for instance, a soda machine in the hallway can speak louder than any number of lectures about nutrition). Schools are systems, and they are communities. Schools are themselves important nodes in the web of institutions that constitute society. Whatever happens in schools will have profound effects on the rest of society."

—Centre for Ecoliteracy, Sustainability and Schools, 2009

v. Participation in Community Process Projects

In these projects, students become a player in an initiative that the community has identified as important.

EXAMPLE

Advocacy (Secondary)
In a municipal review of wastewater treatment, senior geography students prepared briefs and presented them to municipal officials just like other stakeholder groups, taking on the role of full-fledged citizens with the support of the school-learning environment.

The Garlic Mustard Busters Festival organized by a grade 4 class included student-made videos, marketing, contacting community members and management of the activities during the event.

PHOTO CREDIT: STAN KOZAK

vi. Solving Community Problems

Community problem solving is a specialized and open-ended form of service learning that is determined by the location or community where it takes place. Students identify an issue or problem that needs addressing, investigate its causes, develop possible solutions, prepare a plan and then carry the plan out. This form of service learning exposes students to the insights and challenges of active citizenship. Students lead the process with the teacher adopting a coaching role, while linking the project to curriculum expectations. (UNESCO, 2002)

EXAMPLE

Graffiti Remediation (Grade 5)
Students identified the graffiti and vandalism-ridden park in their neighbourhood as an issue of concern. They came up with plans to clean up the area and initiated a community awareness campaign (Smith, 2002, 590).

d. Planning for Service Learning/Action Projects

Service learning project planning emphasizes:

i. Preparation

Involving students from the start, and making clear the learning expectations to be addressed, enhances the chances of successful learning. Students should be prepared with the knowledge, skills and possible challenges they might encounter. The greater the involvement of students in the selection and planning of the service, the better the learning will be. Criteria for evaluation should be co-created.

ii. The Service

Through project design, students can get a variety of placements — engaging with different people, places and tasks. Students can gain more if the service is in an unfamiliar environment.

iii. Reflection

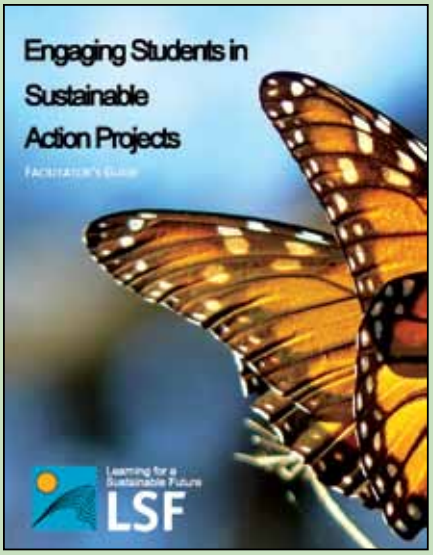
Reflection is essential to maximize learning. Both self and group reflections are beneficial. Reflection identifies the challenges experienced during the service, how members of the class are sharing different tasks, and future implications. Reflection is important for exercising judgment.

iv. Celebration

The completion of a project should include some form of celebration where experiences and achievements are acknowledged and community participants are thanked.

v. Evaluation

Everyone involved in the service learning project should have a role in the evaluation of its degree of success.



Engaging Students in Sustainable Action Projects is a detailed guide that outlines 11 steps to help turn significant elements of decision making over to students. It is available on the Learning for a Sustainable Future website. www.lsf-lst.ca

e. "Walking the Talk": Schools Modeling Sustainability in Operations and Administration

Schools and educators that make efforts to "practice what they teach" demonstrate authenticity.

Ways for Schools to "Walk the Talk"

- Staff can verbalize eco-friendly actions … "I am turning out the lights as we leave the room because…"
- Administrators can include sustainability practices as part of the school's annual goals
- Share progress with the entire school community and celebrate when particular goals are achieved
- Involve students in budget decisions and determining school rules.

EXAMPLE

The Ontario Ecoschools Program (All Grades)
This program assists schools in reducing energy and water use, as well as waste production, and in greening of school grounds. Through these and other efforts, the operation of schools becomes consistent with what is taught (http://ontarioecoschools.org/).

Acting on Learning Examples from the R4R Database

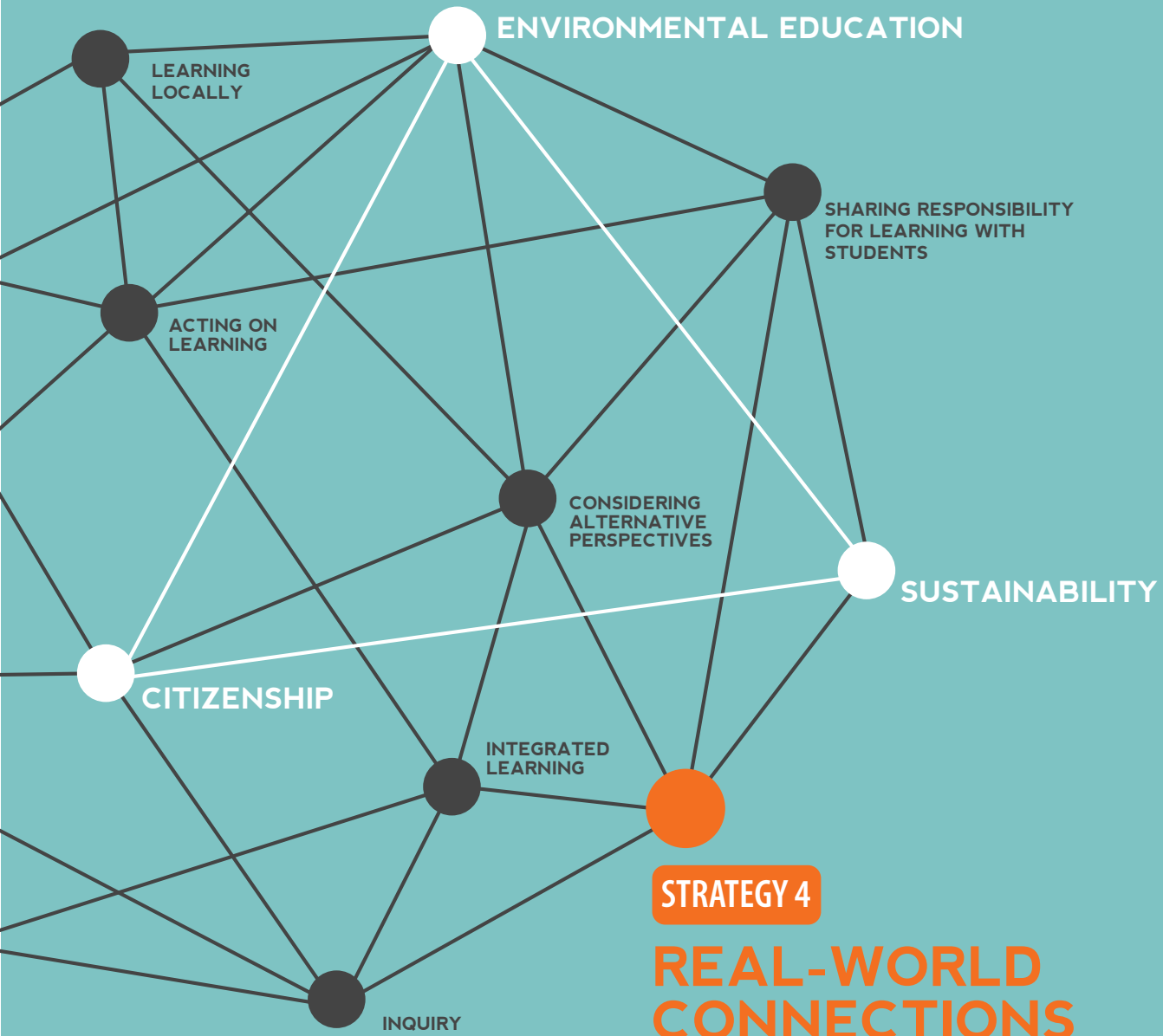
The Resources for Rethinking Database (R4R.ca) provides teachers with access to learning programs from many sources that often feature transformative learning strategies. A search for the term "Action" turns up over one hundred examples. Some examples include:

- No Idling at School
- Quest for Clean Shorelines
- Give Water a Hand
- eCards
- Water Mapping

The database searches for learning programs by jurisdiction, grade, subject, theme, resource type and keywords and is applicable across Canada.

What does transformative learning look like? It involves being an active contributor learning in the context of doing real work enhancing both the learning and the community.

PHOTO CREDIT: STAN KOZAK



STRATEGY 4

REAL-WORLD CONNECTIONS

Students want to be involved in the real world.

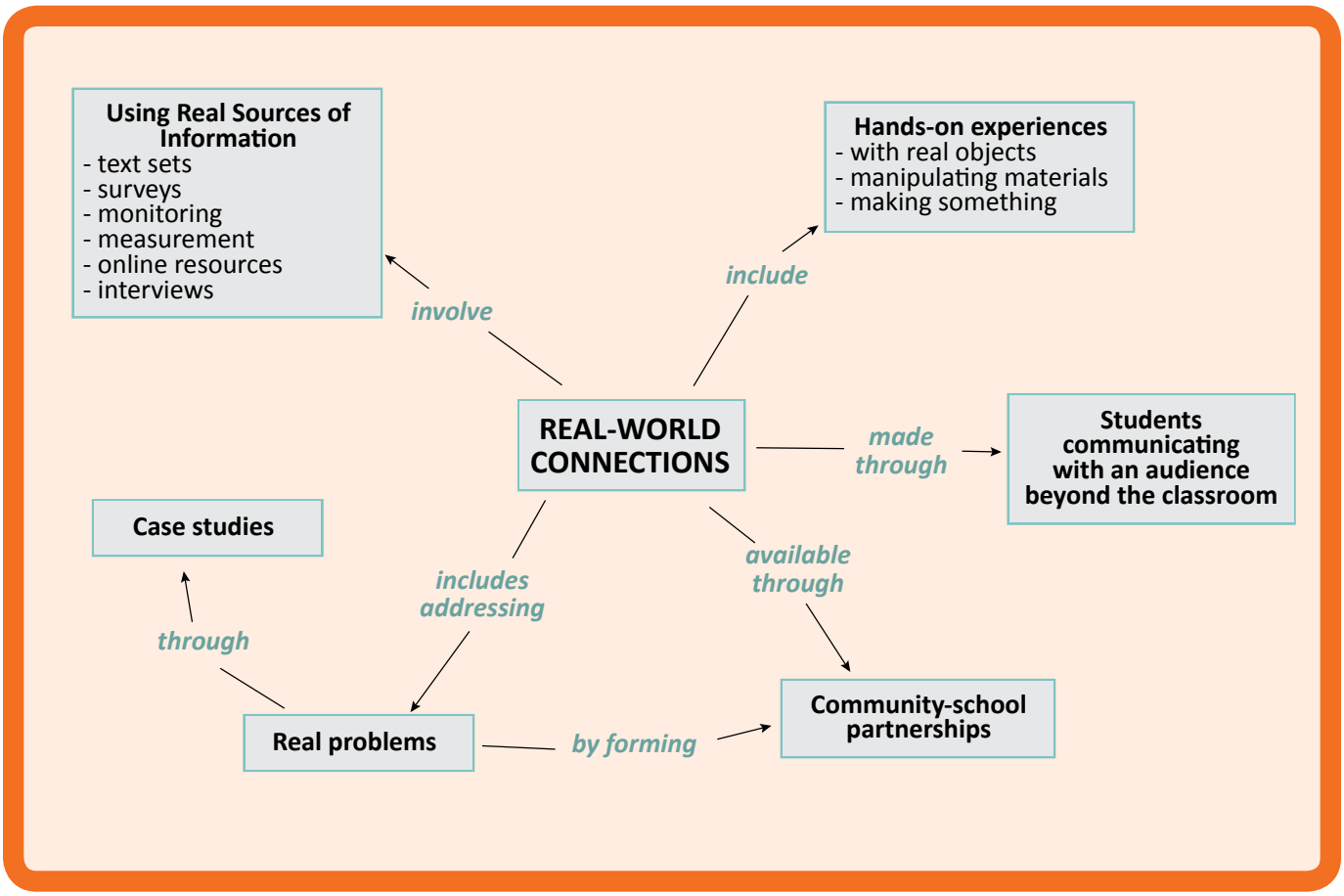
Strategy Outline

1. What Is It?
2. Visualizing Real-world Connections Concept Map
3. Why Use It?
4. How to Implement Real-world Connections
   a. Manipulating and Experiencing Objects
   b. Making Something Useful
   c. Solving Real Problems or Issues
   d. Getting Information from Authentic Sources
   e. Directing Learning to an Audience beyond the Classroom
   f. Community Partnerships

1. What Is It?

Connecting learning to the world beyond the classroom has many advantages. It is highly relevant since it relates directly to students, their families and the community.

2. Visualizing Real-World Connections Concept Map



3. Why Use It?

- Addresses concepts, problems, or issues that are similar to ones students have encountered or are likely to encounter in life
- Brings the relevance, complexity and motivation of the real world to learning
- Includes sensory experiences, which appeals to and assists a wide range of learners
- Raises student achievement through the authenticity of the learning
- Supports character education as relationships between the community, the school and other students are strengthened
- Generates issues or questions to pursue through inquiry
- Provides greater opportunity to learn how our communities and societies work

4. How to Implement Real-world Connections

The best context for learning is life in the real world. Real experiences can be incorporated into the learning process.

a. Manipulating and Experiencing Objects

Often referred to as hands-on learning or activity-based learning, this can be described as "any educational experience that actively involves people in manipulating objects to gain knowledge or understanding" (Haury & Rillero, 1994).

EXAMPLES

What is a Filter? (Grade 2)
During an inquiry-based investigation into water, one of the students used the term "filter" but did not have the meaning quite right. The teacher used this opportunity to expand on this tentative use of new vocabulary by bringing many samples of filters into the classroom and having students use them to "clean" mixtures of soil and water. A lively discussion ensued as to how the filters worked. The next day the teacher brought in additional examples of filters, a flour sieve, an aquarium filter, a safety mask filter and a furnace filter — all objects she collected at home. Students linked their experience of filtering to cleaning dirty water through a funnel filled with playground sand. Having the opportunity to observe and use the various filters prompted lots of writing and illustration in student journals, and the use of new vocabulary.

River in a Box (Elementary)
Students were given a trunk of materials. These included maps of the watershed, eroded stones, biological and historical artifacts, taped stories from several people who live along the river and taped historical reenactments, as well as newspaper clippings. With these items students got a better grasp of the size, complexity and history of their region, leading to insights as to how they can help improve watershed health. The collection was organized on a large watershed floor map. As students moved along the river system map they pulled objects out of labeled pouches that related to a place and a story line, in this case an historic journey down the river. The real materials were supplemented with books and audiotapes (Mack, 1998, 27).

"No student should graduate without understanding how to analyze resource flows and with the opportunity to participate in the creation of real solutions to real problems."

—David Orr, 1991

The first project of the semester for this construction class was a nest box. Through a partnership, a community group pays the cost of busing so that the builders can also erect the boxes in a nearby conservation area.

PHOTO CREDIT: STAN KOZAK

b. Making Something Useful

Necessity is a powerful motivator.

EXAMPLES

Building a Bird Nest Box (Grade 4)
Drawing on children's need to help other living things, a nest box construction project required them to practice many skills. The learning project included reading for information, measuring and calculating to determine materials required, learning to use hand tools safely and writing to explain to others why their structures were important.

Craft as an Environmental Learning Experience (All Grades)
This refers to making items from materials from the land that are then used. Local materials can be harvested and used to make items such as a wooden spoon or a canoe paddle in a relatively short time. The maker reflects, connects to the land through the material and achieves a sense of accomplishment when the item is put to use (MacEachren, 2007).

c. Solving Real Problems or Issues

A real-life problem or task makes learning authentic. When it is not possible for students to have direct involvement in a task or problem, a case study approach can be used.

EXAMPLES

Planning a Trip Using the Transit System (Grade 7)
Senior elementary students were asked by their teacher to plan a field trip to a suitable location in the community using public transit. Small groups researched possible destinations and the routes by transit and presented these to other members of the class. Based on the presentations, one of the trips was selected. The students finalized the arrangements and the trip was conducted all with the teacher taking a "back seat" in the learning process.

Case Studies in Tragedies of the Commons (Secondary)
A secondary school teacher selected the collapse of the northern cod stock in Canada as the context for students to learn about the challenges of sustainability in a resource issues class. Media reports and other documentation provided real-world sources of information and these were supplemented by telephone and email interviews with individuals who had direct experience with the event.

d. Getting Information from Authentic Sources

Gathering data can occur in the schoolyard or reach to anywhere on the planet with technology. Using real-world data provides authentic opportunities to use literacy and numeracy skills in contexts that learners find more meaningful. Students can:

- Apply technical skills to maintain and develop networks, communicate, collaborate and share information
- Develop skills to use, evaluate and judge real-world sources of information
- Apply critical literacy skills to find credible information and identify perspectives and bias.

"The sequence is important. When we do, we sense. When we sense, we respond. When we do, sense and respond, we learn."

—Jim Martin, 2001

i. Text Sets Rather than Textbooks

A text set is a collection of trade or library books and other print information on a particular topic that is used as a source of information for learning. Different titles provide learners with a range of reading levels, perspectives and writing genre.

EXAMPLE

Biodiversity Research (Grade 6)
In an investigation of biodiversity in local habitats, the teacher assembled a collection of titles from the school and public library for each of four local habitats studied. Based on the research from the text sets, each group of students prepared a guided tour of their local habitat.

ii. Digital Libraries and Libguides

Access to online sources allows for a very wide range of information resources. To control or limit this vast resource, teachers can work with their teacher-librarian to create a Libguide to a topic to help facilitate research and explicitly teach digital research skills.

iii. Measurement, Surveys, Monitoring

Many projects can involve students in collecting data and making observations to achieve valuable insights.

EXAMPLE

Measure Up! (Grades 7 to 12)
The Association for Canadian Educational Resources (ACER http://www.acer-acre.ca/) helps citizens become more environmentally literate through working with their local ecosystems. In the Measure Up! Program, students measure and monitor trees in their schoolyard or local community and submit data for use in monitoring the effects of a changing climate.

iv. Accessing Governmental and Non-governmental Organizations

Government provides services to citizens to help them address challenges. Students as citizens have access to these resources and should have experience with them. Similarly it is valuable to understand that democracies are made stronger through the participation of civil society organizations. These organizations have tremendous resources that can support learning on many topics.

EXAMPLE

Identifying Pollution Sources in the Community (Secondary)
The overused term “pollution” takes on new meaning when it is something that students experience directly. Project Pollution Watch (http://www.pollutionwatch.org/) provides government data to the public on pollution sources for each community in Canada by simply typing in a postal code. It provides students with relevant information to launch further research into options for action.

The Telephone: Important Tool and Important Skill

People working in institutions, government, post-secondary education and business can provide students with valuable information by phone. Help students develop this important skill with these guidelines:

- Plan your call and know what you want from it. Be prepared with follow-up lines of inquiry if your primary one is not successful.
- Be persistent and polite.
- Ask for clarification if you are not sure what someone says.
- If the person can't help you, ask them who can.
- Leave a clear message if you need to and include your name and number, the time you called and specific details as to the information you are after. Speak slowly so that your message is clear.
- Get a time commitment if someone is going to send you something.
- Keep notes of your calls and who you spoke to so that you can refer to these later if needed.

e. Directing Learning to an Audience beyond The Classroom

This is a simple yet powerful learning practice. Design the learning experience so that students must direct the product of their learning to an audience beyond the classroom (Newmann et al 1995, 25). This alone strongly enhances and shapes the learning since the project must be of interest to others outside the school. Once students realize that their learning will be shared with others for a purpose, their motivation soars.

Audiences can be reached by:

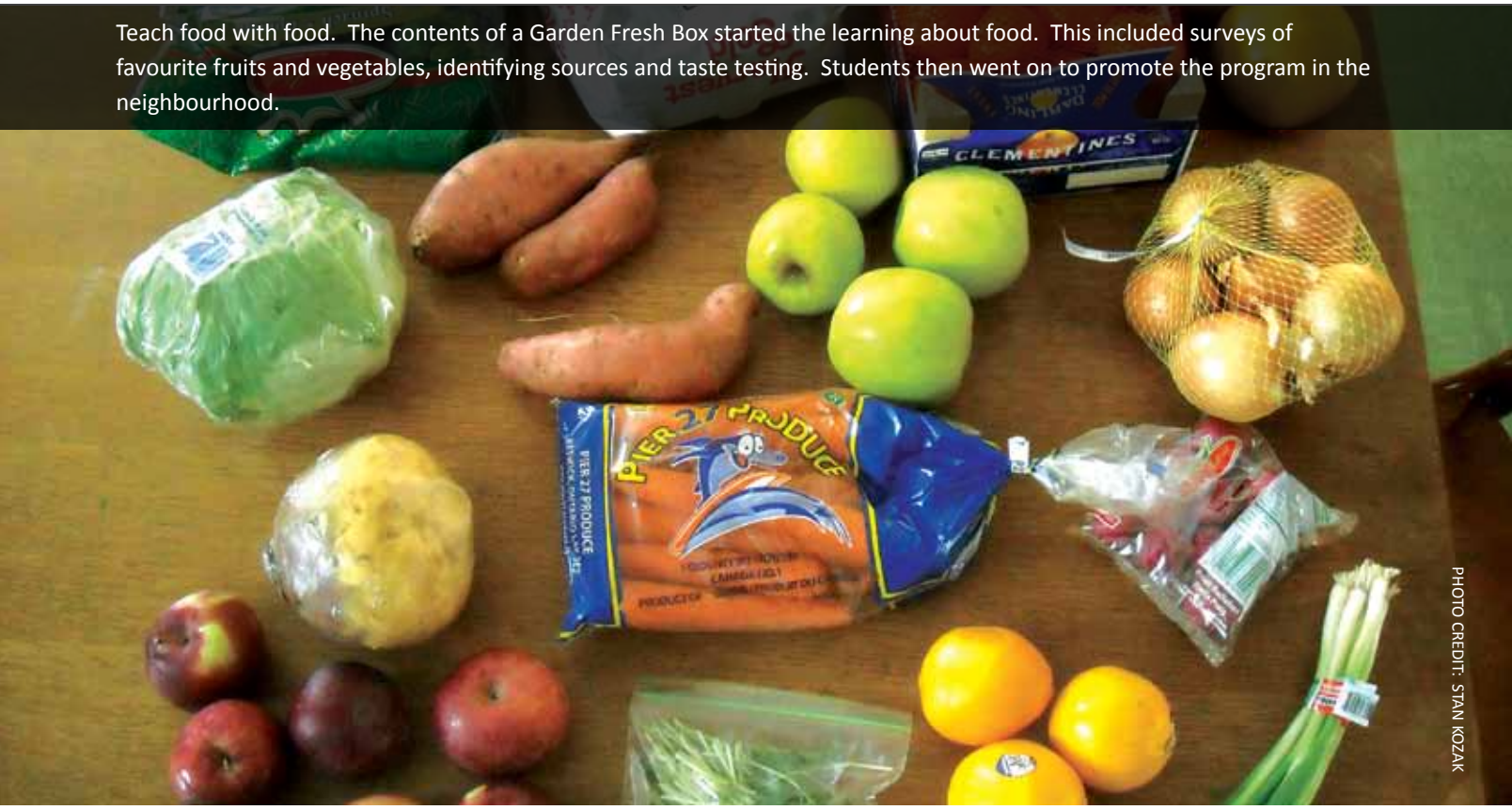
- Bringing people into the school such as a panel of community members
- Students communicating to an audience beyond the physical school
- Taking students out of the school to connect with the audience directly.

EXAMPLES

Storefront Displays (Grade 1)
Students each created an example of a structure found in their community then displayed these in an empty storefront window. Proud of their work, they brought other family members to view the display. The teacher arranged for the local newspaper to cover the event.

Health Note (Grade 1)
Grade 1 students shared their understanding and concerns for their family members by sending them a "health card" (a postcard) on how to avoid germs.

Postcards (Grade 3)
Student-created postcards featuring a local ecology park were sent to community members informing them of the living things found there and how these can be helped.



Teach food with food. The contents of a Garden Fresh Box started the learning about food. This included surveys of favourite fruits and vegetables, identifying sources and taste testing. Students then went on to promote the program in the neighbourhood.

PHOTO CREDIT: STAN KOZAK

Panel Displays (All Grades)
Following a field trip to a local natural area, students created three-panel displays of what they found there, and then set them up for viewing in a local hospital waiting room.

Mall Displays (Grade 8)
Students researched an animal rights issue and created A-frame displays. These were set up in a local mall where students could interact with local shoppers.

Street Theatre (Grade 8)
Students created short, street theatre plays about local waste management issues and presented them in the mall and on the main street of town.

Emailing a PowerPoint Presentation (Grade 9)
Using The Acid Rain Primer (Pollution Probe, 2006), students analyzed the information and identified community groups who could benefit from a better understanding of this form of air pollution (car sales people, mechanics, auto columnists in the local paper). They created PowerPoint presentations, contacted target audiences, sent them the presentation and asked them to respond.

Peer Teaching (Grade 11)
Secondary students using a business model (they charged for their service), organized and led two-day fieldtrips for grade four classes that explored four common habitats from the perspective of a scientist and an artist. Each elementary class paid a fee to participate. The profits were used to fund parts of the secondary school program expenses.

f. Community Partnerships

A partnership implies give and take involving both parties. Learners have much to offer their communities and in turn communities can provide learners with many resources, insights and experiences.

EXAMPLES

Conservation Area Composting Toilet (Grade 4)
A neighbouring conservation area was closed to Belfountain Public School classes and the public during the off-season because there were no washroom facilities. The class, with the guidance of their teacher, suggested a partnership. They would get a suitable facility constructed and in turn the area would be open for them to use throughout the school year. The students found the expertise in the area to design the facility, raised the funds and monitored its construction. Classes and the public now use the conservation area all year.

Wetland Centres of Excellence —Ducks Unlimited (DU) (Secondary)
This national non-governmental organization partners with a number of secondary schools that adopt local wetlands. In New Liskeard, Ontario, DU and LSF provide funds for the program where secondary students prepare and deliver an elementary field trip program to Grade 4 students.

Commissioned Community Projects (Grade 11)
The Gosling Foundation provides funds to secondary school integrated programs to help cover costs and in turn asks students to research a local issue and share insights with the community. Students from the Ecoshores Program on the Bruce Peninsula were asked to find out about the current status of the Massasauga Rattlesnake. They conducted research, came to a position they thought the community should know about and communicated it through market displays, radio interviews and public service announcements.

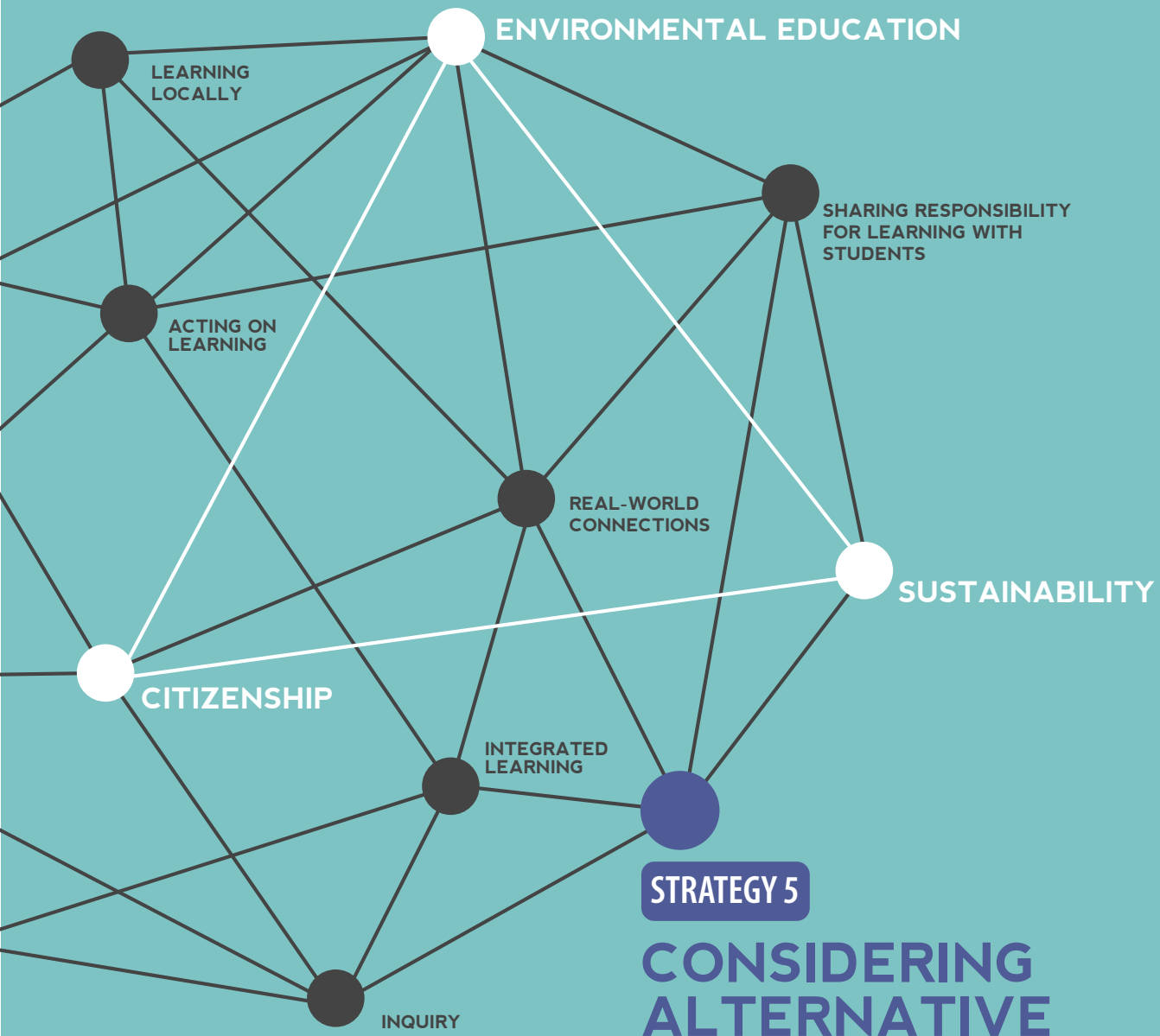
Ecoshores students took their learning about Massasauga rattle snakes to a local farmers market to reach an audience that they identified as being important players in determining the future of this endangered species.

PHOTO CREDIT: STAN KOZAK

Numeracy and literacy expectations can be met within the context of a useful project. These students are making shopping bags from discarded clothing.

We learn if we have something in our hands.
—Jean Piaget

PHOTO CREDIT: STAN KOZAK



STRATEGY 5

CONSIDERING ALTERNATIVE PERSPECTIVES

Bringing alternative perspectives to the attention of students is an invitation to critical thinking.

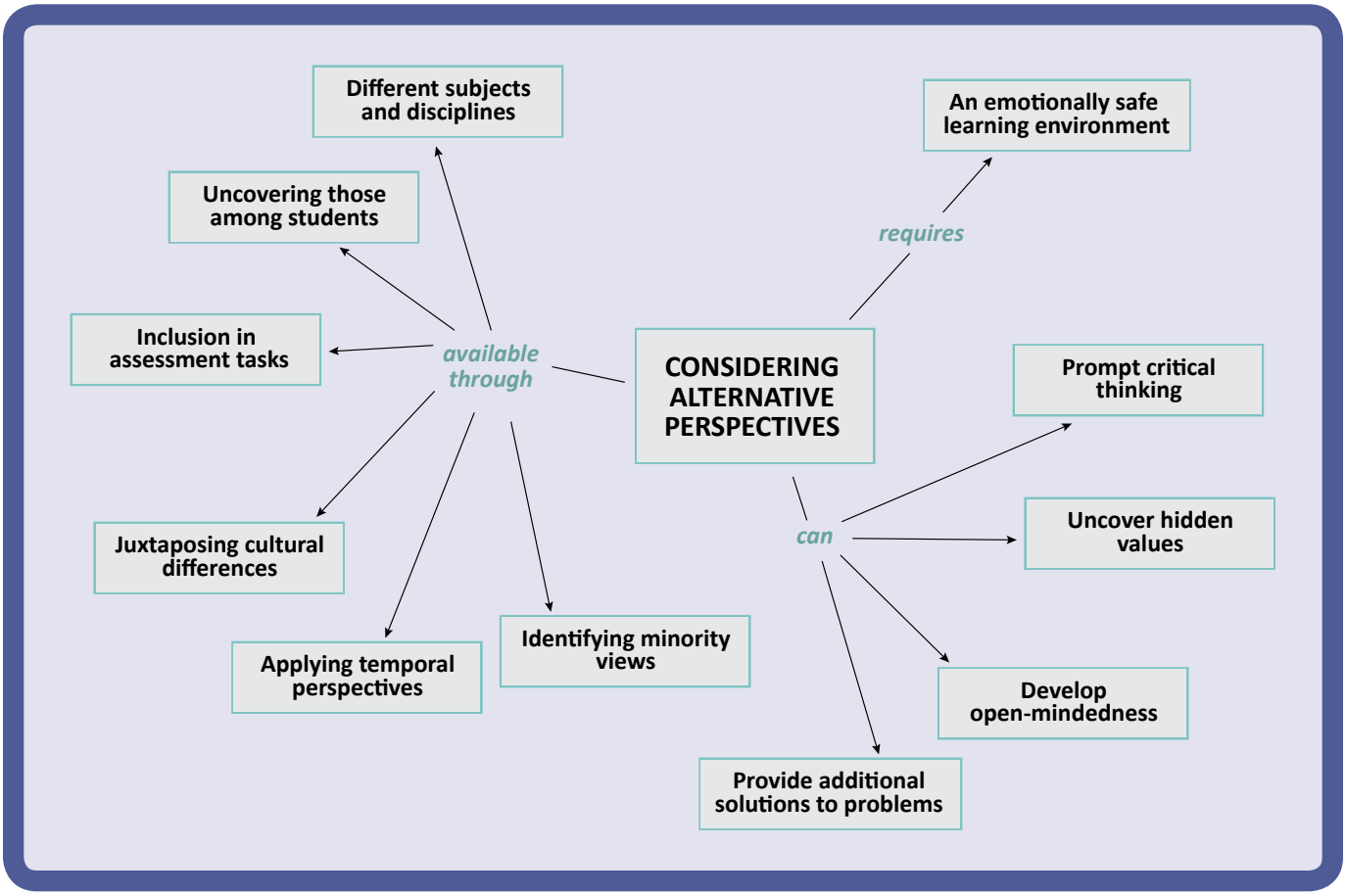
Strategy Outline

1. What Is It?
2. Visualizing Considering Alternative Perspectives Concept Map
3. Why Use It?
4. How to Implement Considering Alternative Perspectives
   a. Perspectives Provided by Different Subjects and Disciplines
   b. Uncovering Alternative Perspectives among Students through Multiple Points of View Activities
   c. Learning and Assessment Tasks that include Alternative Perspectives
   d. Juxtaposing Cultural Differences
   e. Temporal Perspectives –Considering the Past, Present and Future
   f. Revealing Minority Views through Literature and the Media

1. What Is It?

Considering Alternative Perspectives exposes student to different ways of looking at issues, solutions, strategies, experiences, world views and ways of knowing, in the process of solving problems, forming opinions, clarifying values and taking an informed position.

2. Visualizing Considering Alternative Perspectives Concept Map



"Hear one side and you will be in the dark. Hear both and all will be clear."
—Thomas C. Haliburton

3. Why Use It?

- Exposes our values to critical thinking, preparing students to make better decisions as informed citizens
- Creates a thinking dilemma through which reflection techniques, critical analysis skills and informed opinions can be developed
- Develops open-mindedness, "an intellectual virtue that involves a willingness to take relevant evidence and argument into account in forming or revising our beliefs and values" (Critical Thinking Community, 2009)
- Provides more options for solving problems and addressing challenges
- Develops an ability to respect and understand different viewpoints by making students more aware of their own values and biases. This is an essential element of character education
- Supports respect for diversity, creating an emotionally safe place for students to express their current views and compare them to those of others
- Addresses the issue of bias and indoctrination. The learning process shifts from the transfer of accumulated knowledge to the evaluation of two or more perspectives or interpretations of knowledge.

4. How to Implement Considering Alternative Perspectives

This learning strategy is based on practices that introduce students to multiple sides of an issue and prompt them to gather and compare information in order to make a judgment or take a position. A variety of techniques can be used to access students' views and advance the understanding of everyone in the class. From there, learners can explore the range of perspectives found within their community and beyond.

a. Perspectives Provided by Different Subjects and Disciplines

Subject perspectives provide insight into different ways of understanding. Teachers can plan to bring different subject perspectives to a topic. Learning about a wildflower meadow can be approached through science, which could examine the interaction of species found there. Visual art can be used to explore form and colour. Numeracy can provide numerical insights such as numbers of members of plant species per defined area. In this way each subject contributes to an understanding of the concept of a wildflower meadow.

b. Uncovering Alternative Perspectives among Students through Multiple Point of View Activities

Each group of students brings a diversity of background, experience and understanding. There are a number of techniques that can be used to bring forth these different perspectives to aid learning.

EXAMPLES

Four Corners (All Grades)

Students individually select and write about their own position on an issue. Meeting with others who have the same position, they compare and articulate a group response. The four corners of a classroom are posted with four positions on a statement concerning the topic or issue under consideration: Agree - Strongly Agree - Disagree - Strongly Disagree. Students are asked to select the one closest to their position. Alternatively, students can be assigned a point of view, which they then support and present. Following a class debate or discussion, individual students each write a paragraph outlining the position they have come to after hearing from others (Learn Alberta, 2008).

De Bono's Six Hats (All Grades)

The Six Thinking Hats process can improve the quality of group decision-making. Six Hats looks at a decision from different perspectives.

- The Blue hat keeps order, allows each person to speak and collects the data.
- The White Hat focuses on available data, analysis of past trends and extrapolating from the past to the future.
- The Red Hat uses intuition, gut reaction, and emotion in responding to the proposal or statement under consideration.
- The Black Hat is a pessimist, always cautious and defensive, who tries to see why ideas and solutions won't work.
- The Yellow Hat is always positive, one who sees all the benefits, values and opportunities.
- The Green Hat is creative and offers freewheeling ideas.

The process can be modified to assign each coloured hat a particular position on an issue (Mind Tools, 2013).

c. Learning and Assessment Tasks that include Alternative Perspectives

These students have each researched a living creature and are speaking on their behalf at the Council of All Beings to let humanity know how they think they should be treated.

PHOTO CREDIT: LCDSB

Tasks that require students to consider alternative solutions, strategies, perspectives, or points of view in addressing a concept or problem, enhance learning (Newmann et al, 1995, 21).

EXAMPLES

The Council of All Beings – Communicating on Behalf of Another (All Grades)
Research and creative imagination helps students understand how others might communicate if they had the chance. The Council of All Beings activity calls on participants to identify with and speak on behalf of living creatures or some aspect of nature. Participants prepare by becoming familiar with the entity they are representing and reflecting on what it would have to say to humanity if it could, and what it might ask of us.

Students choose the entity that they will represent. The project is highly integrated requiring students to do research, prepare oral introductions, create a visual image, and determine issues that are relevant to the beings they represent.

The Council of All Beings has been modified to be a Rich Performance Task modeled on a Webquest format for Grades 5 to 8 (http://www.ldcsb.on.ca/Pages/The-Council-of-All-Beings.aspx).

Climate Change Briefing Paper (Secondary)
You are an advisor to the Provincial Premier and are to prepare a briefing note on the actions that the province should take to reduce carbon emissions. Your briefing note should address:

- The sources of carbon and the reasons why controlling them is necessary
- A summary of the evidence supporting the need to control carbon emissions
- The various means of reducing carbon emissions and their relative merits
- What sectors of society will likely object or disagree and an analysis of options that they may provide as alternatives
- Conclude with a final summary that will lead the Premier to take your advice.

Business Plan Preparation (Grade 11)
Students in a business course were asked to prepare a greening plan for a local business. Students had to consider the needs of the owner, the environment, laws on the product, the type of customer already being served by this business and potential new clients.

"Educators can and should find ways to present environmental and sustainability concepts that will allow learners to draw their own conclusions about important environmental and societal issues."

—Environmental Learning and Experience, 2006, 6

d. Juxtaposing Cultural Differences

Dominant world-views and an understanding of one's own culture come into focus when comparisons can be made. Within most communities, pockets of alternative, minority cultural, religious or philosophical practice exist and these can be brought to the attention of students (Duenkel & Pratt, 2001).

Examples of cultural differences found in many communities include:

- A local cooperative and a privately owned enterprise
- A vegan restaurant and a steakhouse
- An Old Order Mennonite family farm and an agri-business
- Someone following volunteer simplicity practices and a regular household
- A non-car owner and a car owner.

Minority perspectives can be brought to students' attention directly through juxtaposing experiences or through indirect means (literature, online, the arts, etc.).

The assignment involved identifying minority points of view that would benefit the community then communicating them using sidewalk chalk messages.

PHOTO CREDIT: STAN KOZAK

e. Temporal Perspectives — Considering the Past, Present and Future

Thinking for the short term limits our understanding of current realities that stem directly from the past, and limits our ability to make choices to influence the future positively.

Timelines provide visual representations that are easy to grasp. Through research, students can create a timeline that connects them to a time that was quite different. Timelines can be used to consider future possibilities.

> *"One of life's biggest challenges is accepting that there are numerous interpretations and that there is rarely one right way to view the world. Literature can introduce characters who have learned to accept that different viewpoints exist, demonstrating how they persevere when faced with difficulties. Books can also change readers' perspectives about what they already know and extend their knowledge through new ways of seeing familiar things."*
>
> —Giorgis and Johnson, 2002

EXAMPLES

Local Biodiversity Timeline (All Grades)
Most people have very little awareness of the changes that have taken place in biodiversity in the region in which they live. Students can see the changes more clearly by creating a biodiversity timeline with visual and written components. The timeline can be extended into the future to identify species that could return to the area if certain actions were taken.

Alternative Futures (Secondary)
In contemplating the future, students can brainstorm using graphic organizers to show a number of alternatives:

- The future that is possible
- The future that is probable
- The future that is preferred.

Consideration of these alternatives for a range of issues helps us make informed decisions to achieve a sustainable future. (Pike and Selby, 1988, 13)

Appliance Life Cycle Costs (Secondary)
Our consumer culture and the advertising methods that support it, emphasize the purchase price of an item and pay little heed to lifetime costs. Examining lifetime costs presents students with a broader picture of the impact and cost of a purchase. Students can compare the cost of purchase and operation of two appliances listed in the Energy Star ratings. Include costs for water and electricity consumption, as well as initial purchase cost. Prepare an advertisement for the product that you think people should purchase. Base your ad content on the social, economic and environmental considerations associated with the products involved.

"Experiencing another culture teaches us that we are not as free as we might have thought, that we have been formed by forces of which we are largely ignorant. This new viewpoint then helps us to discern these forces and their values. In being able to identify them, we can begin to make choices about how we wish to direct or create our own lives henceforth."

—Duenkel and Pratt, 2001

f. Revealing Minority Views through Literature and the Media

Literature and media are rich sources of different views on many issues.

i. Using Fiction

Fiction has often been used as a means of conveying different perspectives.

EXAMPLE

Picture Books (Elementary)

Two Bad Ants by Chris Van Allsburg provides students in Grade 3 to 5 with an insight into the world of another living thing with which they would not normally identify. Through the examination of the graphics and the text, they can compare the views of people and those of ants. This story triggers a discussion on how people might respond when ants are found in their house (Read Write Think, 2009).

ii. Using Media

Media sources can be used directly. A high-profile news event can be examined from many perspectives and many viewpoints can be encountered using different media. For example, the fatal train explosion in Lac Mégantic, Quebec in 2013 can be reviewed and discussed through news coverage, looking at issues that include transportation safety, the pros and cons of moving shale oil over long distances, collateral pollution damage, the debate over whether pipelines should be built or expanded or whether society should be moving more aggressively to wean itself off dependency on carbon-emitting fossil fuels.

Environmental issues are covered in different ways by different media outlets and they can be depicted differently in print, in broadcast and online and via social media.

EXAMPLE

Six Views on Tree Sitting (Grade 7)

In a front page story, a national newspaper featured the views of six people on a young woman who had taken up tree sitting to protest the logging of an old growth forest. A Grade 7 teacher used the story as a context for her students to explore the role of hero.

Using the school's speakerphone in the library, the teacher set about preparing students to do interviews to explore the perspectives in the news story to see whether these people thought the tree sitter was a hero or not. Interviews provided perspectives from the tree sitter and five other community members identified in the media report (municipal official, First Nations leader, Ministry of Natural Resources staff member, non-governmental organization member, and a tourist operator).

Following the interview, the results were analyzed and students individually prepared a written paper on the question.

What is the most important part of the environment? This Grade 4 group chose water and prepares their presentation to other members of the class to support their selection.

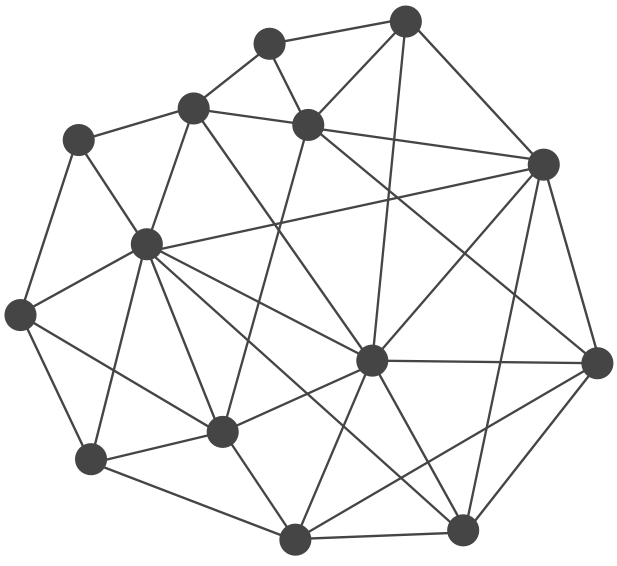
PHOTO CREDIT: STAN KOZAK

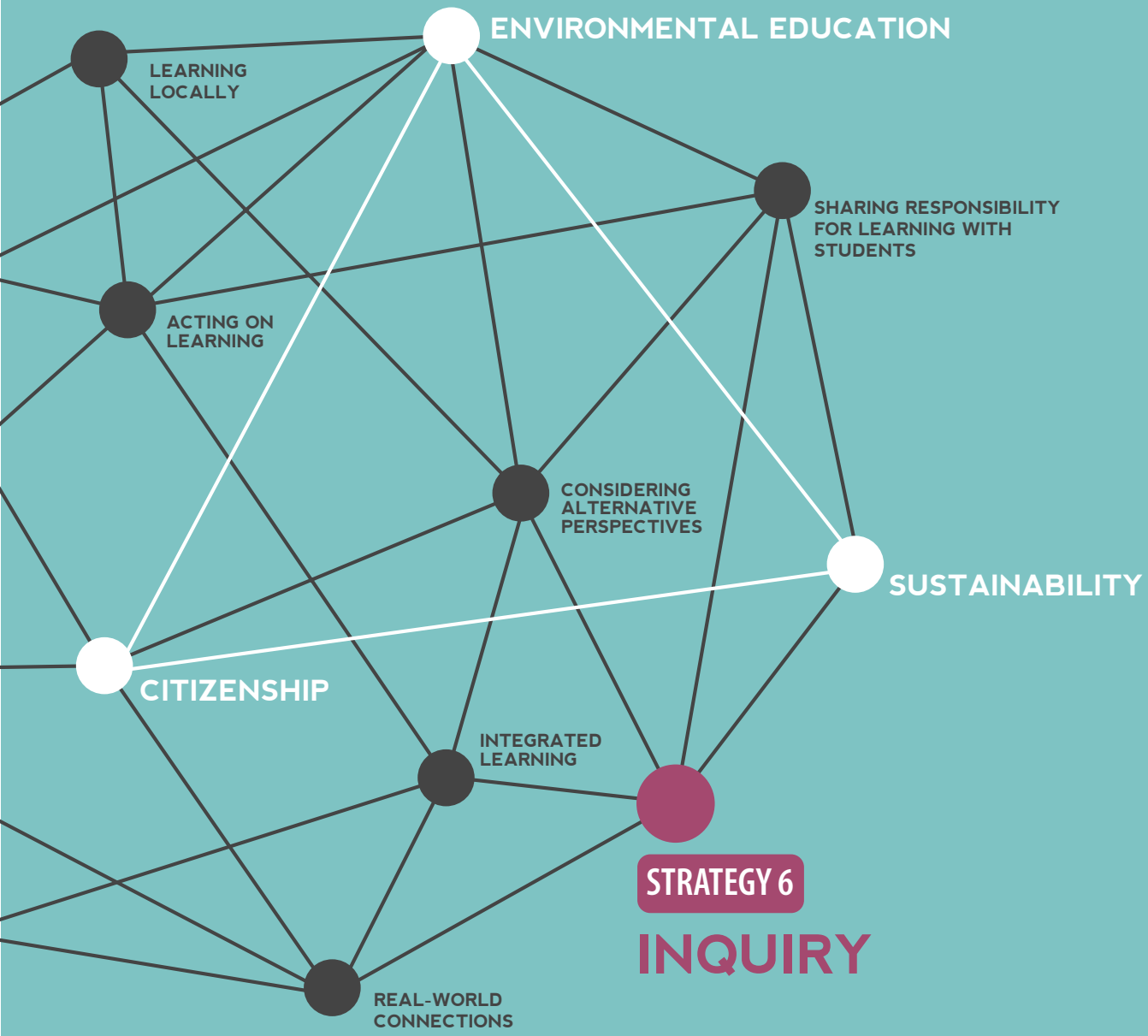
Responsibility to Learners

Educators have four kinds of responsibility to learners (Scott, 2009):

1. To help them understand why a consideration of sustainable development is in their interests
2. To use appropriate pedagogy for active engagement with issues
3. To help learners gain plural perspectives
4. To encourage learners to continue thinking about such issues beyond their formal education.

The challenge is to guide the learning, providing access to a variety of perspectives without indoctrinating. Presenting learners with minority perspectives is within the realm of the Considering Alternative Perspectives learning strategy.





Inquiry-based learning is most consistent with development of skills for lifelong learning. It prepares students to know what to do when the options before them are unclear.

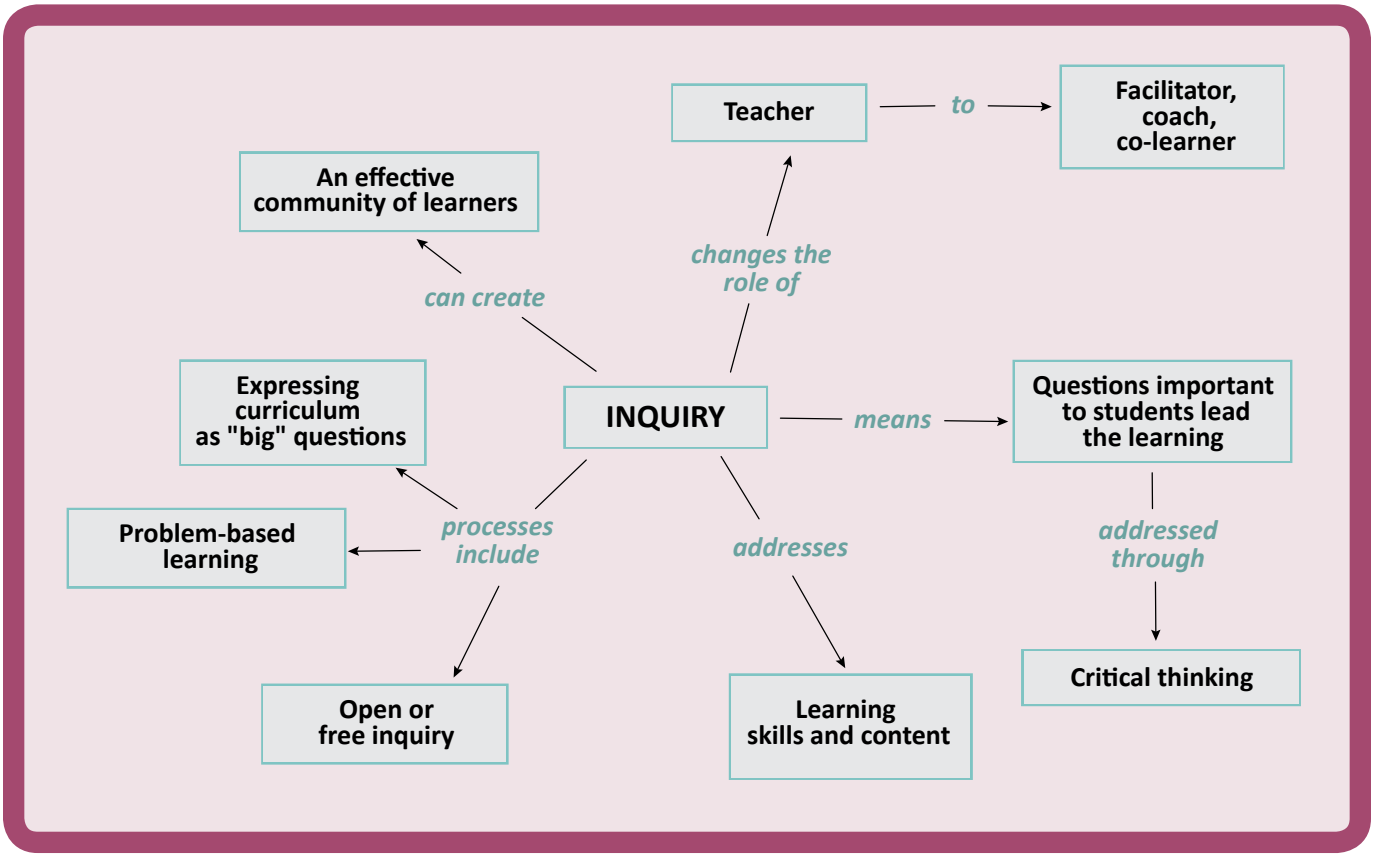
Strategy Outline

1. What Is It?
2. Visualizing Inquiry Concept Map
3. Why Use It?
4. How to Implement Inquiry
   a. Shifting to Inquiry — Expressing Curriculum as Key Questions
   b. Lesson Plan Remodeling for Inquiry and Critical Thinking
   c. The Experimental Method
   d. Learning Cycles
   e. Problem-Based Learning
   f. Open or Free Inquiry
   g. Critical Thinking Occurs In the Context of Inquiry
   h. Creativity and Inquiry

1. What Is It?

Inquiry is an approach to learning that is directed by questions, problems, an hypothesis or a challenge that individuals and groups of learners work together to address. At its best the learning is driven by student-generated questions. Students, assisted by the teacher, clarify the questions being asked and determine how to answer them. As knowledge is pursued, unplanned but important learning territory is often uncovered.

2. Visualizing Inquiry Concept Map



3. Why Use It?

- Provides a context to develop critical thinking skills and encourages problem solving
- Connects school learning with students' own knowledge and experiences
- Requires students to acquire information for an authentic purpose
- Provides students with opportunities to apply a wide range of reading, writing, talking, listening and thinking skills
- Student learning improves when schools adopt a consistent model of inquiry across all grades and subjects (Ontario Ministry of Education, 2004)
- Supports the development of a community of learners where group knowledge building contributes to individual understanding (Scardamalia, 2002)
- Inquiry learning supports the expression of creativity, the development of a positive outlook and independence.

4. How to Implement Inquiry

Inquiry learning has been characterized as ranging from "traditional," "hands-on," "structured," "guided," to student directed (Bonesetter, 1998). Over this range students take greater responsibility in determining the topic, the questions to be pursued, the learning processes and how the learning is applied.

Elements in effective inquiry learning experiences include student opportunity to:

- Build on their existing knowledge and skills
- Select topics of interest
- Use a variety of resources
- Select the best way to communicate their findings
- Share with real-world audiences
- Be evaluated on both process and product
- Evaluate themselves, their peers, their resources and teachers (Information Age Inquiry, 2009).

The following examples provide a range of inquiry processes from closed to open.

a. Shifting to Inquiry — Expressing Curriculum as Key Questions

Educators are required to organize learning based on expectations found in curriculum. A subtle but profound shift occurs when teachers take curriculum expectations and present them to students in terms of "big" questions.

Content curriculum exceptions for Grade 3 for the topic of plants can be expressed as five questions:

1. What do plants need to live?
2. What different parts do plants have and why?
3. What is the life cycle of plants?
4. How do plants and animals help and hurt each other?
5. How do people help or harm plants?

Turning curriculum expectations into big questions is a means of engaging readers and writers (Wilhelm, 2007). All the questions on plants identified above for Grade 3 could be addressed through one "big" one — what is the best place for plants to live?

> *"No longer are we passive receptacles of facts but actively involved explorers, constantly interpreting our experiences."*
>
> —J. Awbrey and S. Awbrey, 1995

b. Lesson Plan Remodeling for Inquiry and Critical Thinking

By using a lesson plan remodeling process teachers can take the lessons they currently have and improve them to incorporate inquiry and critical thinking (Critical Thinking Community, 2009).

EXAMPLE

Reconsidering Kitchen Utensils (Grade 10)
A standard Home Economics lesson on kitchen utensils was remodeled to incorporate critical thinking. It expanded the learning from kitchen utensil use to exploring what students should consider when purchasing these. The remodeled lessons included questioning and investigation of the practice of continually accumulating kitchen tools, gadgets and electronic equipment in relation to long-term impact. The learning experience was reframed in terms of the question: What factors ought to guide consumer decision making related to kitchen tools and technology? (Smith, 2009)

c. The Experimental Method

Experimentation is a formal scientific process used to gain understanding of phenomena. Classically, it has discrete steps used to test a hypothesis or guess but in reality it is not so cut and dried. Of significance in scientific experiments is the use of controls to limit the influence of variables. Experimentation is a powerful investigative process. It is only useful when a hypothesis is testable.

The term experiment is often used incorrectly. An activity that demonstrates a science principle undertaken by following predetermined instructions is not a science experiment. At best, it is a science demonstration.

In a formal science experiment, the experimenters don't really know the answer and are using scientific processes to find out if what they think will happen might be true.

EXAMPLE

An Experiment to Determine If Plants Need Water to Live (Grade 3)
Students in Grade 3 included water in a list of what plants need to live based on their experience. The teacher asked how they could prove that this was so. The students suggested that they could test their guess and with the teacher's help they used onion bulbs to see if these would grow with, and without water.

With the teacher's help the students devised an experiment using three onion bulbs of about the same size and identical containers. The amount of water given to each onion was the variable. The control onion received no water, one onion received 2 cm of water and one onion had enough water to submerge it.

The water levels were maintained over three weeks, observations were made and recorded. At the end of the experiment it was noted that the onion with no water had not changed, the

onion with 2 cm of water had sprouted and was growing vigorously, while the submerged onion had grown but then died and was rotting. Based on this experiment the students had evidence that some water was good for plants but they might get too much to live, as well. The teacher suggested they repeat the experiment with bean seeds to see if what they had learned applied to another plant.

d. Learning Cycles

Learning cycles guide students through a prescribed set of overlapping learning activities. The suggested number of steps in the process varies. Though developed for use in science learning, E-learning (based on the names of each step) cycles are applicable in many subject areas.

Engagement	Object, event or question used to engage students. Connections facilitated between what students know and can do.
Exploration	Objects and phenomena are explored. Hands-on activities, with guidance.
Explanation	Students explain their understanding of concepts and processes. New concepts and skills are introduced as conceptual clarity and cohesion are sought.
Elaboration	Activities allow students to apply concepts in contexts, and build on or extend understanding and skill.
Evaluation	Students assess their knowledge, skills and abilities. Activities permit evaluation of student development and lesson effectiveness.

(Coe, 2001).

Fieldtrips play multiple rolls in inquiry learning, sometimes being a shared event that starts an inquiry or being a means of pursing answers to questions.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

e. Problem-Based Learning

Problem-Based Learning is Characterized by:

- Involving students as stakeholders in a situation
- Organizing curriculum as a holistic problem, enabling student learning in relevant and connected ways
- Creating a learning environment in which teachers coach student thinking and guide their inquiry, to facilitate deeper levels of understanding (Torp & Sage, 2002, 15)
- Keeping the focus on formulating a solution.

Problem-Based Learning has Three Main Steps:

1. Understanding the problem
    a. The problem is introduced
    b. Students determine what they know and need to know
    c. Students define the problem and what a successful solution might look like
2. Exploring the Problem
    a. Students gather information from many sources
    b. Students share the information and determine its relevance
    c. Possible solutions are generated through synthesis
3. Resolving the Problem
    a. Solutions are analyzed
    b. A solution is presented to an audience beyond the classroom
    c. Debriefing of solutions considers feedback and the work of others (Problem-based Learning Network, 2009)

There are eight major steps for guiding students through the process of Community Problem solving (UNESCO, 2002):

1. Exploring community concerns
2. Selecting problems
3. Assessing, evaluating and developing student skills
4. Investigating the problem
5. Developing visions of a sustainable future
6. Planning actions
7. Taking action
8. Judging actions and changes.

"Complexity of scenarios has been shown to increase student motivation and engagement."

—Finkle and Torp, 1995

EXAMPLES

Ecological Footprints (Grades 7 to 9)

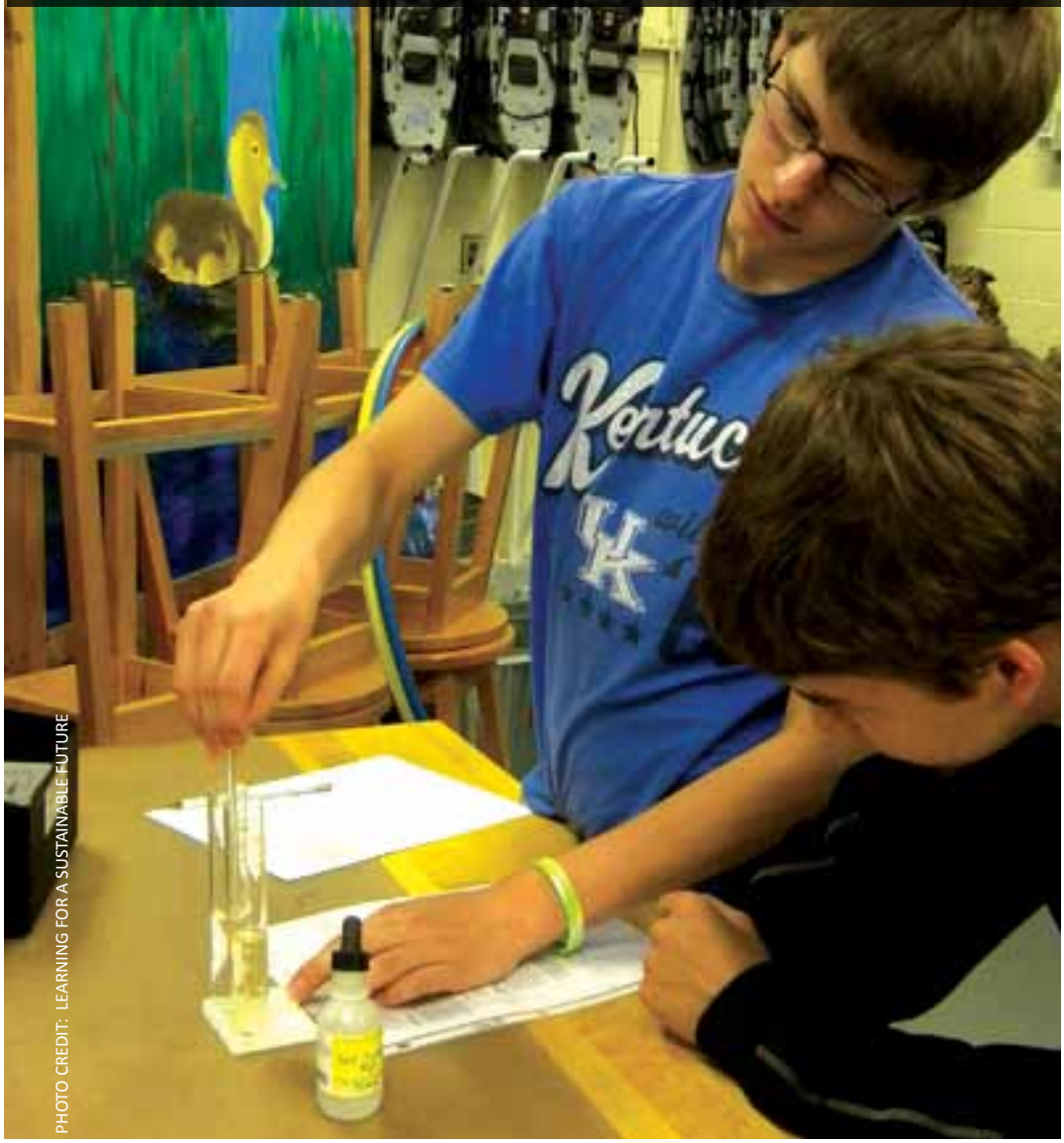
Mathematics teachers devised an interdisciplinary learning challenge for students that required using all the steps in the problem solving process.

Problem: What is the ecological footprint of a city that you are familiar with? Can everyone on the planet live like North Americans live today? (Flewelling et al, 1996)

Future Problem Solving (Grade 7 and up)

Future Problem Solving uses a process similar to Community Problem Solving but incorporates a futures perspective, an important element in environmental and sustainability education. A futures perspective, looking ahead five, 10 or 50 years, can be incorporated into the Community Problem Solving sequence of steps (UNESCO, 2002).

Solving problems through inquiry leads students to activities that they would not normally find relevant. These elementary students conduct a chemical test to prove a point.



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f. Open or Free Inquiry

Somewhat contrary to its name, Open or Free Inquiry follows prescribed learning processes. The inquiry is open to the participation and lead of the learners involved. Within limits, students take the lead in determining the direction for the inquiry, the steps in the process and the actions to be pursued.

The teacher's role is first that of coach or facilitator assisting students. When required, direct instruction is used to teach a specific skill or include relevant curriculum content within the context of student-driven inquiry. The teacher often introduces the topic or theme to be pursued; however, she/he is always attuned to the interests, observations and initiatives that arise from the students. These provide the most authentic directions for learning since they are what interest the learners themselves.

This way of facilitating learning requires mastery of a challenging skill set for teachers; balancing the direction of an inquiry driven by students with the need to address curriculum policy expectations.

EXAMPLE

Environmental Inquiry through *Natural Curiosity* (Elementary)
Staff at the Laboratory School of the Dr. Eric Jackman Institute for Child Study use the process of learning through inquiry as the pillar of their approach to learning, articulated in the publication *Natural Curiosity* (Chiratto, 2011).

A key feature is the interplay of learning between the individual and the group that includes the practice of the Knowledge Building Circle. This is a process of respectful listening, in which ideas are put forth to the group where they become commonly owned and developed.

The inquiry learning process practised is driven by learner interests and insights. Yet it has a framework:

- The context and general topic or theme are identified by the teacher.
- Learners engage in an experience that provides them with individual insights to share and a personal connection or interest to the topic.
- Exploration activities take place that extend and provide insight into student understanding.
- Observations are made and ideas and questions are identified.

As a whole class, learners participate in a knowledge building circle (refer to page 91) to share ideas, build on those that others put forth, extend and clarify student theories, and share further questions and wonderings. These student insights provide the direction fro the learning inquiry. The teacher does not intervene directly to contradict student perceptions even if adults would consider them incorrect. As facilitator she/he waits for student experiences and learning to bring understanding closer to commonly held understanding.

Key elements of this environmental inquiry approach include:

1. Integration — Content and skills from all subject areas are addressed during the inquiry process
2. Experiential Learning — Prior experiences of students and planned experiences are used as a basis for idea and question generation and to test knowledge assumptions.
3. Stewardship— Classroom learning leads to application in the community to help improve it.

Learning inquiries follow the curiosity of the individual and group involved and so can vary greatly.

Learners lead with their questions and interests. Teachers support through facilitating, coaching and modeling. Environmental inquiry is one strategy used and may be limited to as little as two half days a week. The rest of the learning timetable may follow traditional subject allocations.

The Grade 2 curriculum topic of water is expressed as key questions. Students contribute answers to the understanding of the class. Upon general agreement information gets added to the shared understanding chart.

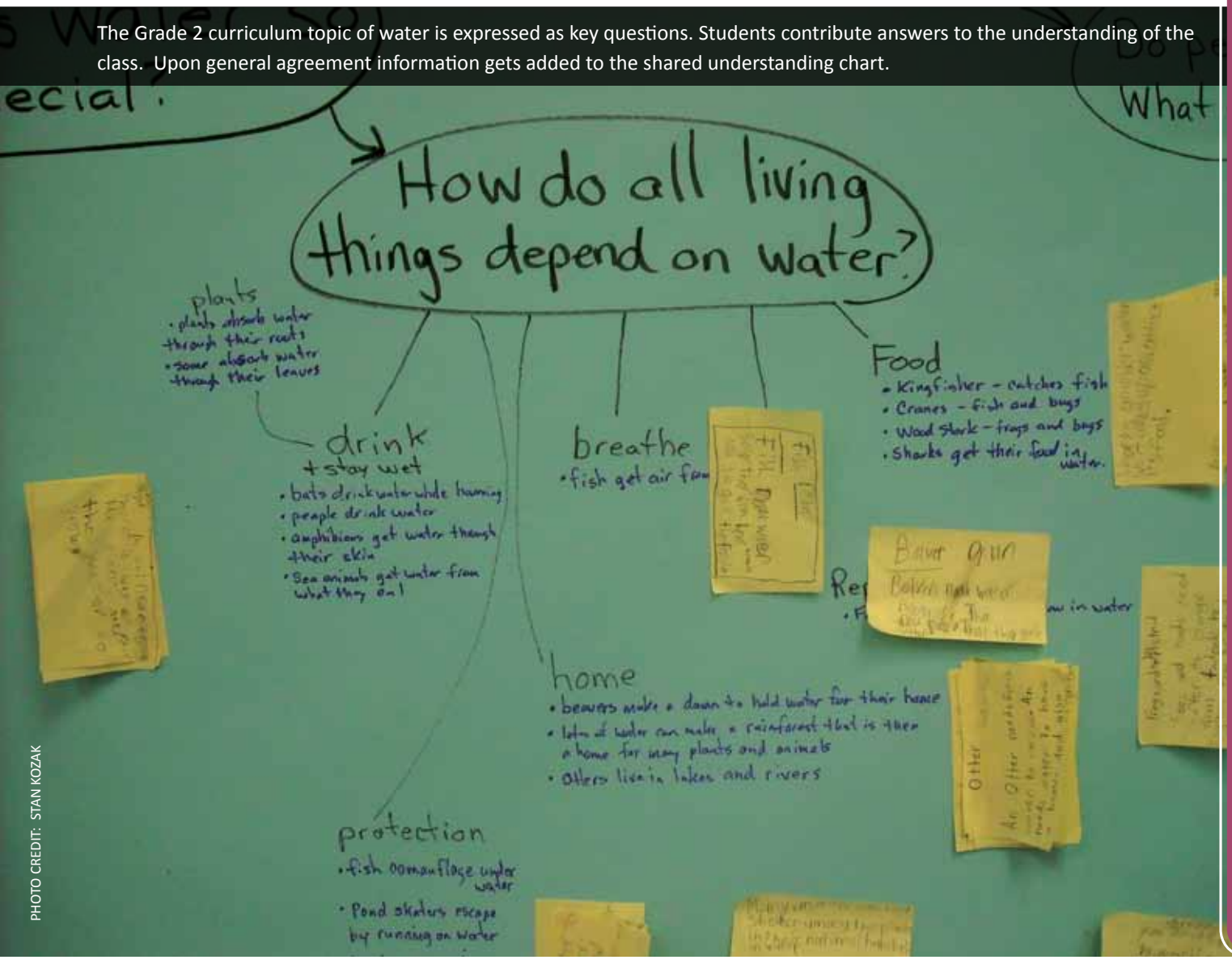
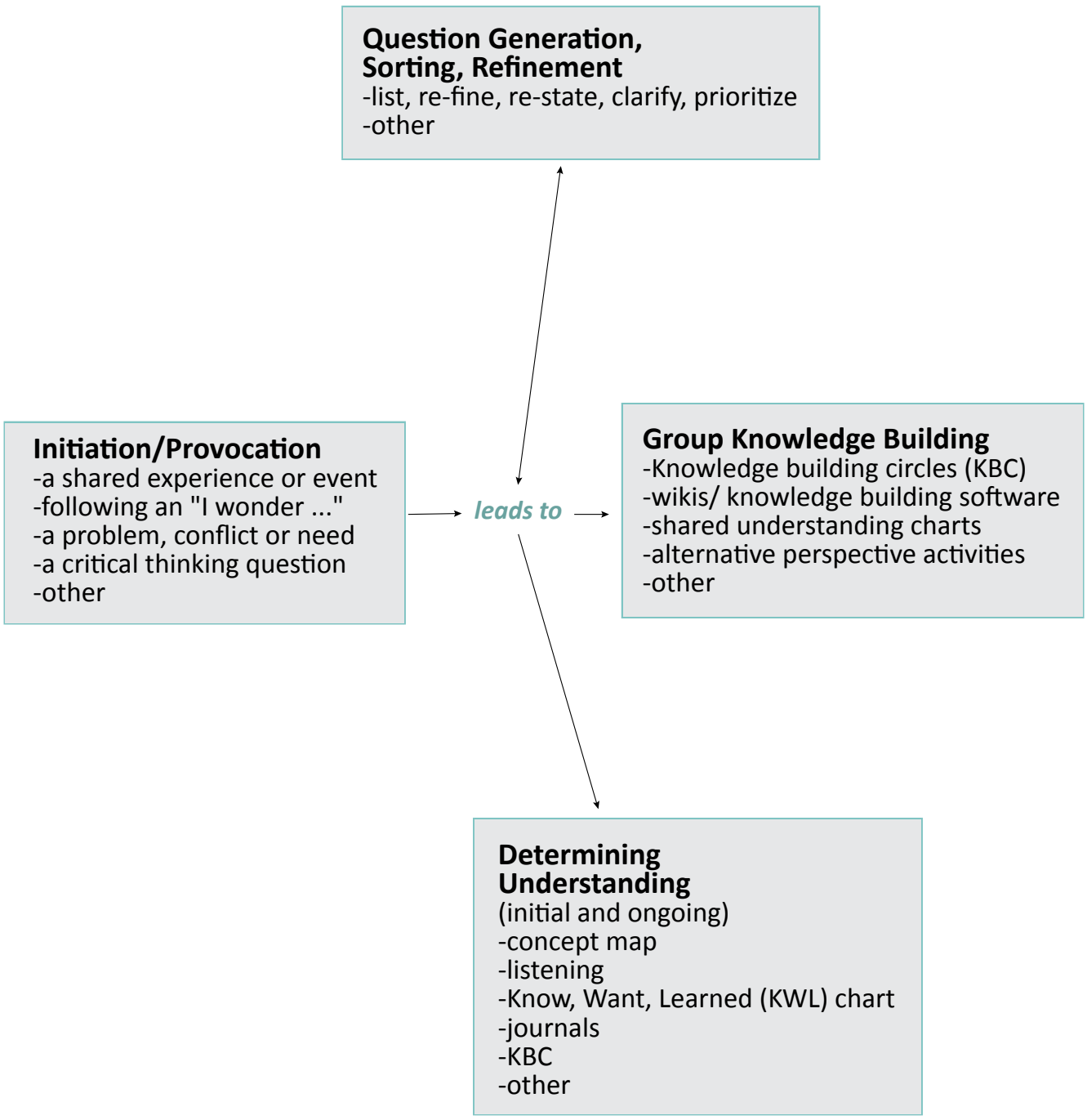
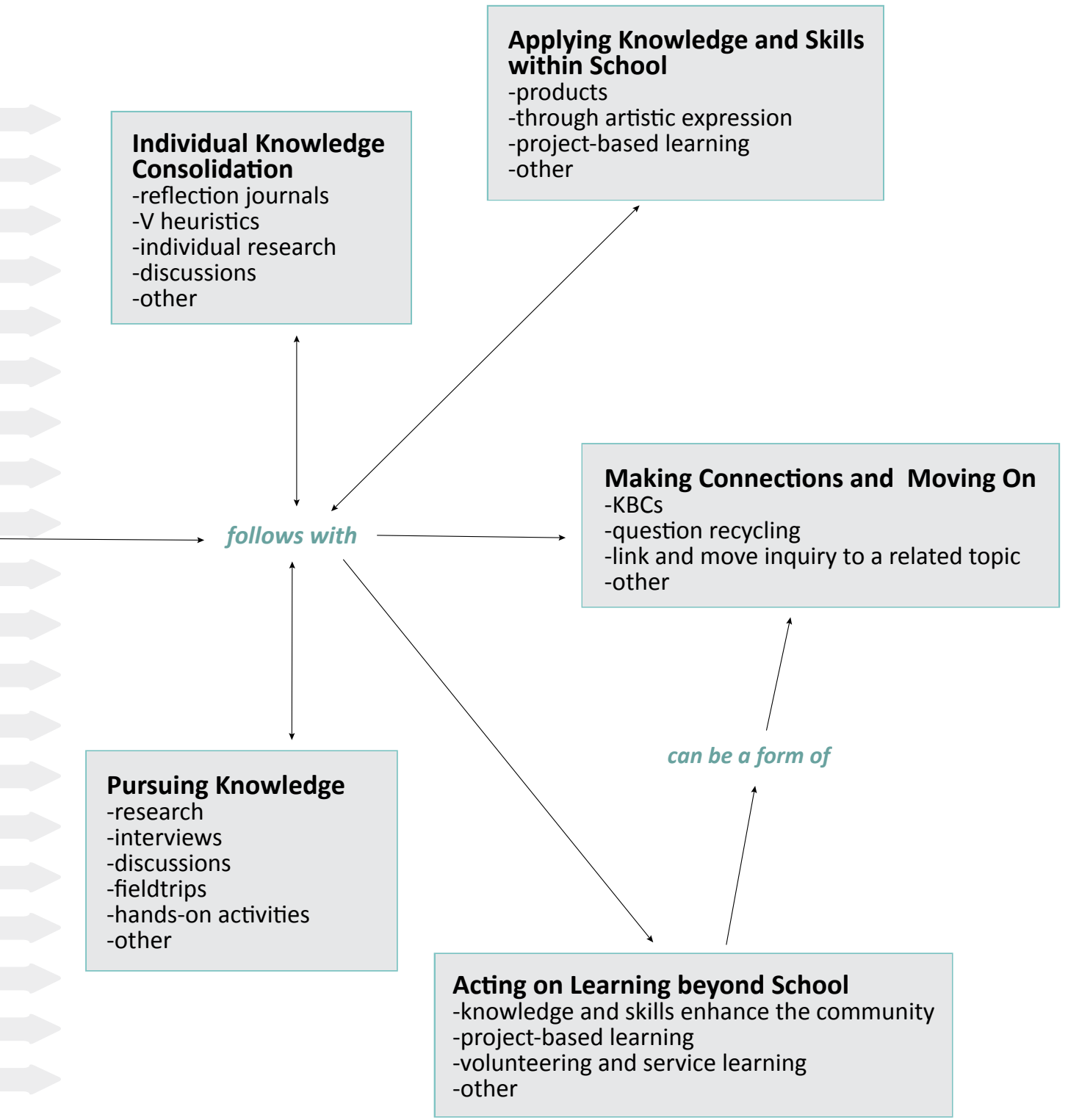


PHOTO CREDIT: STAN KOZAK

A Structure of Inquiry Learning



Open or free inquiry is best viewed through a systems perspective. Each inquiry involves the illustrated elements that occur in a variable sequence with much repetition, hence the description open or free. The teacher facilitates the process and uses the opportunities for integration of curriculum and assessment available with each element of the process. Learning is directed by the learners involved and is hence organic in nature.


Applying Knowledge and Skills within School
-products
-through artistic expression
-project-based learning
-other
Individual Knowledge Consolidation
-reflection journals
-V heuristics
-individual research
-discussions
-other
follows with
Making Connections and Moving On
-KBCs
-question recycling
-link and move inquiry to a related topic
-other
Pursuing Knowledge
-research
-interviews
-discussions
-fieldtrips
-hands-on activities
-other
can be a form of
Acting on Learning beyond School
-knowledge and skills enhance the community
-project-based learning
-volunteering and service learning
-other

g. Critical Thinking Occurs in the Context of Inquiry

Carefully selecting the right questions to drive learning will lead to a learning process that requires students to make judgments that develop critical thinking skills. For example, in a Grade 2 examination of the topic Growth and Changes in Animals, an overriding question that leads to critical thought could be: "How should we treat animals?" Teachers can address all of the curriculum expectations in the curriculum policy document as this question is pursued.

Designing Critical Challenges (Critical Thinking Consortium, 2009)

Inquiry learning experiences driven by critical thinking challenges can be designed using the following criteria:

- Does the question or task require judgment?
- Will the challenge be meaningful to students?
- Does the challenge address key aspects of the subject matter?
- Do students have the tools? Or can they reasonably acquire the tools needed to address the challenge competently?

Examples of Critical Thinking Questions to Frame Inquiry through Environmental Education:

- Is water a special substance?
- Are plants important?
- What does our community need to make it a better place to live?
- Does nature produce garbage?
- How is our part of the province special and unique?
- What is a healthy environment?
- How can the lives of indigenous people of the past and present teach us how to live more responsibly?
- How do we get what we need to live from nature without compromising it?

h. Creativity and Inquiry

Creativity-oriented occupations require workers to apply their knowledge to changing situations, make responsive decisions and communicate.

—Florida & Martin, 2009

In reading what two leading thinkers prescribe for the future of the Canadian economy one cannot help but see the link to inquiry-based learning. Florida and Martin could as easily add the social and environmental crisis that we face as drivers of the increasing need for developing creativity in our students.

The best niche to elicit creativity is complex, unsolved problems. Unleashing the creativity of a classroom of students is the essence of transformative learning; classroom creativity will outdo that of the individual teacher every time. The nature of the issues we face, and the complexities of the society we live in require that we cultivate creativity in all learning endeavours.

EXAMPLE

Six Tools to Make Climate Change Art (Secondary)

Artist Franke James has learned that long-winded written pieces about climate change simply don't grab the public's attention. Her website has many examples. She prompts students to be creative and use visual art to convey a message using the following tools:

1. **SYMBOLS:** How can you show climate change when you can't see it?
2. **METAPHORS MAKE THINGS STICK:** How can you give old phrases new meaning?
3. **WITNESS:** How do you help the viewer see what you see?
4. **CULTURE CHANGE:** What will we lose?
5. **HUMAN NATURE:** Can you touch a nerve?
6. **ACTION:** Do something green and record it!

(James, 2009)

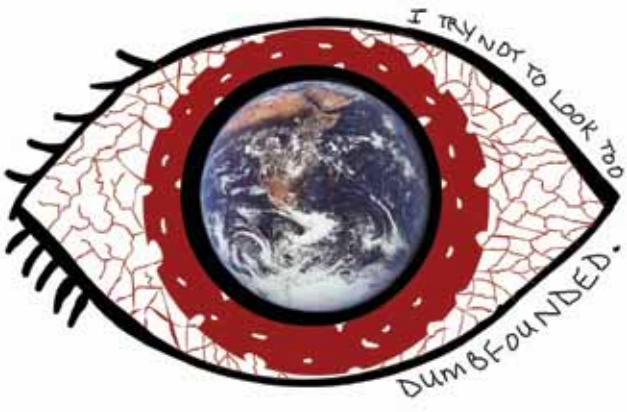
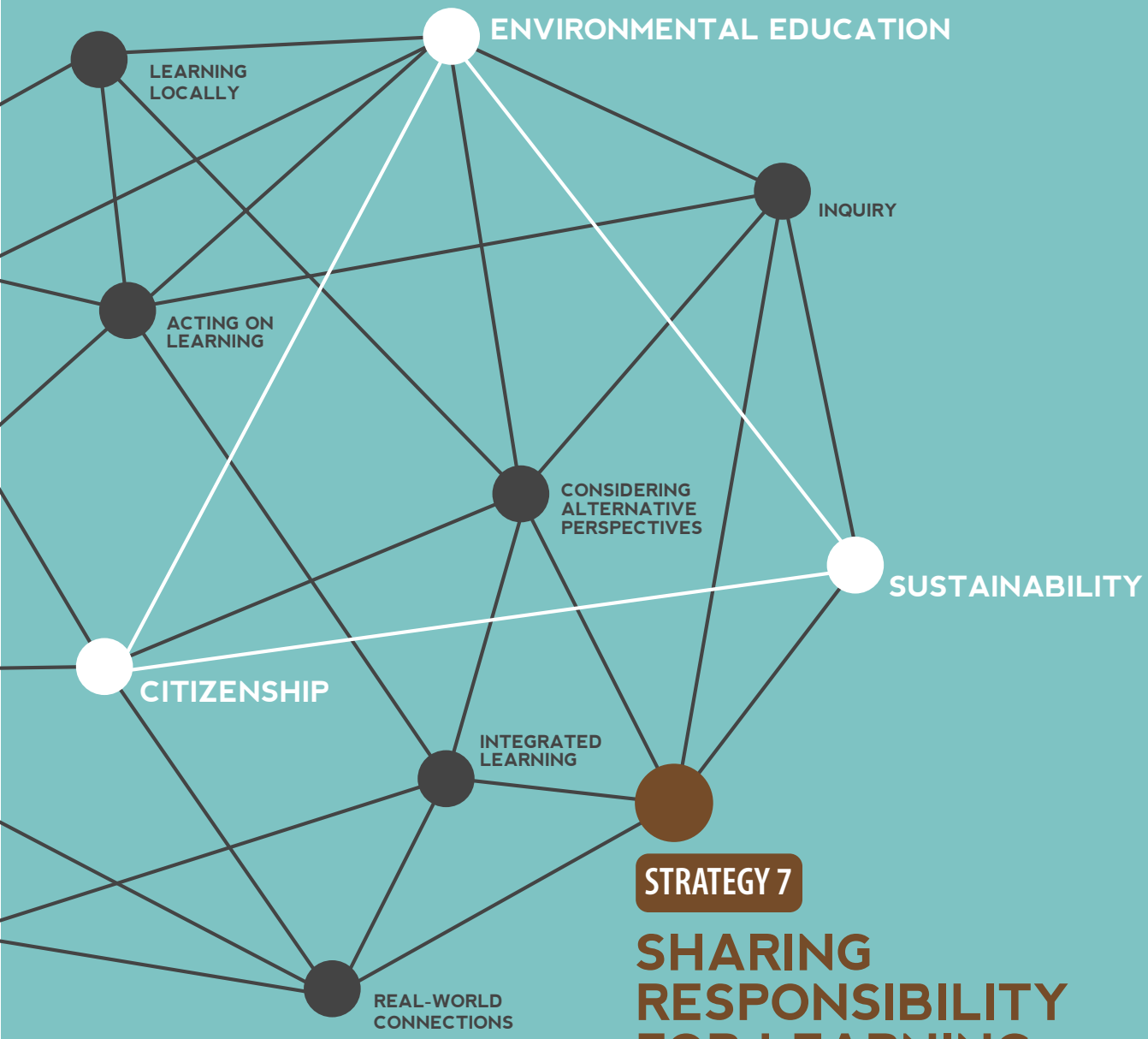


PHOTO CREDIT: FRANKE JAMES

Creativity is important in addressing the challenges that arise during inquiry. Artist Franke James suggests one tool is the use of symbols. "How can you show climate change when you can't see it?"

Living things such as composting worms spark genuine interst. A casual wondering “Do worms have eyes?” led to an indepth investigation by the whole class.

PHOTO CREDIT: STAN KOZAK



STRATEGY 7

SHARING RESPONSIBILITY FOR LEARNING WITH STUDENTS

Preparing for active and engaged citizenship requires educators to shift responsibility for learning to students. This requires that teachers prepare learners to be able to assume responsibility by addressing individual and group learning capacities. It involves deep listening to understand and respect student motivations and needs and to support their learning journey in becoming who they wish to be.

Strategy Outline

1. What Is It?
2. Visualizing Sharing Responsibility for Learning — Concept Map
3. Why Use It?
4. How to Implement Sharing Responsibility for Learning
   a. Developing Self-Awareness to Support Sharing Responsibility for Learning
   b. Evolving the Role of Teacher to include Facilitator, Coach, Co-learner
   c. Developing Peer Collaborative Learning Communities
   d. School Facilities and Technology for Collaborative and Self-Directive Learning

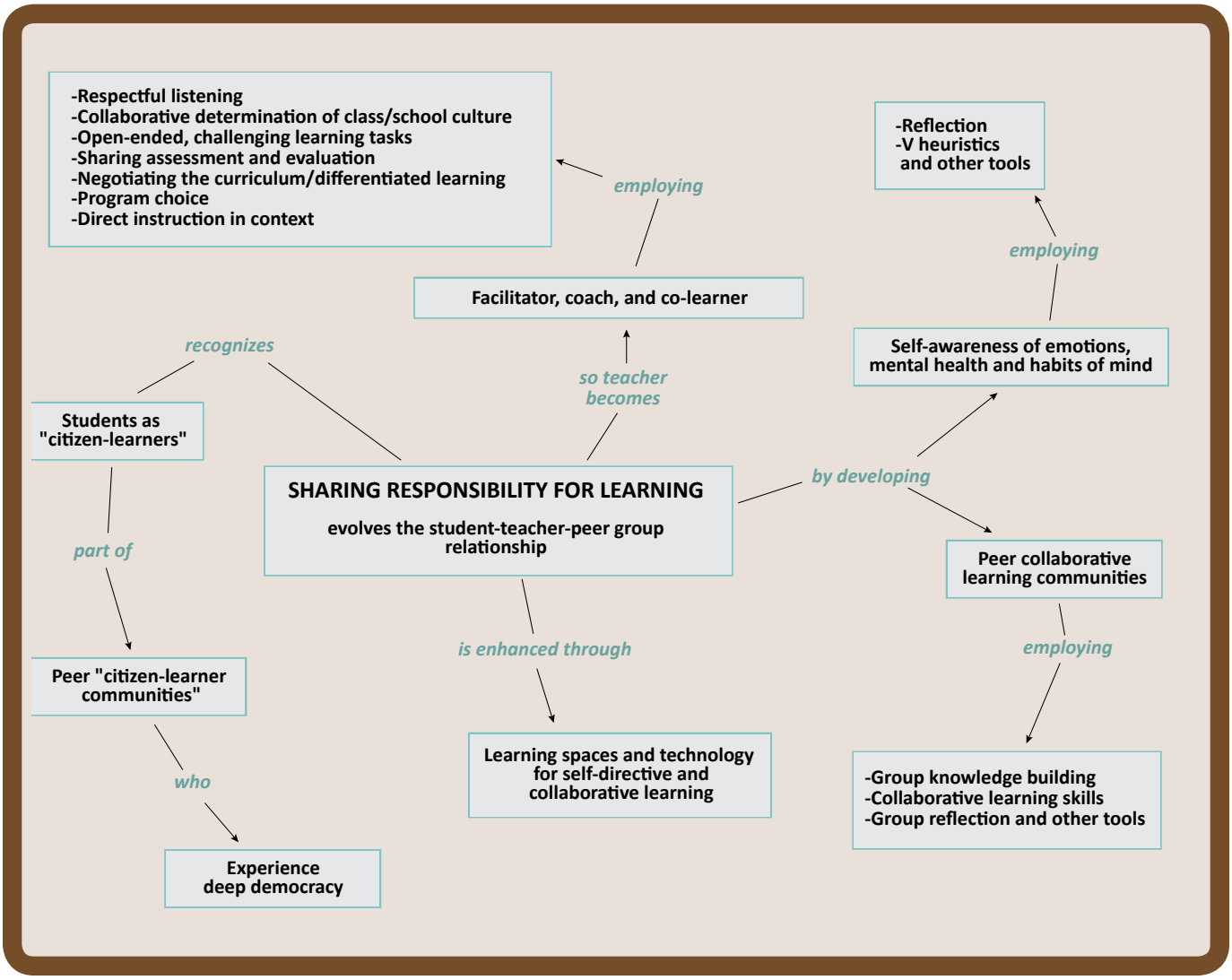
1. What Is It?

Sharing Responsibility for Learning involves viewing each student as a whole person –a citizen learner – from the time they start school when they arrive ready, able and needing to contribute to their communities. It involves the planned and appropriate transfer of responsibility, from teacher to student(s) in determining what is learned, how it is learned, how learning is used, and what is assessed and evaluated.

Preparing students to take responsibility for their learning requires attending to an individual learner's development by addressing emotional/mental health (self-awareness and control) and social skills, and addressing the capacity of the individual for learning that arises from being part of a collaborative community of learners.

With support at the personal and group levels, teachers should allow students to make authentic decisions with consequences, individually and as collaborative learning groups.

2. Visualizing Sharing Responsibility for Learning Concept Map



"Education becomes powerful when everyone has a voice in the decisions and power is shared. When we trust our students to make wise decisions and to take control of their education, they can and do create change. They find their voices; they become empowered and prepared to take a role in maintaining a democratic society."

—Karen Dockstader-Anderson, 1994

3. Why Use It?

- Helps our students become independent learners and contributing citizens
- Allows teachers to model and mentor the creation of a classroom culture of knowledge building (Scardamalia 2002)
- Supports democratic values
- Contributes to the development of students' voice
- Ensures that educators gain greater insight into what learners know and what they wish to know
- Promotes reflection and positivity, which fosters enduring understanding.

These grade one boys are helping each other find words they know in the text of a story that is result of a fieldtrip to find living things in the schoolyard. It is their story in their own words hence they are highly engaged in a challenging task for the first week of school.

PHOTO CREDIT: STAN KOZAK

4. How to Implement Sharing Responsibility for Learning

To share responsibility for learning, educators can structure the learning environment to bring a balance between the teacher, the individual learner and the peer group. They can also prepare themselves to look for unplanned learning opportunities. This requires a significant shift in the teacher mindset associated with traditional practice.

Strategies outlined earlier in this document require sharing responsibility of learning. In authentic student-led inquiry, the teacher may help shape the questions that set the context of the learning but the student questions are respected. When addressing real-world problems, the learning involved will be dictated by the options available. In considering alternative perspectives through critical thinking, insights outside those of the prescribed course or teacher's understanding and experience will arise and offer directions for learning. In using digital tools, learners can quickly access knowledge beyond teacher expertise to bring perspectives from the community to the learning.

Setting the learning environment up to share responsibility for learning effectively involves a systems perspective. It considers the whole curriculum and the whole child. It includes attending to aspects of the individual's social emotional development:

- Developing emotional self-awareness and maturity as well as certain habits of mind are viewed as necessary for a successful life (Casel.org 2013)
- Evolving the role of teacher into an active facilitator, coach and co-learner
- Taking advantage of the potential of peer learning groups
- Establishing the context that supports all of these elements, including facilities and the design of learning experiences.

a. Developing Self-Awareness to Support Sharing Responsibility for Learning

How we are taught strongly influences what we will do when no one is looking. Teachers can assist students in knowing their own learning strengths and challenges, their awareness of their emotions, and the tools needed to manage them, including persistence and positive self-talk. Supporting these habits of mind equips students for daily life and for the life they wish to have in the future.

> *"Although many of us may think of ourselves as thinking creatures that feel, biologically we are feeling creatures that think."*
>
> —Jill Bolte Taylor, 2009

i. Emotional and Mental Health

Emotional maturity includes greater emotional awareness, coping with negative emotions, effective self-control, and sustaining attention. These can all be learned. Successful learning activities have been developed to support children in dealing with negative emotions (Coleman, 2003). Similarly, cultivating positive emotions can also be addressed. Learning is affected profoundly by an individual's emotional and mental health. Mental health is "the state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community." (www.who.int/mediacentre/factsheets/fs220/en). Spending time in nature is increasingly being recognized as a contributor to positive emotional health.

ii. Habits of Mind

Most children come to school with curiosity and an ability to persevere when pursing something challenging that is of interest to them. Formal school should build and develop these habits of mind, which include: thinking about thinking, flexibility, persisting, striving for accuracy, thinking independently, creating and innovating, wonderment and awe, and taking responsible risks (Heick, 2013).

Mapping out a model community in the schoolyard. These students have demonstrated that they can learn on their own while their teacher facilitates other groups nearby.

PHOTO CREDIT: LEARNING FOR A SUSTAINABLE FUTURE

iii. Tools Educators Currently Use to Enhance Self-Awareness

An underappreciated but important aspect of formal learning is self-awareness. This includes developing in each person an awareness of values, priorities, goals and what makes us happy. A number of techniques can be employed to develop this awareness.

EXAMPLES

Reflective Journaling (All Grades)
A reflection journal is a learning log where the student records his or her experiences, thoughts and feelings on the learning process and records what has been learned.
Reflection journals:

- Should be used regularly to guide and articulate the learning process
- Can contain writing, drawings, quotes or whatever the student feels is relevant to the learning
- Can be started with teacher prompts to assist some students
- Are an excellent assessment tool when it is understood beforehand that the teacher will be assessing journal content.

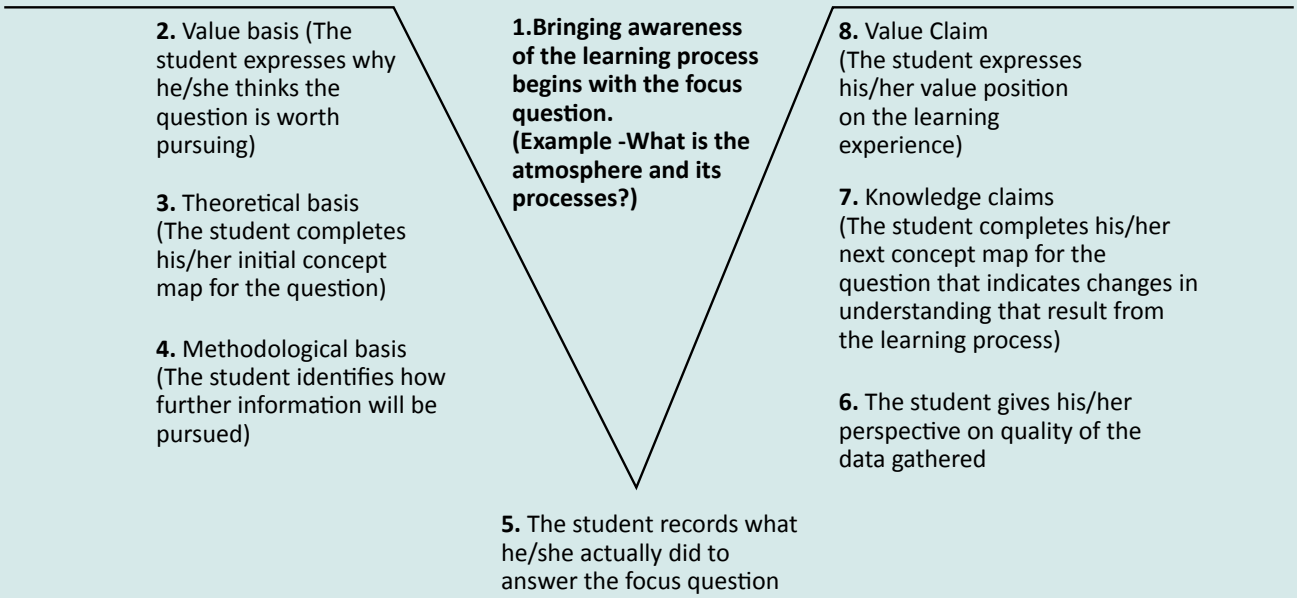
Solo Spots in Nature (All Grades)
This established practice in the outdoor/environmental education community involves introducing students to a natural area and then developing their capacity to sit on their own, in one spot, to experience the setting and listen to their own thoughts. It is often used in conjunction with some form of journaling. Extended solo experiences can go for a full day.

Cognitive Awareness and Values with V Heuristics (All Grades)
A V Heuristic requires students to think about their values at the beginning and end of the learning process (Ahlberg, 2005). It is a concept-mapping tool through which: "learners are trained in decision-making, reflection and problem solving skills by effectively identifying the child's 'internal environment' … (Vanhear and Pace 2008)."

"Teachers are often nervous that they may not know the answer to a child's question. In that case, the proper reply should be, 'I don't know. How do you think we can find out?'"

—Charlotte Ward, 1997

EXAMPLE



The Elements of a V Heuristic (adapted from Ahlberg, 2005)

For each learning experience or inquiry, students individually record their thoughts on the process as each step is reached. The eight-step process includes students identifying their values about the learning, determining what they know initially, planning a process to learn more, through to concluding with a value claim on the process and result.

"Highest priority should be given to encouraging the curiosity about the world that children bring to school."
—AAAS, Benchmarks for Science Literacy, Project 2016

b. Evolving the Role of Teacher to include Facilitator, Coach, Co-learner

Teaching now means a greater emphasis on activating prior knowledge, selecting learning experiences for differentiated instruction, facilitating the inquiry process, and coaching individuals. Teachers use their expertise to co-construct new knowledge with students and model what it is to be a curious and collaborative learner.

Facilitating means:

- Prompting and guiding individuals' reflection, analysis, and experimentation
- Finding curriculum expectations in the inquiry process and guiding learning so that these are addressed
- Asking good questions, activating prior knowledge, providing resources and teaching learning skills
- Helping students make responsible choices for their learning
- Establishing open and honest communication, participating in shared decision making, maintaining a respectful environment, and promoting common understandings
- Noting and moderating the interactions between individuals, groups and the entire class
- Assisting group functioning while groups engage in the learning process
- Ensuring that students share with the teacher a common understanding of what is to be learned (learning goals) and what constitutes successful learning (success criteria).

Coaching means:

- Providing direct instruction when it is needed to individuals, small groups or the whole class
- Monitoring progress
- Providing descriptive feedback through ongoing assessment
- Scaffolding learning tasks.

Co-learning means:

- Modeling inquisitiveness
- Demonstrating options on how to learn when one knows they don't know
- Exemplifying appropriate risk taking in learning
- Practising self and peer assessment.

i. Respectful Listening to the Thinking of All Students (Fletch, 2009)

Respectful listening shows that the teacher values all contributions of learners, a significant shift from being the arbitrator of what is right and wrong.

Ways of Respectful Listening Include:

- Extend response wait time after a teacher's question. This can engage more students to think and acknowledges that all student thought is important.
- Pass around a talking stick.
- Ask students to discuss with partners and share with each other (Think-Pair-Share).
- Ask everyone to write their responses before sharing. This gives all more time to think and express their ideas.
- Reduce the use of right or wrong responses. Instead, "Tell me more" or "Tell me how you got to that conclusion" helps learners to find their own errors.
- Have students respond to each other instead of going back to the teacher each time.
- Model body language and facial expressions that positively support all learners.

ii. Collaborative Determination of Class/School Culture

The process of establishing class and school culture contributes to the social development of those involved through the negotiation of rules and acceptable behaviour.

Schools that are intent on listening to and engaging students in determining norms and practices have many tools available to them. These have been developed for organizations working to involve stakeholders including discussions, surveys, exit surveys, advisory teams, and focus groups.

EXAMPLE

Rights-Respecting Schools (All Grades)
The rights-respecting school program assists in creating a positive learning environment based on inclusiveness, active participation, and citizenship. The scope of activity ranges from what is taught in the classroom to student participation in determining school culture including administrative and policy decisions. The program is based on the UN Convention on the Rights of the Child (UNICEF, 2013).

When students are given authority in learning projects to benefit the community, they can come up with good solutions. This group wrote and performed a song about biodiversity to communicate to shoppers.

PHOTO CREDIT: STAN KOZAK

iii. Sharing Assessment and Evaluation

Assessment and evaluation for many learners is a black box (Black and Wilam 2001). They get the results but they have little idea as to how it all took place. Sharing Responsibility for Learning calls for significant changes including:

- Undertaking assessment in such a way that students learn to assess themselves to become effective lifelong learners
- Making assessment an ongoing part of the learning process that provides feedback which guides further learning activity
- Assessment that involves and takes advantage of the participation of the individual, the teacher, and the peer learning group
- Having assessment of performance based on criteria standards and not on the basis of relevance to other learners present.

Enabling Student Self-Assessment

Developing student capacity to effectively self-assess their learning progress helps them to become independent, self-monitoring learners. Black and Wilam (2009) identify five key strategies:

- Clarifying and sharing learning goals and criteria for success
- Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding
- Providing feedback that moves learners forward
- Activating students as instructional resources for one another
- Activating students as the owners of their own learning.

When teachers implement these practices, student/teacher and student/student relationships evolve and students become empowered to direct their own learning.

Peer Teaching and Assessment

Peer assessment is an important element of peer teaching. It:

- Requires that assessment criteria are well understood by all involved and are clearly posted for ongoing reference by all learners
- Involves students learning how to give feedback to peers by following the model provided by the teacher.

Through informed peer assessment, learners exchange ideas that help internalize learning.

Clarity in assessments, including rubrics, is vital. This is best achieved when rubrics are developed with students using criteria and exemplars.

iv. Negotiating the Curriculum/Differentiated Learning

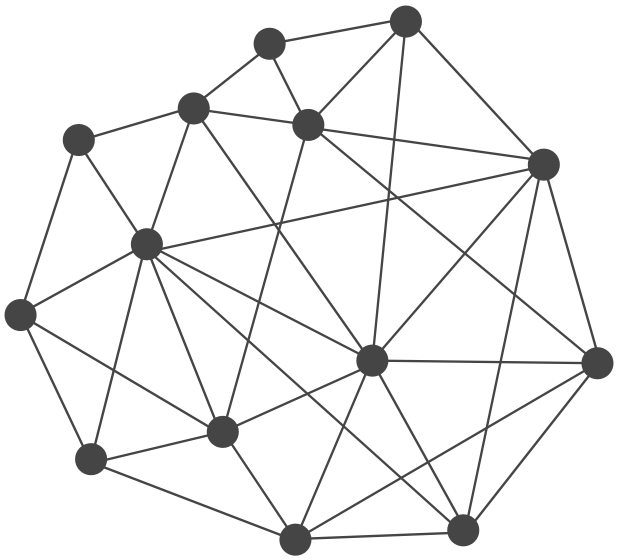
Through negotiation and a willingness to differentiate learning, teachers can provide students with an appropriate level of choice in what they learn, what process is followed, and what products are created.

Differentiated learning allows students to learn in ways most relevant to themselves and supports their development as autonomous learners.

The KWL learning technique — what do we Know, what do we Want to know and what have we Learned (American Institutes for Research, 2013), has been used by elementary teachers and includes elements of negotiated learning.

When providing learners with the opportunity to direct their learning on a topic, the teacher's role shifts to finding the curriculum that goes in the direction that the students have taken. It is often surprising how students, themselves, end up suggesting learning activities that closely address expectations in curriculum policy.

> *"Learning is easier when learners understand what goal they are trying to achieve, the purpose of achieving the goal, and the specific attributes of success."*
>
> —Chappuis & Stiggins, 2002



EXAMPLES

How to Study Ancient Civilizations (Grade 5)
A Grade 5 teacher described an example of providing students with a lot of latitude in what and how they would learn: "Right now I am doing an early civilization theme, as mandated by the social studies curriculum. I literally handed it over to my students to plan. I equipped them with excellent resources, and they came up with the learning activities" (Drake, 2000).

Ten UP (Grade 10)
The Ten UP program involved four teachers and about 80 secondary students following a school-within-a-school model that ran for the semester. Based on students' personal concerns, questions and important local issues, teachers practiced negotiating how the curriculum was addressed. Students learned that people and organizations have ways of resolving differences and making and enforcing decisions for the common good: "The changes we have introduced help to engage and empower students while acknowledging student intention as essential to successful learning" (Ast, 1995, 30).

v. Authentic, Open-Ended Learning Tasks

Inquiry Learning and Acting on Learning projects can put the student at the centre of the learning process where important decisions are to be made.

EXAMPLE

Good Food through Good Learning (Grade 6)
A Grade 6 class was invited to help increase support for the local good food box program as a way to help school neighbours get access to fresh food and vegetables. This learning challenge provided opportunities to address expectations in many subjects. Through discussion and some initial research, students identified several projects with the guidance of their teacher. One authentic measure of success was the increase in food box orders the following month.

vi. Program Choice

Curriculum expectations can be met in many ways. Having a diversity of programs available for students to choose from allows learning to be matched with student interest. At times personalized learning is appropriate and at times it can negate the benefits of learning with others as a community of learners.

EXAMPLES

CyberARTS (Grades 7 to 12)
Students apply to attend this program. Projects are created throughout the year, which address curriculum expectations in all subject areas through student interest in cyber art learning. The opportunity to attend a cyber-arts focused program has been extended to Grade 6 students (Toronto District School Board, 2013).

Secondary School Integrated Programs
Students attending secondary schools in Limestone District School board have a choice of more than 40 programs (known locally as Focus Programs). Each semester, more than 800 students move from their home schools to one of the 13 secondary schools that offer more focused programs (Limestone District School Board, 2013).

vii. Direct Instruction in Context

Direct instruction is most appropriate when the purpose of the learning is clear, the benefit to the student is clear, and the skill or content are relatively straightforward. Direct instruction is less successful when complex understanding is required.

There is always a place for direct instruction as part of a larger learning context when a specific skill or knowledge is necessary to get a task done to reach goals that matter.

c. Developing Peer Collaborative Learning Communities

A learning community "includes a conscious, reflective and analytic approach to current conditions and practices achieved through identification of common goals, respect for one another, a culture of safety and trust, participatory leadership and an appropriate level of autonomy" (Mitchell, 1999, 286).

The teacher-individual-peer learning community triad is the essential element of transformative learning. The goal of peer collaborative learning communities is to bring out the best in each participant and this is accomplished by focusing on relationships (Riel, 2013). Once achieved, a collaborative learning community contributes to the skills and attitudes of positive interpersonal relations, the process of learning, and the projects and problems that the group addresses.

i. Collaborative Skills Development

Learning to be a productive and positive member of a group is a requirement of effective citizenship and success in the workplace. These skills can be developed over a student's school experiences through their participation in learner/citizen communities.

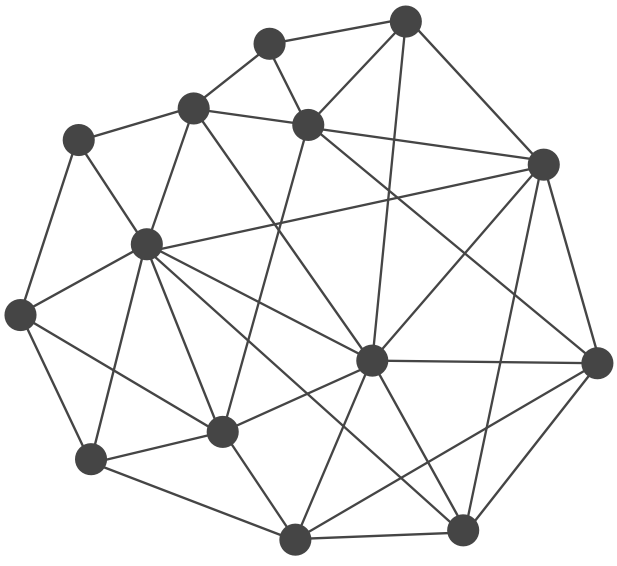
Sharing Responsibility for Learning requires development of group skills consistent with successful citizenship and the world of work. Peer-learning groups, citizenship and the workplace all require that individuals be adept at working with others and also be able to:

- Understand and work within the dynamics of a group
- Ensure that a team's purpose and objectives are clear
- Respect and support the thoughts, opinions, and contributions of others in a group
- Recognize and respect people's diversity, individual differences, and perspectives
- Accept and provide feedback in a constructive and considerate manner
- Contribute to a team by sharing information and expertise
- Lead or support when appropriate, motivating a group for high performance
- Understand the role of conflict in a group to reach solutions
- Manage and resolve conflict when appropriate.

In peer learning groups students can be taught collaborative skills such as consensus building and conflict resolution, preparing them for when these skills are needed in the classroom or in life outside school (Burgess, 2013b).

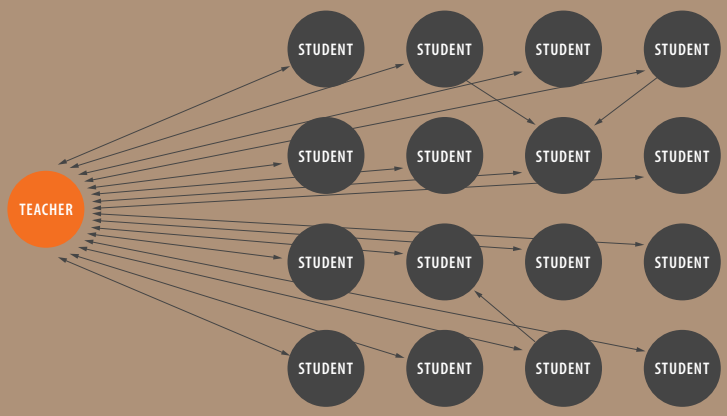
ii. Group Knowledge Building

Knowledge building is simply "creative work with ideas that matter to the people doing the work (Bereiter & Scardamalia, 2003, 13)." Collaboration, determined by the ability of a group to function as a community of learners, is recognized as important in constructivist learning through knowledge building.

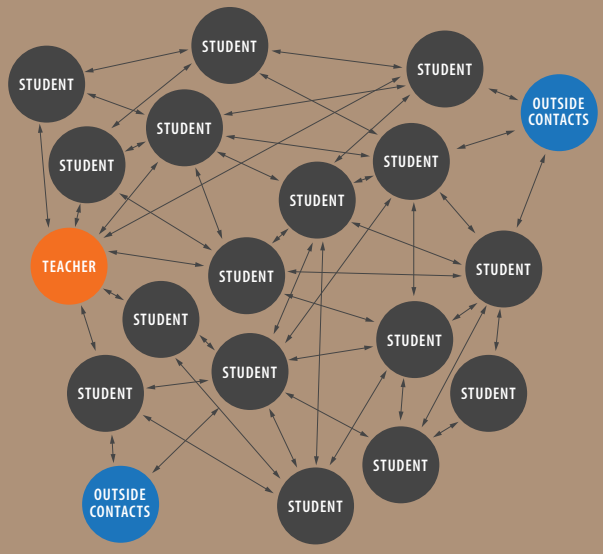


Substantive Interactions and Collaborative Knowledge Building

An effective learning community engaged in collaborative knowledge construction results in many meaningful interchanges between students as observed in this mapping of interchanges between those present in a classroom.



Substantive Interactions in the Traditional Classroom –The teacher dominates the exchange of information.



Substantive Interactions in the Transformed Classroom –Student-student interactions dominate the discourse and the teacher facilitates knowledge building among those participating individuals. Some learners engage in meaningful interactions with contacts from beyond the class.

Adapted from Zhang et al, 2009

EXAMPLES

Knowledge Building Circles (All Grades)

The term Knowledge Building Circle refers to the seating configuration of students as they engage in Knowledge Building Discourse. The circle is an intentional physical configuration that is conducive to successful knowledge building (Chiarotto, 2011). Knowledge building circles can be used with learners of any age. They feature respectful dialogue where students exchange, negotiate and build on each other's ideas. The process is more important than the product since the product is always under review. Knowledge building circles are employed with the principle that "all ideas can be improved" (Scardamalia quoted in Chiarotto, Natural Curiosity, 2011).

The physical set-up in the form of a circle promotes communication and reduces hierarchy. Students learn to participate respectfully, building on the knowledge of others in the group.

The teacher is not expected to know about everything that is brought up in the circle. The talk moves from student to student most of the time. (See diagram) The teacher facilitates the dialogue and when appropriate assists by posing questions, asking for clarification, working to ensure appropriate participation, recording contributions and offering follow-up learning experiences that can help address the questions that have been raised.

Grade 6 students participate in a knowledge building circle sharing insights on the needs of salmon following a recent fieldtrip.

PHOTO CREDIT: STAN KOZAK

EXAMPLE

Learning Circles: Face to Face and Online, Building Knowledge through Collaborative Projects (All Grades)

A learning circle is a highly interactive, participatory structure for organizing group work. The goal is to build, share, and express knowledge though a process of open dialogue and deep reflection around issues or problems with a focus on a shared outcome. Online learning circles take advantage of social networking tools to manage collaborative work over distances following a timeline from the opening to the closing of the circle. Circles have a final project that collects the shared knowledge generated during the interactions. Learning circles are a great way to organize learning in massively open online courses (Riel, 2013).

Learning circles in schools consist of groups of classrooms that work together over several months on projects based on a theme. At the end of the session each class publishes their work and the learning circle comes to an end. The use of online collaborative software allows learning circles to involve classes from anywhere in the world.

A guide is available to support teachers in using cross-classroom collaboration online (http://www.iearn.org/circles/lcguide/).

iii. Group Reflection

Reflection gives an individual the opportunity to think about learning and become more aware of it. Discussion in a learning group can prompt individual reflection. Individual reflection can contribute to group exchange and positioning on an issue, contributing to group reflection (Mitchell, 1999).

Group reflection processes are used to advance a learning project, the learning process, and relationships within the group, making group members active participants in this overall learning experience. As group members, students learn from each other and increasingly develop the skills to support the overall aims of the group and its members.

The features of group reflection include:

- Individuals expressing their insights or point of view
- Analysis used to weigh the options
- Decisions made as to the best way to proceed.

Group journaling has been suggested as a tool for reflection, fun, and group development (Asfeldt, 2012, 14). This tool can also be used in any group-learning situation. After each day one person is chosen to write in the group journal in relation to the topic or project. At the beginning of the next day the next writer reads the entry. It becomes a regular feature that starts each day. This can be done with a class website or blog.

iv. Tools to Prompt Peer Interaction

Teachers can increase peer group formation and development by remodeling their lessons to make them more active and social. Practices aimed to do this include:

- Jigsaw learning
- Assigning roles to group members for specific tasks (facilitator, recorder, resource manager)
- Think-pair-share
- Group adventure challenges.

EXAMPLE

Tribes (Elementary)
Tribes is a program that works to establish effective learning communities. Every school should be a model home, a complete community, actively developing compassionate citizens capable of creating, leading and contributing to the kind of democratic communities in which we all long to live. Tribes community agreements include: attentive listening, appreciation/ no put-downs, right to pass and mutual respect (www.tribes.com).

d. Learning Spaces, Information Technology and Pedagogy

Differentiated learning includes students working individually, in small groups, and as an entire class, at different times. This puts demands on school buildings and facilities including computers and related equipment.

The Learning Spaces, Technology and Pedagogy Matrix presents a hierarchy supporting self-directive and collaborative learning leading to the transformative learning goal of anywhere/ anytime learning.

In most schools the variety of spaces for learning is limited and includes the classroom and sometimes the school library, with the school hallway filling in when there are no other options. Teachers have adapted to using these options to support collaborative and self-directive learning. Most school architecture however only supports self-directive and collaborative learning at a low level.

The utility of spaces and facilities in the schoolyard and community to support learning are usually overlooked.

Learning Spaces, Information Technology and Pedagogy Matrix

Traditional to Transformative Learning						Goal
Self-directed Learning Spaces	traditional classroom is teacher centred	-individual carousels -learning centres	individual work stations	office and studio spaces	individual special project work areas	**support individual initiative to learn**
Collaborative Learning Spaces	traditional classroom is teacher centred	-small group work areas -moveable furniture for flexible groups	small group conference rooms/ discussion areas	-whole group meeting spaces -labs -learning commons	group special project rooms, media rooms	**support the ability of groups to learn**
Information Technology	classroom desk tops	computer lab	-wireless -lap tops -blogs and chat	-hand held devices--roaming wireless	-wikis and knowledge building, presentation and other sharing software	**global information sources and sharing**
Facilities	traditional classroom	school library	schoolyard individual and group learning spaces - natural and built	neighbourhood purpose designed facilities and natural spaces	government, civil society and private sector workplaces	**melding of learning and broader community functions**

Learning spaces, information technology and facilities all effect how students learn. The school library has traditionally been allocated responsibility for many of these needs. Adapted from Webster and Johnson (2008).

"We shape our buildings; thereafter they shape us."

—Winston Churchill

The impact of information technology on self-directive learning is powerfully evident in our "digital native" learners. Advances in technology that allow for collaborative work are providing exciting examples in which students take over and continue their learning outside the context of school and sometimes throughout the summer vacation months. Student interest and skills can be harnessed by using digital tools and apps that provide virtual learning spaces and use in the field. They provide creative contexts for building and sharing work fluently and give teachers data and evidence of learning.

Wikis are one example showing the capabilities that technology provides to advance peer collaboration: http://educationalwikis.wikispaces.com/.

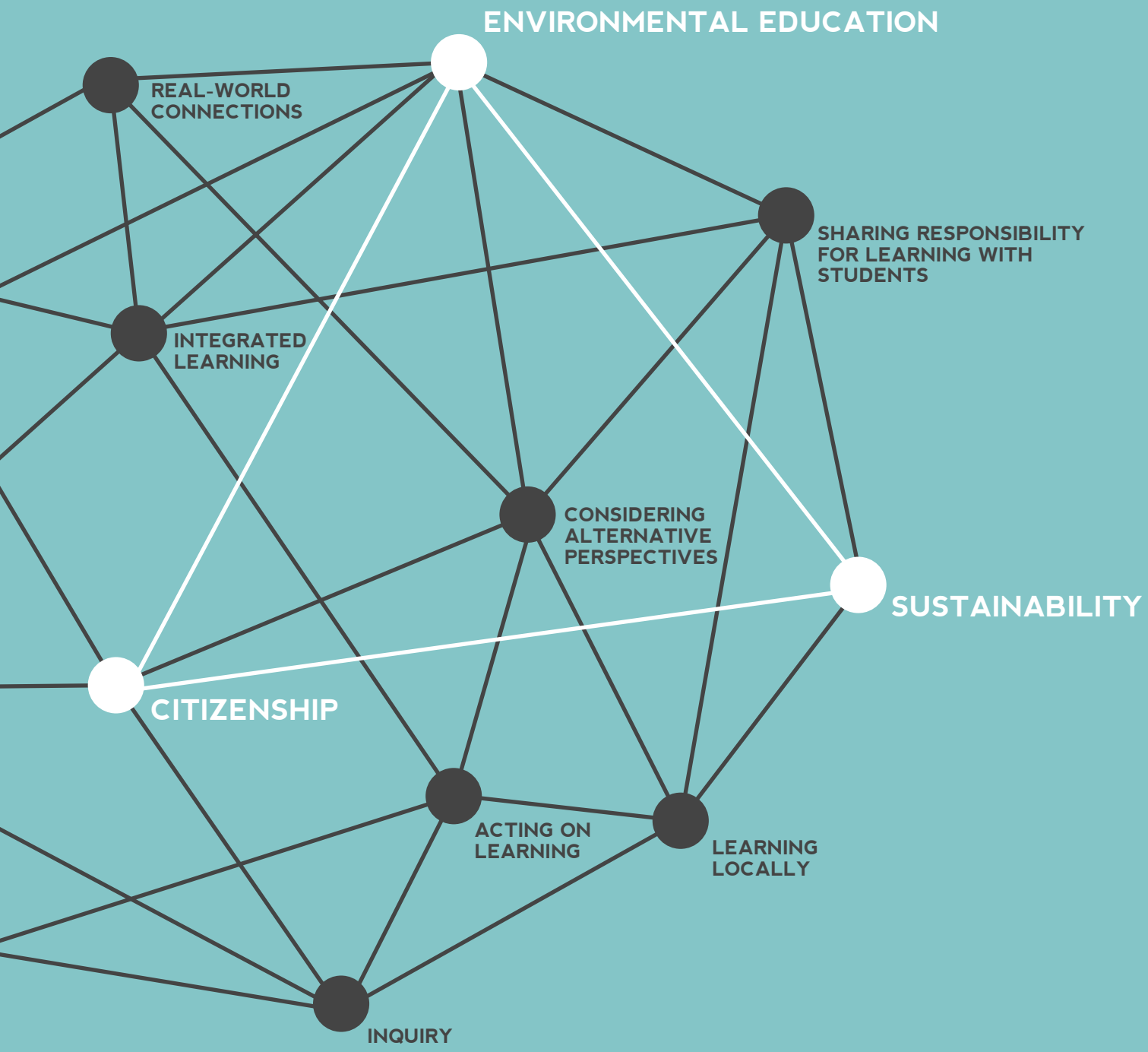
Other software programs that allow for group knowledge building include Knowledge Forum http://www.knowledgeforum.com/index.htm.

Cmap Tools (http://cmap.ihmc.us/) allows the use of concept maps and learner collaboration. It is the software that was used to create the concept maps in this document.

It is important to note that cognitive research is now investigating the importance of balancing our digital and nature experiences both for mental health and improved thinking and attention. For example, studies indicate that the kind of attention used to experience the sensory input of nature can restore the kind of attention needed for computer and academic work. (Berman, M. Jonides, J and Kaplan, S. 2008).

"The future will belong to the nature-smart — those individuals, families, businesses, and political leaders who develop a deeper understanding of the transformative power of the natural world and who balance the virtual with the real. The more high-tech we become, the more nature we need."

—Richard Louv, 2012



CONCLUSION

VISIONS OF LEARNING

Connect the Dots explores strategies that engage students as active citizens in supporting environmental, social and economic sustainability.

This work is meant to support change in practice to prepare learners to meet the challenges we all face. It aims to prompt professional discussion, collaboration and the creation of the learning experiences our students need to become active citizens with an interconnected worldview.

Change requires a vision or destination to pursue. We note the following examples:

Educating for an Effective Democratic Society …

Learning addresses three kinds of citizenship: the Personally Responsible Citizen who acts responsibly in his/her community, the Participatory Citizen who actively participates in the civic affairs and the social life of the community from the local to national level, and the Justice-oriented Citizen who seeks change to improve society by addressing social issues and injustices through an understanding of root causes.

Westheimer and Kahne, 2004

from Friluftsliv* Education: Learning through Nature, Experience and Culture

"We strive to co-create an educational environment that is non-hierarchical and collaborative, valuing the contributions of each individual and recognizing that the most profound teachings are often from spontaneous and unpredictable sources. We challenge the notion that education is a one-way street and realize that in order to be effective teachers we too need to be learning."

Duenkel & Pratt, 2001

*A Norwegian term with no English equivalent.

The Eco-restorative School

"The eco restorative school increases the natural and social capital of the location in which it operates. High efficiency buildings are standard. The buildings might even be energy positive; i.e., the school generates more power than it uses for its traditional functions. The eco-restorative school contributes to the optimization of the local community as a system by acting as one node in a decentralized power grid or as a community workshop space for social enterprises focused on "repair and reuse" flows of materials.

"In land use terms, the eco-restorative school increases local wildlife diversity through careful planting and habitat management. Recreational access to such areas is encouraged. In curricula, a sustainable school has many practical connections to the community. Vocational and training opportunities are tied into how the school and local community operates as eco-restorative – in relation to energy, technology, food, waste as food systems, ecology and design, business to name but a few."

Webster and Johnston, 2008

We hope that this resource and the many examples of transformative learning described in it will help you to create the learning experiences needed to help students achieve a sustainable future.

Education is not the filling of a pail, but the lighting of a fire."
—William Butler Yeats

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Learning for a Sustainable Future is a Canadian charitable organization founded in 1991 to promote, through education - the knowledge, skills, values, perspectives, and practices essential for a sustainable future. Working with business, governments, school boards, universities, communities, educators, and youth across Canada, LSF acts as a connector, a resource, and a facilitator for change.

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