

EDUCATION FOR A SUSTAINABLE FUTURE

BENCHMARKS:

FOR INDIVIDUAL AND SOCIAL LEARNING



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Authors

Dr. Leanna Archambault
Sustainability Science Education Project
Arizona State University

Dr. Kirk Bergstrom
WorldLink
WorldLink Media

Dr. Brigitte Bollmann-Zuberbuhler
Pädagogische Hochschule Zurich

Dr. Heather Burns
Portland State University

Jennifer Cirillo
Shelburne Farms

Jaimie P. Cloud
The Cloud Institute

Andres R. Edwards
EduTracks

Dr. Rider Foley
Sustainability Science Education Project
Arizona State University
Department of Engineering and Society
University of Virginia

Ursula Frischknecht-Tobler
Pädagogische Hochschule St. Gallen

Dr. John Gould
Drexel University

Emily Hoyler
Shelburne Farms

Dr. Viniece Jennings
USDA

Dr. Sybil S. Kelley
Portland State University

Robert Korenic
Youngstown State University

Dr. Patrick Kunz
Pädagogische Hochschule St. Gallen

Dr. Jerry Lieberman
State Education and Environment
Roundtable

Dr. Lauren McClanahan
Western Washington University

Dr. Pramod Parajuli
Prescott College

Dr. Anouchka Rachelson
Miami Dade College

Dr. Jay Roberts
Integrated Learning Earlham College

Dr. Debra Rowe
US Partnership for Education for Sustainable
Development

Dr. Charles L. Redman
School of Sustainability
Arizona State University

Susan Santone
Creative Change Educational Solutions

Dr. Shari Saunders
University of Michigan

Chris Seguin
Madonna University

Dr. Peter Senge
Society for Organizational Learning

Dr. Bora Simmons
Institute for a Sustainable Environment

Dr. Greg Smith
Lewis & Clark College

David Sobel
Antioch University

Heather Spalding
Student Sustainability Center
Portland State University

Dr. Stephen Sterling
Plymouth University

Dr. Michael Stone
Center for Ecoliteracy

Lees Stuntz
Creative Learning Exchange

Dr. Linda Booth Sweeney
Linda Booth Sweeney Co.

Dr. Daniella Tilbury
The World Conservation Union

Dr. Ting Wang
Auburn University

Annie Warren
Sustainability Science Education Project
Arizona State University

Gilda Wheeler
Washington State Office of Superintendent
of Public Instruction

Dr. Dilafruz Williams
Portland State University

Dr. Arnim Wiek
School of Sustainability
Arizona State University

Dr. Vicki Wise
Portland State University

Dr. Lauren Withycombe
School of Sustainability
Arizona State University

Curator/Editor: Jaimie P. Cloud
The Cloud Institute for Sustainability Education

Facilitators, Analyzers and Reviewers

Dr. Jerry Lieberman, State Environmental Education Roundtable, **Jaimie Cloud**, The Cloud Institute for Sustainability Education, and **Darcy Hitchcock**, Dragonfly Fund designed the protocols for the analysis methodology. Darcy Hitchcock facilitated the process, and the team that participated in the analysis and review processes included:

Dr. Andrew Bernier, Senior Field Correspondent for Science and Innovation, Adjunct Professor at The Center for Research, Engineering, Science and Technology

Sarah Bobrow-Williams, Faculty Member, Goddard Graduate Institute

Dr. Brigitte Bollmann-Zuberbuhler, Zurich University of Teacher Education, Lecturer in mathematics education, Pädagogische Hochschule Zürich

Jennifer Cirillo, Director of Professional Development, Sustainable Schools Project, Shelburne Farms

Jaimie Cloud, President, The Cloud Institute for Sustainability Education

Andres R. Edwards, President, EduTracks

Dr. Rider Foley, Sustainability Science Education Project, Arizona State University, and Assistant Professor Science, Technology and Society, School of Engineering and Applied Science, Department of Engineering and Society, University of Virginia

Ursula Frischknecht-Tobler, Dipl. Phil. II and M.A.T., Hochschule St. Gallen (retired) Pädagogische Hochschule St. Gallen

Dr. John Gould, Associate Clinical Professor and Co-Designer of EdD program in Educational Leadership and Change, Drexel University

Peter Herzberg, Educational Consultant, Board Member for Change for Kids, Board Member for Mead School Founding Principal, Boys Prep, Bronx (emeritus)

Dr. Viniece Jennings, Biological Scientist, United States Department of Agriculture

Dr. Patrick Kunz, Head of Science Education, University of Teacher Education, Pädagogische Hochschule St. Gallen

Dr. Koh Ming Wei, Professional Developer, Curriculum Developer, Master Gardener and Garden Educator, PREL and The Cloud Institute

Dr. Larry Frolich, Former Editor, Journal of Sustainability Education, Professor of Natural Sciences, Miami Dade College

Dr. Rosemary Logan, Lecturer, First Year Seminar Program, Action Researcher, Northern Arizona University

Ryan Morra, EfS Partnerships Coordinator and Educator, Shelburne Farms

Dr. Pramod Parajuli, Professor, Sustainability Education, previously at Portland State University and Prescott College

Dr. Jennifer Seydel, Director, Green Schools National Network, School Designer, Expeditionary Learning

Dr. Bora Simmons, Director, National Project for Excellence in Environmental Education, University of Oregon

Heather Spalding, Coordinator, Student Sustainability Center, Student Activities and Leadership, Portland State University

Jeremy Solin, Wisconsin ThinkWater Coordinator at the University of Wisconsin-Extension

Michael Stone, Senior Editor, Center for Ecoliteracy

Jenny Wiedower, Leader, Center for Green Schools' Teaching and Learning Program, K-12 education platform, Learning Lab

Dr. Dilafruz Williams, Professor of Leadership for Sustainability Education in the Department of Educational Leadership and Policy, Graduate School of Education, at Portland State University

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THE PROCESS

The Essential question these Education for Sustainability (EfS) Benchmarks were developed to address is:

What are the essential elements that distinguish and define the field of Education for Sustainability?

Forty-two authors from around the country and the world contributed data to the project through the [Journal for Sustainability Education](#), and thirteen of us conducted an analysis of the data we collected using the Grounded Theory (GT) Methodology, a systematic methodology in the social sciences involving the construction of theory through the analysis of data. Seven people reviewed the final draft and gave us critical feedback. The next step the Journal for Sustainability education will take is a call for exemplary curriculum, assessments, performance criteria and student work in which the elements are combined in different ways and evident at various depths of knowledge (DOK) and developmentally appropriate levels. We want to build a data base of exemplars so we can calibrate the work for continuity, creativity, and continuous improvement.

KEY INSIGHTS

As we reviewed the “essential elements” of EfS that our authors contributed, five distinct through-lines became apparent:

1. **What defines the field of Education for Sustainability** as we currently understand it, is a whole system of dynamic and interconnected elements including Enduring Understandings/ Big Ideas, Applied Knowledge & Actions, Higher Order Thinking Skills, Dispositions, and Authentic Place Based Community Connections. The EfS Benchmarks serve to communicate what those elements are.
2. **The Instructional practices and organizational policies and practices recommended by the authors** are especially valuable, but are not particular to EfS. How we teach, the organizational culture in which we teach, and the places in which we teach, are all inextricably linked to what we teach, what is learned, and what is applied. The authors agree that the “medium is the

message” (McLuhan), however most authors and reviewers feel strongly that those elements don’t define the field of Education for Sustainability, but rather support it. We have included them in the section entitled “Supportive Policies and Practices.”

3. **Topics, aligned frameworks, disciplines and fields of study that inform EfS**, have been especially relevant to our work, but also don’t define the field. They are useful as historical antecedents and current influences, and we think that they can help inform educators who are developing their capabilities to educate for sustainability, and so we have included them in the Appendices.
4. **The process of self-regulated learning**, though also not a distinguishing characteristic of Education for Sustainability, is critical to our endeavor because it effectively enables life-long learning, and involves the self-awareness, self-motivation, and behavioral skill to implement knowledge appropriately. Life-long learners have to believe they can learn, whatever the task before them, and they need to be motivated. They need to learn how to learn, and to manage their learning at every stage. This involves self-evaluation and “causal attribution,” which refers to beliefs about their contribution to the outcome. They need to recognize when they have failed, but then focus on how they can fix what went wrong. Continually analyzing tasks, setting goals, developing plans, selecting strategies to attain those goals, personally adapting and deploying specific learning strategies or methods, and then observing how well those strategies and methods are working by monitoring progress, self-evaluating the methods selected, restructuring if the goals are not being met, and then adapting future methods based on what was learned..., and being prepared to do it all over and over again indefinitely, is what is required of learners for the future we want.

5. Finally, we recognize that **there is not yet a universally shared understanding of “sustainability,”** and that some people find the term problematic for a variety of reasons. Still, it is clear that unintentionally educating for unsustainability makes no sense, if you want to flourish over time. We have found “Education for Sustainability” to be a useful descriptor for educators who are intentional about preparing students to participate in, and to lead with us the shift toward the future we want. Whether they prefer sustainable, restorative, regenerative, resilient or other terms, these educators are united in their desire to cultivate individual and collective potential and to increase the possibility that humans and other life can flourish on Earth now and into the future. We hope that this document will be helpful to those of you who fit that description.

WAYS TO USE THE EFS BENCHMARKS

ADOPTION

When a State, District or School considers adopting standards of excellence for their constituents, they need to know exactly what they are adopting. They need to be able to compare one set of standards with another so that they can choose the standards they believe are the most robust, current and useful for their community members. Standards should reflect the best thinking by the most accomplished authors available to date in a particular field. New standards of excellence are iterated and evolved over time as we evolve and grow our knowledge and capabilities. The EfS Benchmarks will serve those interested in educating for a healthy and sustainable future and will certainly be iterated and evolved over time.

ALIGNMENT/ CROSSWALK

Existing Curricula: Aligning EfS Benchmarks with pre-existing standards/content and performance expectations is a logical first step to implementation. The following types of questions can all be pursued: “Where can EfS add value to what we are already teaching? Where are we educating for sustainability already? Where might EfS improve teaching and learning? If we align to EfS in all the appropriate places, what do we need to change? What will stay the same? What do we need to stop doing? What do we need to start doing?”

New Curricula: New curriculum development projects have the option to begin with a lateral or vertical scope and sequence of EfS Benchmarks by discipline, grade level or grade level bands, and can then align discipline specific content and performance standards/expectations to the EfS scope and sequence where appropriate. It can work the other way around as well. Which way a district or school decides to do it depends on the purpose of education in that place, and the intentions and aspirations of the leaders there. Either way EfS Benchmarks can be elegantly embedded into new and existing curricula with powerful results.

DESIGN

Curriculum: Once the EfS Benchmarks are aligned with required content and performance expectations, unpack them, uncover the synergy between them, and watch the unit plans and courses become meaningful, relevant and engaging for students.

Professional Development: EfS Benchmarks can also be used to develop professional development protocols for teachers, administrators, school board members and parents. They are appropriate for anyone that wants to learn how to thrive over time in an interdependent and changing world.

Diagnostic, Growth, Formative and Summative Assessment and Evaluation Instruments: Use the EfS Benchmarks when building assessments and evaluation instruments. Remember to assess for the EfS Benchmarks with the other content and skills you are in the habit of assessing for and ultimately evaluating.

Quality Criteria: Use the EfS Benchmarks to communicate explicit quality criteria, content and performance expectations and articulate the degrees of quality and depths of knowledge for each dimension in the form of rubrics, checklists and exemplars.

AUDITS/SELF-ASSESSMENT

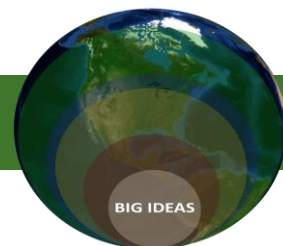
Curriculum: Use the EfS Benchmarks to audit your existing curriculum, assessments and performance criteria.

Personalized/Self-Regulated Learning: Students and adults can use the EfS Benchmarks to self-assess the quality of their EfS knowledge and performance capabilities by using personalized learning tools to track expectations, and by submitting student work as evidence of the acquisition of knowledge, skills and dispositions.

Measure the effect of EfS on measurable indicators of sustainable community development: Once you have evidence that you are successfully educating for sustainability and the supportive policies and practices are in place to sustain and improve your work over time, if your school or district is in a municipality that has a sustainability plan, you can also look for evidence of a correlation between educating children and young people (and their families by extension) for sustainability, and improved performance on the measurable indicators of sustainability that are tracked there.

EFB BENCHMARKS

BIG IDEAS



Big Ideas are also known as “Enduring Understandings”. They operate at the level of principles that are transferable. They describe the big ideas students will understand, and that will have lasting value (“why” we are learning) in the real world over time. They serve as the rationales for the content and performance standards but are not the same. The list of Big Ideas that are associated with educating for sustainability is not complete or exhaustive. This is a collection of the Big Ideas that were independently articulated again and again by the authors and scholars in the field, and thought to be essential for humans and other life to flourish on Earth over time. These big ideas collectively frame the other essential elements of EfS and serve as a distinguishing characteristic of the field. Some EfS Big Ideas are accompanied by clarifying statements in italics to assist the reader. If there is an imperative that further contributes to meaning making, we have included it in **bold italics** as well.

LIVING ON PLANET EARTH

- A healthy and sustainable future for human and other life is possible
- Adaptability helps all living things (including humans) survive (even thrive) over time
- Creativity (the generation of new forms) is a key property of all living systems and contributes to nature’s ability to sustain life
- Humans are dependent on Earth’s life-support systems
- Diversity makes complex life possible. *It assures resilience in living systems*
- Everything must go somewhere because there is no such place as “away”. *Matter and energy do not appear or disappear. They cannot be created or destroyed. In a healthy community, one species’ waste is another species’ food*
- All systems have limits. Healthy systems live within their limits. ***Tap the power of limits***
- Life organizes towards life. *Life contributes to its own regenerative capacity, and so far, .1% of all the species that have existed on Earth have prevailed.*

- Places are alive, unique and evolving. ***If humans want to flourish over time, our relationships with the places in which we live must be mutually beneficial***
- There is an appropriate rate and scale for every living thing *and they may not be the same in every circumstance*
- Change is inevitable. *Life is dynamic and living systems develop or they die*
- We are all in this together: We are interdependent on each other and on the natural systems
- Nature sustains life by creating and nurturing communities
- Living and non-living things are subject to the laws and principles derived from nature

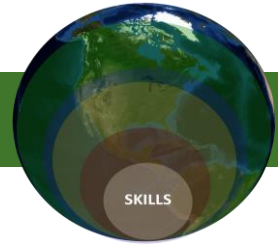
MAKING CHANGE

- A small shift in one thing can produce big changes in everything
- A sustainable solution solves more than one problem at a time and minimizes the creation of new problems
- Treating symptoms makes them worse over time, creates new problems and doesn't address the fundamental problem.
Create change at the source not the symptom
- Quick fixes to complex problems tend to back fire
- Every system is perfectly formed to get the results it gets
- The changes to the Earth's surface environments made by human activity are causing unintended consequences on the health and well-being of human and other life on Earth
(proposed Anthropocene Epoch)
- The significant problems we face can't be solved with the same thinking we used to create them
Our prior experiences with the world create cognitive frameworks (also known as mental models/maps) that inform what we can perceive. They shape our behavior and our behavior causes results. If we want to produce different results, it all begins with a change in thinking
- There is no beginning or end in a system. *Intervene where there are favorable conditions, i.e., where and when possible*

**TAKING
RESPONSIBILITY
FOR THE
DIFFERENCE
WE MAKE**

- Fairness applies to all. To *us*, to *them* and to the “*we*” that binds us all together
- Sustain-ability requires individual and social learning and community practice
- We all depend on and are responsible for “the commons”, i.e., what we share and hold in trust for future generations.
Recognize and Protect the Commons
- Individual Rights are upheld by Collective Responsibilities. *We must reconcile them when they come into conflict with one another*
- We must pay attention to the results of our thinking and behavior on the systems upon which we depend if we want to thrive over time. *Read the Feedback*
- We are all responsible for the difference we make. Everything we do and everything we don’t do makes a difference

HIGHER ORDER THINKING SKILLS



One of Albert Einstein’s famous quotes is, “the significant problems we face cannot be solved with the same thinking we used to create them.” The following thinking skill sets frame the “different way of thinking” that characterizes Education for Sustainability. They were independently articulated again and again and thought to be essential by the authors and scholars in the field. Our capability to think in all these ways is a valuable asset as we strive to thrive over time.

We have excerpted short descriptions here that define each skill set. These thinking skills can be taught discreetly and will be useful to learners who want to contribute to a sustainable future when they are operating in context and in consort with one another and integrated with EfS big ideas, applied knowledge domains, actions and dispositions. These definitions have been specifically written, selected and adapted to reflect and illuminate the whole system of thinking that defines education for a sustainable future.

ANTICIPATORY

Futures Thinking is based on the premise that “the best way to predict the future is to design it” (Buckminster Fuller’s adaptation of Abraham Lincoln’s quote, “The best way to predict the future is to create it”.) We can consider that futures are aspirational, and that we are in a position to create futures instead of accepting futures. It involves discussing how people in the past affected our options today, and how we now affect the options of people in the future. This requires us to recognize different theories of how futures emerge. It prompts us to observe emerging trends and their potential future trajectories and to consider the range of possible future scenarios (Utopian, dystopian, possible, probable and desirable) so that we can design for the future we want. This includes the potential future consequences of inaction in the present, often referred to as the “no action” scenario.

We are compelled to envision desired futures and contrast them with our current reality i.e., the present status quo, as a means to produce structural and creative tension that compels us to

build strategies to get from here to there often referred to as “backcasting” or “backwards design”. Appreciating all the while, the process by which the solutions of the past have become the problems of today, and anticipating how the solutions of today might become the problems of tomorrow. All of this requires imagining, the use of geospatial tools to visualize current and preferred futures, modelling the potential unintended consequences, both positive and negative, of our human activity, and successively approximating and managing our activity to progress toward a sustainable future. (Warren et al , 2015; Newman & Jennings, 2008; Our Common Future, 1986; Kuhlman, 2001; D. Robinson et al, 2011; J. Robinson et al, 2011; Norton, 2005, Bergstrom, 2016, R. Fritz, 2017)

EMERGENT

Lateral Thinking is concerned with the generation of new ideas... breaking out of the concept presence of old ideas. This leads to changes in attitude and approach; to looking in a different way at things which have always been looked at in the same way. Liberation from old ideas and the stimulation of new ones are twin aspects of lateral thinking. Lateral thinking is generative. (Edward De Bono)

Creative Thinking A way of looking at problems or situations from a fresh perspective that suggests unorthodox solutions (which may look unsettling at first). Creative thinking can be stimulated both by an unstructured process such as brainstorming, and by a structured process such as lateral thinking. (Business Dictionary; Creativity at Work)

Design Thinking is a methodology used by designers to solve complex problems, and find desirable solutions for clients. ... Design Thinking draws upon logic, imagination, intuition, and systemic reasoning, to explore possibilities of what could be—and to create desired outcomes that benefit the end user.

Ecologically inspired design includes the study of ecological worldviews, systems dynamics and applied complexity theory alongside the philosophies and practices of permaculture and biomimetic design. **Regenerative Design**, introduces into **Ecological Design** at least two additional streams—the Science or Art of Place,

and the Science of Living Systems. (Schumacher College; Regenesi Group)

COMPLEX

Critical Thinking is that mode of thinking — about any subject, content, or problem — in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it. Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking. It presupposes assent to rigorous standards of excellence and mindful command of their use. It involves disciplined thinking that is clear, rational, open-minded, and informed by evidence. It entails effective communication and problem-solving abilities. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevance, sound evidence, good reasons, depth, breadth, and fairness. (Adapted from the Foundation for Critical Thinking)

[Living] Systems Thinking is a holistic approach to understanding the dynamics of living systems. Living systems are the context for life, decision making, defining and solving complex problems, and for fostering more effective learning and design. Living systems thinkers look at the pattern of the whole and think about shifting the underlying pattern to develop the system to another level. Instead of working at the level of what exists right now, systems thinkers work at the level of potential. We are encouraged to think in terms of interrelationships, patterns, dynamics and connectedness, and to understand how systems work over time and within the context of larger systems. The systems thinking approach contrasts with traditional analysis, which studies systems by breaking them down into their separate elements. (Adapted from The Center for Ecoliteracy, Linda Booth Sweeney and Joel Glanzberg)

MINDFUL

Metacognition is "cognition about cognition", "thinking about thinking", or "knowing about knowing". It comes from the root word 'meta', meaning beyond. It can take many forms; it includes knowledge about when and how to use particular strategies for learning or for problem solving. More precisely, it refers to the

processes used to plan, monitor, and assess one's understanding and performance. Metacognition includes a critical awareness of a) one's thinking and learning and b) oneself as a thinker and learner. Since thinking drives behavior and behavior causes results, the recognition that our cognitive frameworks (mental maps/mental models) are guiding constructs that change over time with new knowledge and applied insights, has proven to be essential to educating for the future we want. Our ability to re-appraise/re-frame our thinking to increase our understanding of, and ability to perceive, the results of our actions on our ability to thrive over time, is paramount in an ever changing, diverse and complex world. (Adapted from The Center for Teaching at Vanderbilt University, Wikipedia, Neuro-leadership Institute)

Questioning is characterized by intellectual curiosity, and is a major form of human thought and interpersonal communication. It involves employing a series of questions to explore an issue, an idea or something intriguing. Questioning is the process of forming and wielding that serves to develop answers and insight, to solicit better questions, and to create knowledge and understanding when necessary. As happens in much of the core content of Education for Sustainability, we have a lot of questions. In fact, our questions lead to other, better and better questions before they lead to answers, and the answers, often lead to new and better questions. (Such is the fate of the life-long learner.) The questions are rich, essential, and in some cases, relatively new to our public discourse. We define better questions as those that trigger higher order, complex and lateral thinking, and that inspire us all to think about the world, our relationship to it, and our ability to influence it in an entirely new way. (Adapted from Webster's Dictionary, Wikipedia and The Cloud Institute for Sustainability Education)

Reflective Thinking is the ability take time to contemplate on our experience and knowledge, and on how things are going. It helps us keep track of our progress, and, if needed, make adjustments and improvements. It involves the processes of analyzing and making judgements about what has happened. Dewey (1933) suggests that, "reflective thinking is an active, persistent, and careful consideration of a belief or supposed form of knowledge,

of the grounds that support that knowledge, and the further conclusions to which that knowledge leads.” As Plato once said, “The life without examination is no life”. (Adapted from the University of Hawaii, Solent, Responsive Classroom and NEA)

Transference is the effective extent to which past experiences and prior knowledge affect learning and performance in a new situation. It is the ability to demonstrate understanding independently and in a novel context i.e., to extend what has been learned in one context to other contexts. It is the ability to use knowledge in many different rapidly changing situations. It is the intelligent use and adaptation of what we “know”.

Transference allows us to utilize what we have learned in new situations and to learn related information more quickly. It requires learning for understanding and learning that is applied in authentic contexts. Learning that contributes to our ability to thrive over time must be continually applied, improved on and transferred to different contexts over time. (Adapted from Byrnes, 1996 and Grant Wiggins)

HANDS ON SKILLS

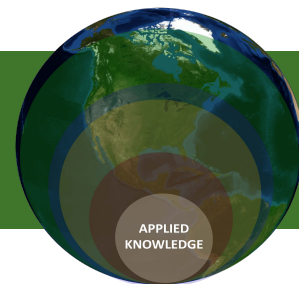
In this context, skills are considered competencies related to working with our hands. These skills can be taught discreetly and will be useful to learners who want to contribute to a sustainable future when they are operating in context and in consort with one another and integrated with EfS big ideas, applied knowledge domains, actions, dispositions, and community connections. They were independently articulated again and again and thought to be essential by the authors and scholars in the field:

- Use and creation of appropriate technology to the place and culture in which you find yourself
- Building, Making, Tinkering, Crafting
- Cartography (mapping, geo spatial, geographic)
- Computer Modeling
- Design/Drawing
- Gardening/Farming (organic, permaculture/biodynamic, integrated pest management)

NOTE: Our scholars and authors would like to note their discontent with the fact that neither the thinking skill sets nor the hands on skills on the lists above, nor the dispositions on the list below can be considered uniquely EfS. They each have an independent body of literature that defines them, and that provides in depth descriptions of each of them. For example, one can be a creative thinker, and *not* contribute to sustainability. One can be a “maker” or a farmer and not contribute to sustainability. One can be curious or trustworthy, but not contribute to a sustainable future, and so on. On the other hand, we can also argue that in order to move toward a sustainable future, we need, at the very least, to be curious, trustworthy, creative thinkers and more. As discreet thinking skill sets and dispositions they do not define the field of Education for Sustainability or distinguish EfS from other educational frameworks. They are, however, interdependent on each other and are as a whole, necessary to achieving our goals. That is why they are listed as a collection of essential skills and dispositions in the EfS benchmarks.

APPLIED KNOWLEDGE

(Content Standards)



Applied Knowledge includes concepts, data, facts and information (“what” we are learning) to be consciously understood, applied and explained to others. These EfS applied knowledge domains are interdisciplinary and cross-disciplinary and were independently articulated again and again and thought to be essential by the authors and scholars in the field. This composite of applied knowledge domains serves as a distinguishing characteristic of EfS. They are components of a system of knowledge domains. Though they appear in a list, no particular sequence or hierarchy is implied.

Over time, through the “call for exemplars”, we will collect and disseminate a range of exemplary scope and sequences for these applied knowledge domains with specific performance indicators that will provide evidence of the acquisition and application of knowledge at different age appropriate stages and depths of knowledge. We will also collect quality criteria and student work samples at the different age appropriate stages and depths of knowledge so that, over time, we can develop inter-and intra-rater agreement and reliability for our field through calibration. EfS dispositions, thinking skills and actions will be embedded in the performance indicators, and evidence of them should be found in student work that results from curricula that was designed to address and assess for them.

These EfS Applied Knowledge Domains explore:

INVENTING THE FUTURE

The Frame:

What kind of future will we invent? What will it take? **Possible, probable and preferred futures are all available to us today.** The more we create favorable conditions for our ability to thrive over time, the more we increase the odds that human and other life will flourish on Earth indefinitely. Looking back, it is often interesting to see how we got here. Looking forward and planning forward requires visioning and re-visioning over time, the identification of a set of actions, measurable indicators to track our journey, and a way to make the progress (or setbacks) visible to all involved. It requires motivation and perseverance. It involves turning problems into opportunities to create value. We will each make a unique

contribution to the future and our intentions will play a big role in shaping it. What will it look like to unleash a quality of life for all within the means of nature?

The Standard:

Vision, imagination, motivation and sense of self, combined with intentional design combine to create preferred futures for ourselves and our communities. *Students will anticipate and construct plausible futures, do scenario planning, design, implement and assess themselves and their actions in the service of their individual and collective visions.*

LAWS AND PRINCIPLES THAT GOVERN THE PHYSICAL AND BIOLOGICAL WORLD

The Frame:

Planet Earth is a finite system with respect to energy and materials. It is water-based, gravity-driven and runs on sunlight and sugar. The Earth is a self-emergent, self-nourishing, self-educating, self-governing, and self-fulfilling community. All life systems must integrate their functioning within the larger complex of mutually dependent Earth Systems. **The ecological principles and physical laws derived from nature govern and serve as operating instructions for life and for the regeneration of life on Earth.** What are the laws and principles that govern life on Earth? What can we learn from nature about living well in a place over time? Can we mimic the way nature solves problems to solve complex human problems?

The Standard:

All living things (including humans) are bound by the ecological principles and physical laws that are derived from nature. *Students will understand the laws and principles that govern life on Earth, and will see themselves as interdependent with each other, and all living things, and as dependent on the natural systems upon which all life depends. They will know how to learn from, and translate into design, the strategies and attributes of living organisms and systems that have stood the test of time, and they will strive to contribute to the regenerative capacity of the living systems of which they are a part. They will be able to put their knowledge and understanding to use in the service of their lives, their communities and the places in which they live, work and study.*

STRONG SENSE OF PLACE

The Frame:

The spirit of caring that comes from a deep and strong connection to place, contributes to our ability to make, and to maintain day after day, the changes needed for sustainability. Discovering the story of a place enables us to understand how living systems work in a particular place, and provides greater intelligence about how humans can then align themselves with that way of working to the benefit of both. A sense of place emerges through knowledge of the history, geography, and geology of an area - through the story of the place. It emerges through a strong connection with its flora and fauna, its human history and its legends, and through our relationship with the place as it is, and as it can become over time. Understanding the story of a place provides a framework for an ongoing learning process that enables humans to co-evolve with their environment. All living systems are in a continuous state of transition, either evolving or devolving. **In order to interact with a place in a beneficial way one needs to be able to discern the trajectory of its development.** We can then effectively interact with the places in which we live in a beneficial and mutually supportive way (excerpted and adapted from Regenes Group, 2017). Where is here? What is the history of this place? What are the discernable patterns? Who and what lives and grows well here? Who and what struggles here? Why? How can we contribute to the health of this place and its inhabitants over time?

The Standard:

The strong and inspired connection to the places in which we live, work and study. *Students will recognize and value the interrelationships between the social, economic, ecological, geological, and architectural history and current condition of the place in which they live and contribute to its regenerative capacity and continuous health. They will also be able to rotate from a local perspective to a global perspective by developing geo-spatial literacy.*

CULTURES, TRADITION AND CHANGE

The Frame:

Cultures, Tradition and Change integrates the arts, fiction and non-fiction literature, anthropology and sociology (just to name a few of the disciplines from which we draw), all of which have a point of view on the cultural web of life and its relationship to the ecological web of life. **Connecting the Biosphere and the Ethnosphere:** The “ethnosphere”, according to anthropologist Wade Davis, is “the sum total of all the thoughts, beliefs, myths, and institutions brought into being by the human imagination. It is humanity’s greatest legacy, embodying everything we have produced as a curious and amazingly adaptive species. The ethnosphere is vital to our collective well-being and is inextricably linked to the health of the biosphere.”

And just as the biosphere is being eroded, so is the ethnosphere--and at a rapid rate. **Reconciling Tradition & Change:** By focusing on the cultural fabric that envelopes the earth, we examine what we can learn from local cultures about living well in a place over time. **Uncovering and Catalyzing through the arts:** How can the arts contribute to sustainability? What can they teach us about our relationships to one another, to the places in which we live, to nature, to our past and to our future? What can they tell us about what we value and what we want to pass on to future generations? Can they help us to preserve what we need to preserve and change what we need to change? What’s in a word? What do we lose when we lose a culture and a language? What do we gain by preserving them? These are some of the questions explored in this core applied knowledge domain

The Standard:

The preservation of cultural histories, heritages and knowledge of place, and the evolution of cultural identities and practices that contribute to sustainable communities over time. *Students will understand the inextricable link between the health of the biosphere and the health of the “ethnosphere”, and with the help of the arts and social sciences, will develop the ability to continuously discern with others what to preserve and what to change in order for future generations of cultures and communities to thrive over time.*

THE MANY WAYS OF KNOWING

The Frame:

All knowledge comes from somewhere. Epistemology is the study of the nature and scope of knowledge and justified belief. It also deals with the means of production of knowledge, or the methods through which knowledge becomes apparent, as well as skepticism about different knowledge claims. How we understand the world and represent the world to ourselves and others, and how we figure out our relationship with it all, influence what we can perceive as truth or facts. There are religious ways of knowing and indigenous ways of knowing. There is intuitive knowledge based on innate feelings and sensibilities, there are ecological worldviews and there is pattern making, based on conclusions drawn from looking at the big picture and looking for patterns that connect the parts to one another and to a larger whole. There is authoritative knowledge based on information received from people, books, a supreme being, scientific literature, etc. There is logical knowledge achieved by reasoning from "point A" (which is generally accepted) to "point B" (the new knowledge), and empirical knowledge, based on demonstrable, objective facts (which are determined through observation and/or experimentation).

Other sources of the many ways of knowing or “knowledge systems” include language, sense perception, emotion, reason, imagination, and memory. Disciplines have ways of knowing also: like social analysis, quantitative and deductive reasoning, natural sciences and human sciences including history, ethics and the arts. Different periods throughout time (ancient, medieval, modern and contemporary) also experienced different ways of knowing influenced by the cultural stories that shaped what the people of those periods experienced as reality.

Which ways of knowing will be useful as we move toward a sustainable future? Which ones will impede our ability to get there? What responsibility do schools have to expose our children to epistemology and the relevant questions that ensue? We need to be able to perceive relevant data for our brains to filter if we are to adapt and thrive over time on this planet. **Whether or not the**

concepts of sustainability or regeneration make any sense at all to us largely depends on the ways of knowing we employ. The more ways of knowing we can avail ourselves of, the more we can understand about the world around us, and the better able we will be to perceive relevant data that affects our well-being, that of future generations, and that of the living systems upon which our lives depend.

The Standard:

The nature, origin and scope of knowledge and justified belief that varies across time and cultures. *Students will think about how we know what we know and about the epistemology of human thought. They will be called to think about their thinking (engage in meta-cognition) and to continually expand their ways of knowing in an effort to learn and to flourish over time in a diverse, interconnected and changing world.*

HEALTHY COMMONS

The Frame:

“Commons” are indivisible resources. They are the places and things we share, upon which we all depend and for which we are all responsible. They are the creations of nature and society that we inherit jointly and freely and hold in trust for future generations (i.e., air, trust, biodiversity, climate regulation functions, our collective future, water, libraries, public health, heritage sites, etc.) The Commons are that to which we relate with a sense of “we” rather than exclusively a sense of “me”. Open access to a limited commons becomes a “tragedy” and ultimately reduces the resource through over-exploitation, temporarily or permanently. This idea is crucial to understanding un-sustainability, as it demonstrates what happens when human motivation to pursue individual self-interest at all costs yields harm to the very Commons upon which the individual “selves” depend.

Protecting the Commons: It is also critical to understanding sustainability, as it demonstrates the need for social and legal norms to protect the health of the Commons upon which our lives, and often all life, depend. Developing social and legal norms for tending the commons prevents harm to them before it occurs.

What is it about the commons that appeals to our nature and needs? What is it about the commons that moves us to take responsibility for them? What criteria would you use to reconcile the conflicts that exist between our individual rights and our responsibilities as citizens to tend the Commons?

The Standard:

The necessary reconciliation of individual rights with collective responsibilities for the tenure and welfare of the Commons as society progresses towards sustainability. *Students will be able to recognize and value the vital importance of the Commons in our lives and for our future. They will understand and assume the rights, responsibilities and actions to care for the health of the Commons, and to hold them in trust for future generations.*

SYSTEM DYNAMICS AND CHANGE

The Frame:

One lesson that nature teaches is that everything in the world is connected to other things. John Muir famously wrote, “When we try to pick out anything by itself, we find it hitched to everything else in the universe.” A system is a set of interrelated elements that make a unified whole. Individual things-like plants, people, schools, watersheds, or economies-are themselves systems and at the same time cannot be fully understood apart from the larger systems in which they exist. Systems thinking is an essential part of teaching and learning for sustainability. A systems approach helps us understand the complexity of the world around us and encourages us to think in terms of relationships, connectedness and context.

Thinking systemically requires several shifts in perception, which lead in turn to different ways to teach, and to different ways to organize institutions and society. **From parts to whole:** With any system, the whole is different from the sum of its parts. By shifting focus from the parts to the whole, we can better grasp the connections between the different elements. **From objects to relationships:** In systems, the relationships between individual parts may be more important than the parts. An ecosystem is not

just a collection of species, but includes living things interacting with each other and their nonliving environment. In the living systems view, the “objects” of study are networks of relationships.

From structure to process: Living systems develop and evolve.

Understanding these systems requires a shift in focus from structure to processes such as evolution, renewal, regeneration and change. **From contents to patterns:** Within systems, certain configurations of relationship appear again and again in patterns such as cycles, reinforcing and balancing feedback loops, archetypes, etc. Understanding how a pattern works in one natural or social system helps us to understand other systems that manifest the same pattern. For instance, understanding how flows of energy affect a natural ecosystem may illuminate how flows of information affect a social system.

(Adapted almost entirely from The Center for Eco Literacy, 2017). What is the difference between a heap and a system? What does that matter? How do living systems work? What recurring patterns or archetypes do we see in systems, both natural and social? How do we distinguish adapting to change from coping with decline? Given our limited time and energy, how can an understanding of the complexity of a situation allow me to act more effectively? If we typically see the parts but not the whole system, what tools and methods help us to make systems visible? How can we most effectively surface, test, and share our mental models? (Questions excerpted from Linda Booth Sweeney)

The Standard:

A system is made up of two or more parts in a dynamic relationship that form a whole whose elements “hang together” and change, because they affect each other over time. Living systems are open and self-organizing and are maintained by flows of information, energy and matter. *Students will know and understand the dynamic nature of complex living systems and predict and monitor change over time. They will be able to apply the tools and concepts of system dynamics and systems thinking in their present lives, and to inform the choices that will affect our future.*

**RESPONSIBLE
LOCAL AND
GLOBAL
CITIZENSHIP**

The Frame:

Civic education is a key factor in personal and social development, as well as essential to the democratic process that is critical to sustainable community development. **Understanding citizenship** and articulating the rights, roles and responsibilities of democratic participation and leadership locally and globally makes it possible for people to incorporate the formal political realm and civil society in their present and future lives. **Activating participation** involves working with others to develop visions, identify the assets and liabilities at hand, secure and sustain fairness, justice and equity, distinguish problems from symptoms, and organize toward effective individual and collective action informed by the knowledge, experience, and needs of a broad array of stakeholders. It involves engaging in generative dialogue with members of the community with whom we agree and disagree and illustrating the importance of conflict resolution, consensus-building, and cooperation. **Leading Change** involves advocacy and the development of group decision making processes designed to solve more than one problem at a time and to minimize the creation of new problems. Catalytic and servant leadership styles are congruent with the principles and practices of participatory democracy. In what ways can government and civil society contribute to our well-being and that of the living systems that support us? What is government's role? What is the role of civil society?

The Standard:

The rights, responsibilities and actions associated with leadership and participation toward healthy and sustainable communities. *Students will know and understand these rights and responsibilities and assume their roles of leadership and participation in our democracy.*

MULTIPLE PERSPECTIVES

The Frame:

Decades of research by organizational scientists, psychologists, sociologists, economists and demographers show that socially diverse groups (that is, those with a diversity of race, ethnicity, gender and sexual orientation) are more innovative than homogeneous groups. It seems obvious that a group of people with diverse individual expertise would be better than a homogeneous group at solving complex, non-routine problems. It is less obvious that social diversity should work in the same way—yet the science shows that it does. This is not only because people with different backgrounds bring new information. Simply interacting with individuals who are different forces group members to prepare better, to anticipate alternative viewpoints and to expect that reaching consensus will take effort.

If you do not already understand the critical importance of diversity in our lives, it is reasonable to ask what good diversity does us. Diversity of *expertise* confers benefits that are obvious—you would not think of building a new car without engineers, designers and quality-control experts—but what about social diversity? What good comes from diversity of race, ethnicity, gender and sexual orientation? Research has shown that social diversity in a group can cause discomfort, rougher interactions, a lack of trust, greater perceived interpersonal conflict, lower communication, less cohesion, more concern about disrespect, and other problems. So what is the upside? Sustaining diversity is important for increasing a complex system's capacity to cope with change, reduces sensitivity to losses of specific elements (thereby increasing the type of resilience that bounces us forward not back), and enhances human well-being (adapted from Norberg, Cumming, Ostrom, 2008). **Diversity makes our lives and all complex life possible.**

In addition, the fact is that if we want to build teams or organizations or communities capable of innovating, we need diversity. Diversity enhances creativity. It encourages the search for novel information and perspectives, leading to better decision

making, problem finding and problem solving. **Even simply being exposed to diversity can change the way you think**, which enhances neuroplasticity and expands our ability to understand the world around us. (Excerpted and adapted from Scientific American, 2014). “Working with people who are different from you may challenge your brain to overcome its stale ways of thinking and sharpen its performance. Greater diversity may also change the way that entire teams digest information needed to make the best decisions. Diverse teams are more likely to constantly reexamine facts and remain objective. The scientists think that diverse teams may outperform homogenous ones in decision making because they process information more carefully. (Excerpted from Rock and Grant, Harvard Business Review, 2016). Who are “we” and who are “they”? Can we really benefit from the perspectives of others? What can we see through other’s eyes? In what ways are people the same and different from one another? What does it take to get along with people that are different from us? Why are people still so afraid or intolerant of people that are different from them? Instead of tolerating diversity, shouldn’t we be celebrating it?

The Standard:

The perspectives, life experiences and cultures of others, as well as our own. This includes perspective consciousness (an understanding that everyone sees the world from their own point of view) and an appreciation for diversity. *Students will know, understand, draw from, and recognize the value of multiple perspectives to co-create with diverse stakeholders shared, evolving visions and actions that contribute to a sustainable future locally as well as globally.*

SUSTAINABLE ECONOMICS

The Frame:

This is an evolving field of inquiry that examines the relationship between economics and ecology. Both stem from a Greek term, *oikos* (eco), meaning house or household. Ecological economics is concerned with extending and interpreting the study of the earth’s “household” (ecology) with humankind’s management of the earth’s “household” (economics). Despite a common misconception that they are unrelated, healthy ecosystems and a strong economy

depend on each other. Sustainable Economics **informs our choices** as consumers and producers, and helps us to **make informed choices** that contribute to vibrant, just and sustainable economies. It includes an understanding of appropriate and accurate indicators of well-being; an understanding of market dynamics, market failures, and common-pool resources, life cycle analysis and full-cost accounting, and provides a rich understanding of progress and the true value of capital (natural, social, human, manufactured, and financial). It includes the ability to see the human needs that underlie modern market behavior, and the ability to envision sustainable ways of meeting those needs. The more we understand about the resources and constraints the Earth's natural systems provide to our economy, the greater our understanding of the importance of equity and universal human development as a human right, but also as a crucial necessity if humanity is to attain sustainability. Calculating our buying power, eliminating waste by design and honoring the wisdom of the precautionary principle when implementing new human technologies and innovations, are also included in the evolving study of sustainable economics. How do our choices about economic production, distribution, consumption, and disposal affect natural systems? Why is it important to work towards a balance (or equilibrium) between the resources we use and the resources that are replenished? How do the 5R's (reduce, reuse, recycle, redesign, and regenerate) help us achieve that balance? How might the 5R's create economic opportunities and jobs? How do we distinguish between quality of life and standard of living? Can we "have it all" and still be sustainable? What would that look like?

The Standard:

The evolving theories and practices of economics, and the valuation of the economic, natural and social forms of capital that support and maintain life on the planet. *Students will know and understand 21st century economic practices and will consciously produce and consume in ways that contribute to the health and regeneration of financial, social and natural capital.*

APPLICATIONS & ACTIONS



In many formal education settings, educators are discouraged from linking education to action. We don't want to infringe on our students' individual right to come to their own conclusions about what to do with what they know and what they are able to do. We tend not to advocate for particular points of view but instead provide access to multiple points of view to stimulate critical thought and analysis, and to increase understanding. At the same time, as anticipatory emergent, complex and mindful thinkers, educators for sustainability understand that everything we do and everything we don't do makes a difference. In the context of interdependence, we are all responsible for the difference our actions make to ourselves, to one another, to nature and to future generations. Reconciling individual rights with collective responsibilities is a distinguishing characteristic of education for sustainability. If Education for Sustainability is to contribute to sustainable community development over time, it must encourage students and all school community members to apply what they are learning in authentic contexts and to practice acting in ways that will benefit the "7th generation". The following is a call to the types of actions that will do just that.

BUILD CAPACITY

- Create Social Learning Communities
- Engage in Dialogue
- Engage in Role-Playing, Learning Journeys, Simulations & Games
- Honor the specific knowledge and skills that each person and culture brings
- Learn from children and nature
- Build from successes, Learn from mistakes, develop strategies to improve, and apply what is learned
- Plan Scenarios
- Teach and Learn

DESIGN AND CREATE

- Accept responsibility for the consequences of design
- Adapt to change and elude coping with decline
- Apply technology appropriately so that today's solutions don't become tomorrow's problems

- Contribute to the regenerative capacity of the systems upon which we depend
- Count and value all the capital (natural, financial, human and social)
- Design for multiple pathways, resilience and reinforcement
- Design for whole systems integrity with ecological principles and physical laws in mind
- Design to optimize health and adaptability
- Design with efficiency and effectiveness for a no waste world that runs off of clean and renewable energy, contributes to diversity, recognizes interdependencies and taps the power of limits

LEAD/GOVERN

- Ask different questions and actively listen for the answer
- Define and Re-Define Progress
- Tap the power of limits and use constraints to drive creativity
- Empower people and groups
- Envision, strategize and plan
- Evolve the rules when necessary
- Facilitate a shared understanding of sustainability and regeneration
- Govern from the bottom up
- Lead by example
- Make the least change for the greatest effect
- Relentlessly adjust to the here and now with the future in mind
- Take responsibility for the difference you make
- Trust local wisdom
- Leave every place better than you found it

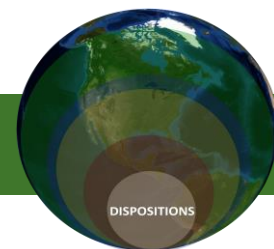
BE JUST, BE FAIR

- Be inclusive
- Embrace mutually beneficial rights of humanity and nature
- Practice justice and equity for all
- Take responsibility for the effect you have on future generations
- Treat others with respect and dignity

**PARTICIPATE
AND
COLLABORATE**

- Act wisely individually and collectively, with precaution and in context
- Create and maintain highly functional and successful teams
- Use creative tension to resolve conflicts
- Listen to one another
- Serve your community

DISPOSITIONS



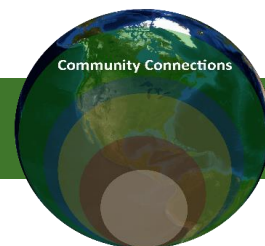
Many educational frameworks promote aspirational dispositions for students to develop. It is a rare curriculum map that documents, assesses for, communicates quality criteria for, and has student work as evidence of them. If we are to educate for a sustainable future, these are not optional, but essential. Again, they represent a whole system of interdependent attributes that must work in context and in consort with one another and with the other EfS Benchmark elements. What if we are motivated but don't persevere? What if we are open minded without humility? How can we be respectful without being self-aware? Should we invent a future without compassion? The definitions of these dispositions are commonly understood, and do not require specific framing in the context of Education for Sustainability. These dispositions are implicit and explicit throughout the EfS benchmarks, and were called out by the authors as essential elements of education that prepares people to participate in, and to lead the shift toward a sustainable future.

BEING

- Courageous
- Curious
- Efficacious
- Humble
- Imaginative
- Mindful
- Motivated
- Open Minded
- Persevering
- Resilient (the spirit to bounce forward not back)
- Risk accepting

RELATING

- Caring
- Collaborative
- Compassionate
- Empathetic
- Ethical
- Place/Community Conscious
- Respectful
- Responsible
- Self Aware
- Trustworthy



COMMUNITY CONNECTIONS

One of the key predictors of success of an EfS program in schools is the authentic project based and place based nature of the work of teachers and students in the context of their local community. Creating new patterns of relationships between schools and their communities that acknowledge Education for Sustainability as inextricable from sustainable community development, is essential to the work of educating for sustainability. The authors' contributions for this benchmark were expansive and fell into these four broad categories and included performance indicators for each one.

SCHOOLS AND COMMUNITIES LEARN & WORK TOGETHER IN PARTNERSHIP

- Develop sustainable community visions and re-visions over time
- Map community assets and conduct needs assessments
- Consider and prepare for a range of potential future scenarios, while charting a course toward the preferred future
- Develop, measure and monitor SMART (specific, measurable, achievable, realistic & time bound) goals and sustainable community indicator sets. Schools data is embedded in social, ecological and economic indicator sets
- Co-Design and implement short and long term projects and programs that are mutually beneficial to partners, are inclusive of all stakeholders and are participatory in nature
- Evaluate progress (read the feedback), reflect, adjust, and continually improve performance

SCHOOLS SERVE AS RESOURCES TO THE COMMUNITY

- Students and teachers make authentic contributions to sustainable community development through service learning opportunities, project-based and place based learning opportunities for students that are laterally and vertically embedded in the core curriculum

**COMMUNITIES
SERVE AS
RESOURCES TO
THE SCHOOLS**

- School buildings and grounds serve the whole community as learning hubs for continuing education of individuals as well as school and community stakeholders to learn together for the future they want
- School buildings and grounds serve the whole community as places to celebrate
- Local community based organizations, service organizations, local government agencies, boys and girls clubs, local businesses, elder-hostels, parks and reserves, state and national forests, residential centers, nature centers, zoos, museums, 4-H clubs, scouting organizations, etc. provide:
 - Internships for students
 - Mentorships for students and faculty
 - Independent and Curriculum Based Learning Sites (case studies, learning journeys, research sites)
 - Physical spaces for school and community stakeholders to learn and work together for the future they want
 - Physical spaces for school and community stakeholders to celebrate together

**SCHOOLS AND
COMMUNITIES
CELEBRATE AND
REFLECT
TOGETHER**

- Regularly and publicly recognize and celebrate individual and collective successes, and progress toward green schools and sustainable community goals at events and in the media
- Make time to reflect on where we are, how we got here, how far we have come, how close we are to where we are going, and what we are going to do next.
- Celebrate the learning that comes from worthy failures

SUPPORTIVE POLICIES AND PRACTICES

INSTRUCTIONAL PRACTICES & PERSPECTIVES FOR THE LEARNING CLASSROOM



As mentioned earlier, the instructional practices recommended by the authors below are especially valuable, but are not particular to EfS. What *is* particular to EfS instructional practices is the authentic, place based, project based, and service oriented nature of the pedagogies employed. You know it is EfS when the school grounds are seen as a microcosm of the larger community and function as an outdoor classroom; when student projects focus on real life community needs and community resources actively enhance student learning; when students meet curriculum learning goals by initiating and participating in real-life problem-finding and problem-solving projects that directly benefit the community outside the school. This helps students see why the curriculum skills and knowledge are important to real life situations, and helps them transfer what they have learned to different contexts while simultaneously bringing student resources to genuine community improvement. Finally, you know it is EfS when non-school community members actively help plan and implement learning projects for and with students. This brings more experience and resources into the school for specific projects and also builds strong community relationships that result in long term support for school activities.

CURRICULUM

DESIGN

PROCESS

- Backwards Design/Understanding by Design (UbD)
- Curriculum Documentation and Mapping, Iteration and Continuous Improvement
- Iterative Design
- Quest-Based Design

ATTRIBUTES OF

EXCELLENT

INSTRUCTIONAL

PRACTICES

- Academically Comprehensive
- Assessment/feedback driven
- Authentic
- Constructivist
- Developmentally Appropriate
- Differentiated
- Inclusive

- Inspires Life-Long Learning
- Interdisciplinary
- Learner-Centered
- Reflective
- Solution Oriented/Preferred Future Driven
- Standards Based

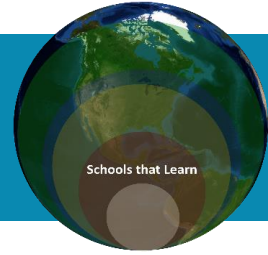
VARIED METHODOLOGIES

- Applied Learning
- Collaborative/Cooperative Learning Communities
- Inquiry based
- Interactive Media/technology
- Map, Activate & Check (MAP)
- Project based
- Place based
- Service learning
- Writing Process

INSTRUCTIONAL PERSPECTIVES

- Students are leaders and their voices must be heard
- Teachers are learners, professional developers and coaches
- Professional learning communities and communities of practice contribute to the speed and quality of individual and organizational learning and action
- Educators are advocates for Education for Sustainability and for youth leadership
- Teachers, administrators, parents, students and all stakeholders are learning and developing the “Lens” (big ideas, knowledge, skills, dispositions and actions) of Education for Sustainability
- To produce self-regulating learners, it is important to remember to give students choices regarding academic tasks to pursue, methods for carrying out complex assignments, and study partners; to provide opportunities for students to self-assess their work, and to regularly invite students to explore their beliefs about themselves as learners.
- The places in which we live *are* curriculum and instruction

SCHOOLS THAT LEARN: ORGANIZATIONAL POLICIES AND PRACTICES



Where we learn matters, and will influence our inclination to love and connect to the places in which we live. Schools that educate for a sustainable future embody and model sustainable living practices.

In schools that learn, everyone is encouraged to keep thinking, innovating, collaborating, talking candidly, improving their capabilities, self-correcting, and making personal commitments to a shared future...

POLICY ALIGNMENT

- Policies and practices are proactive, responsive and adaptable. Careful thought is given to what should be preserved and what should be changed in order for the students and larger school community to thrive over time
- The structures, systems and processes in place for decision making, implementation, and assessment are congruent and aligned with the purpose and values of the school community
- The thinking demonstrated in the school community reflects the knowledge, skills, dispositions and actions that characterize Education for Sustainability
- Priorities do not compete with one another, and instead, are mutually beneficial.

SCHOOL CULTURE

- School culture encourages and sustains innovation, participation, collaboration, reflection, celebration and continuous learning and improvement for all. It reflects the responsive and adaptive cycles of growth, re-organization and renewal
- School community members share what they are learning with one another and with other communities
- Practices of purchasing, procurement, consumption and production of materials, resources, transportation and services model the principles of sustainability at all levels

LEADERSHIP

- Leaders track and plan with knowledge of external and internal driving forces and trends, and are able to envision preferred futures for their schools that are not limited by the past or by the current reality.
- Managers are able to translate the vision of the preferred future into a mission, tangible and measurable action steps, performance assessments, cultural diffusion and cultural transmission over time.
- Leaders and managers operate with theories of change and change strategies that are congruent with the types of changes being made. Disruptive innovations are diffused differently than changes that are easily assimilated. Systems thinking is employed and system dynamics are considered when facilitating systemic change.
- Catalytic and servant leadership qualities are developed in all members of the school community

MONITOR, ASSESS AND ADJUST FOR FEEDBACK ON PROGRESS

- Mechanisms are designed, implemented and sustained to visibly track progress over time regarding student learning outcomes, vertical and lateral curriculum integration, organizational practices, and buildings, grounds and operations.
- School community stakeholders' performance is aligned to purpose, mission and strategic goals
- The schools' contribution to sustainable community development is visibly tracked, measured and communicated.
- School and community needs are assessed, assets are mapped, strengths assessments are conducted, and gap analyses are administered periodically in the service of continuous improvement over time.
- Schools develop, measure, and monitor SMART (Specific, Measurable, Achievable, Realistic & Time Bound) goals and Sustainable Community Indicator Sets. Schools data is embedded in social, ecological and economic indicators sets

CURRICULUM AND INSTRUCTION

- Schools, districts, and communities evaluate progress (read the feedback), reflect, adjust, and continually improve performance
- The curriculum (desired results, essential questions, assessments and shared performance criteria that produce evidence of student learning) is designed dynamic, documented, mapped, provides continuity, and is accessible to all faculty and school community members and continually updated and improved. Mapping is a verb not a noun.
- Where a curriculum is not provided, Faculty are provided the time, opportunity, professional development and coaching to design, document and map new or yet undocumented curricula across all grade levels and disciplines. This is particularly important because EfS often includes materials, ideas and perspectives that are new to educators.
- All required content and performance standards, EfS benchmarks and other aligned competencies that the school/district prioritizes are embedded and integrated into the curriculum in developmentally appropriate places. Expected depths of knowledge are indicated and assessed for throughout the vertical scope and sequence.
- Curriculum Maps and especially analytics are viewed and used regularly in critical conversations among faculty and among faculty and administrators.
- Faculty have regular opportunities to analyze student work together in the service of continuous improvement
- Exemplary lessons, learning experiences, resources and instructional practices are continually documented and accompany courses and units for use by teachers in the classroom or for professional development and coaching purposes.
- Effective curriculum and instructional practices that educate for sustainability are attributed to the authors and shared widely in order to increase the speed and scale of diffusion and adoption

- Faculty are provided with time, professional development, coaching and learning communities they need to meet strategic goals and to educate for sustainability

LEARNING SPACES

- The buildings, the classrooms, the lunch rooms/cafeterias, the grounds, learning gardens, and the community are all utilized as learning spaces for children, young people and adults, and contribute to their social emotional development, academic achievement, learning, and individual and collective wellbeing
- The administration's policy is to utilize green schools standards such as (LEED, CHPS, Living Building Challenge, etc. to guide their practices regarding physical plant, grounds, procurement, purchasing and operations. The U.S. Department of Education Green Ribbon Schools recognition program's pillars 1 and 2 cover elements that are addressed in these and other green schools standards.

INVESTMENT OF RESOURCES

- Investments of time and money are strategic in the short and long term, are efficient and effective, and eliminate the waste of time, materials and energy.
- Schools' investments in construction, upgrading and retrofitting its facilities, materials and equipment improve their impact on the health of all living systems.
- Money saved or generated is re-invested in the schools' continuous progress toward a sustainable future
- Where applicable, schools make external financial investment decisions based on the criteria of short and long term ecological integrity, financial prosperity, and social well-being

HUMAN RESOURCES

- Hiring & Orientation
 - Hiring policies and practices, job descriptions, qualifications and choices are consistent with the schools' purpose and strategic goals to educate for sustainability. Priority is given to new faculty hires who have a successful track record in implementing education for sustainability in their discipline or in the grade level they will teach.

- All hires are expected to be willing and able to learn how to contribute to sustainability through their professional role in the school community and their every day practices.
- New hires are oriented to the policies and practices of the school. Mentorships, apprenticeships, peer to peer coaching and professional development and coaching are offered to new hires so that the cultural traditions, norms and language, curriculum and effective instructional practices are transmitted from generation to generation.
- Performance Assessments and Incentives
 - Performance assessments, grants, recognition awards and other incentives produce individual and collective learning for the adults being assessed.
 - Performance assessments are aligned with the shared purpose of education in the school community, the strategic goals and instructional priorities and the plan to educate for, and contribute to sustainability.

AFTERWORD

Why educate for sustainability? The unique challenges that define our era—developing sustainable food systems, revitalizing the health of our oceans, improving the health and well-being of people, protecting biodiversity, regenerating the integrity of ecosystems, and accelerating the shift toward a green economy and clean, renewable energy (for example)—**require fundamentally new ways of thinking and acting** (Capra, 2007; Rockström, 2009; AAAS, 2001; Barstow & Geary, 2002; Larson, 2011; NRC, 2012; NOAA, 2005 and 2009). Our species' endeavor to achieve a sustainable human future invites reflection on the fundamental question: Education for what purpose? (Orr, 1991 and 2004; Sterling 2001). If humanity is to successfully transition from an unsustainable way of life to a regenerative one, the field of Education for Sustainability (EfS) has a central role to play (Wheeler and Byrne, 2004; DOE, 2011; Assadourian and Renner, 2012; Sterling, 2001; Senge, et al., 2008 and 2012).

Education for Sustainability (EfS) functions as a powerful rationale for teaching and learning in the 21st Century (Sterling, 2001; Wheeler and Byrne, 2004; Cloud, 2010). EfS is a “whole system of inquiry” that combines current best practices of teaching and learning with the content, core competencies, and habits of mind required for students to actively participate in creating a sustainable future (Bergstrom, 2009; Cloud, 2010; ESA, 2012). EfS can be defined as a transformative learning process that equips students, teachers, schools, and informal educators with the knowledge and ways of thinking that society needs to achieve economic prosperity and responsible citizenship while restoring the health of the living systems upon which our lives depend (Cloud, 2004 and 2010).

Education for Sustainability explicitly recognizes the role of teaching and learning in shaping the future we want. In this context, sustainability is viewed as a preferred condition: “A society that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social systems of support” (Meadows, 1992), “a quality of life for all within the means of nature” (Wackernagel, 1995), “the long-term integrity of the biosphere and human well-being” (Chapin et al, 2011), and “The possibility that human and other life will flourish on Earth forever” (Ehrenfeld, 2008).

From a theoretical standpoint, Education for Sustainability draws on multiple research based teaching and learning methodologies. These include backwards design (starting the curriculum planning process with the learning outcomes and forms of evidence in mind), best known as “Understanding by Design” (McTighe and Wiggins, 2004), curriculum mapping tools (Jacobs, 2004), learner centered/assessment driven instruction (Martin-Kniep, 2009), Project-Based Learning (Buck Institute, 2003), Community Based Learning (CBL) (Farnsworth), inquiry-based learning (Bruner, 1996), constructivist learning (Von Glasersfeld, 1995), Place-Based Learning (Smith and Sobel) and Professional Learning Communities (DeFore and Eaker, 1998). EfS provides teachers and learners with an inspiring mission—to participate in creating a sustainable future—and pedagogical and content pathways that support whole systems thinking and design. This truly represents one of the “grand challenges” of our time.

Key research informing popular EfS theories of change includes Organizational Learning and Change (Senge), System Dynamics and Systems Thinking (Von Bertalanffy, Ackoff, Capra, Forrester), the Innovation Diffusion Theory (Rogers), Critical Theory (Horkheimer) and Otto Scharmer’s Theory U (Scharmer).

Many EfS scholars recognize the essential role that interdisciplinary and cross-sector collaboration play in fostering innovation (Beinhocker, 2006). Education for sustainability is inherently transdisciplinary (NSF SEES, 2012). Comprehensive, anticipatory design solutions (Gabel, 2012) are vital to systemic change. Robert Kates, author of *What Kind of Science is Sustainability Science?*, writes that “sustainability science is a different kind of science . . . with significant fundamental and applied knowledge components, and a commitment to moving such knowledge into societal action (Kates, 2011).

Currently, there is a large gap between society’s aspirations for a healthy and sustainable future, and the knowledge, skills, and attitudes being taught and acquired in the majority of Pre-K-12 schools. A long-term goal of the field of Education for Sustainability is to demonstrate the unique value of sustainability as a context for the whole school and curriculum (Stone, 2009), and for the larger community (Sobel, 2004; OFSTED, 2009; Journal of Sustainability Education, 2011). Research designed to measure the impact of EfS on students, schools and communities should, among other important outcomes, demonstrate that there is a correlation between the practice of EfS (sustained, comprehensive EfS in day-to-day actions of community members and explicit instruction), and the achievement of communities as measured by sustainable community indicators.

Research analyzing the effect of EfS programs on students, teachers, and communities shows multiple, positive and long-term benefits. Examples include: Becker-Klein et al, 2008; Duffin, 2006; AED/Cloud, 2007; Sobel, 2008; Gayford, 2009; Barrat Hacking et al, 2010; PEER Associates, 2010. These particular studies indicate that EfS:

➤ **EfS Effect on Students:**

- Improves student learning and standards achievement
- Enhances attitudes towards learning
- Produces better behavior and attendance
- Aligns with people's natural ability to learn holistically
- Significantly decreases students' feeling that they cannot succeed
- Encourages students to make connections between themselves and the systems of which they are a part
- Develops a greater awareness of community, and a greater appreciation of the democratic process
- Produces statistically significant increases in the strength of students' attitudes about civic engagement
- Provides a safe and secure space in which children can take risks and develop skills of active participation

➤ **EfS Effect on Teachers:**

- Supports both new and veteran teachers in achieving strong academic outcomes from their students
- Yields meaningful effects on teacher attitudes

➤ **EfS Effect on Schools, Communities & Ecosystems**

- Improves whole school cultures
- Fosters meaningful relationships between the school, parents and the community
- Improves children's health by improving their food choices
- Models actions and attitudes that promote sustainable living
- Improves air quality, reduces waste, decreases energy and water use

As the Education for a Sustainable and Secure Future Report (NCSE, 2003) states: "Human and global security, economic opportunity, and the quality of life for humans and all species depends upon the continued availability of a life-sustaining environment." **Pre-K-12 Education for Sustainability is uniquely positioned to help address the challenges of environmental, social, and economic sustainability through sustained innovation in teaching and learning.**

Why develop benchmarks for EfS? Seventeen years into the 21st Century, educators and decision makers on the ground need to be able to trust that what they are doing, and what they are receiving in the way of assistance, meets the standards for EfS. In order for that to happen, we need to have *agreed upon* standards of excellence for EfS.

Every legitimate field of inquiry has to define and re-define itself over time. If it doesn't, others will define it, it will disappear, or it will become distorted. A field of inquiry has to establish boundaries for the system of interconnected elements with which it is concerned, and it has to set and re-set the bars of excellence so that those who want to study it, deliver it and assess for it can aspire to the highest degrees of readiness and quality. For years, many countries from around the world have been examining the attributes of EfS/ESD (Education for Sustainable Development as it is often called around the world) through their federal-level education systems, in Colleges and Universities in general, and Schools of Education in particular.

In the U.S. a handful of dedicated thought leaders and scholars, in both NGOs and universities, have studied the historical antecedents—(ex. Leopold (1949) Fuller (1969), Bateson (1972), Armstrong (1970) Meadows (1972), Brundtland (1987), Agenda 21, Chapter 36 (1992), Cajete (1994), The Earth Charter (2000), Orr (2004) to name just a very few) from around the country and the globe, studied the needs for a sustainable future, and created multiple EfS frameworks articulated from our own perspectives. This has made the work rich, robust and relevant for our context. Forty-two thought leaders, authors and scholars in the U.S. and around the world, made their contributions to “The Essential Elements of Education for Sustainability” Matrix in the 2014 issue of the Journal of Sustainability Education’s series entitled, The State of the Field.

Subsequently, a core group of the authors, thought leaders and scholars joined a group of emerging scholars in the field to conduct an analysis of our collective body of work with the goal of developing Benchmarks for EfS. We have come together to share, for the first time, our collected works in one place and to synthesize “the State of the Field” and determine what we all agree is essential to educating for a healthy and sustainable—even regenerative future. These Education for a Sustainable Future Benchmarks are the result of that synthesis. We have combined all grade levels here as a starting point—before we attempt over time to determine the developmental appropriateness and depths of knowledge of the different aspects of EfS for different age groups (although some of us have already begun to do that in our own work driven by the school, organizations and communities we serve).

It is our intention that these EfS Benchmarks, which should come to represent the whole of our collective thinking to date, will be used by school administrators and board members, text book publishers, parents, faculty, students and the community at large, so that they can assess the extent to which their institutions are educating for a sustainable future, and to what extent they are meeting the Benchmarks. More importantly, these EfS Benchmarks can help us to produce and distribute the highest quality EfS programs, curricula and learning experiences, intentionally designed to accelerate the shift toward a healthy and sustainable future.

Note: Green buildings and grounds, procurement, investments and improved occupant health are critical components of EfS, and this document does not include benchmarks for them. We recommend LEED, U.S. Dept. of Education Green Ribbon Schools, CHPS, Eco Schools, Farm to School and the Living Building Challenge.

APPENDIX I

SAMPLE TOPICS OFTEN INTEGRATED WITH EFS BENCHMARKS

DESIGN SOLUTIONS FOR THE NATURAL & BUILT ENVIRONMENT

- Appropriate Technology
- Biomimicry
- Clean, Green Renewable Energy
- Closed Loop Manufacturing
- Cradle to Cradle
- Ecological and Regenerative Design
- Farm to School, Garden to Table, Farm to Table, Sustainable Food Systems, Learning Gardens
- Green Buildings, Rating Systems and Certifications (LEED, CHIPS, LIVING BUILDING CHALLENGE, ECO SCHOOLS, GREEN RIBBON AWARDS...)
- Green Chemistry
- Green Economies
- Living Buildings
- Permaculture, Organic Farming/Gardening, Bio-Dynamic Farming/Gardening, Forest Farming
- School & Community Gardens
- Sustainable Business
- Sustainable Communities, Infrastructure and Planning
- Sustainable Transportation

HUMAN CHALLENGE

- Employment/Careers
- Environmental Justice
- Globalization
- Health
- Human Rights
- Power and Privilege
- Social Justice and Equity
- Sustainable Development
- Women and Sustainable Development

INTER- RELATIONSHIPS

- Amensalism: In the context of cooperation, what is neutral for one, is harmful to the other
- Commensalism: In the context of cooperation, one benefits and the other is neutral
- Mutualism: Mutually beneficial relationships
- Parasitism: In the context of cooperation, one benefits and one is harmed
- Predation: Predator feeds on its prey, kills its prey, then absorbs prey tissues
- Symbiosis between different elements: Living together of unlike organisms

THE NATURAL WORLD

- Air Quality/Oxygen Production
- Biodiversity
- Food Systems
- Forests
- Oceans
- Soil Fertility
- Symptoms/indicators of unsustainability i.e., climate change, hunger, deforestation, ocean acidification, pollution, loss of biodiversity
- Water Quality and Availability

APPENDIX II

SELECTED DISCIPLINES & FIELDS OF STUDY THAT CONTRIBUTE TO EDUCATION FOR SUSTAINABILITY

- Agriculture, Farming and Gardening
- Bio-dynamic Farming/Gardening
- Forest Farming
- Gardening
- Integrated Pest Management
- Organic Farming/Gardening
- Permaculture
- Sustainable Forestry
- Economics
 - Circular economy
 - Ecological Economics
 - Environmental Economics
 - Sharing Economy
 - Sustainable Economics
 - Regenerative Economics
- Education
 - Climate Literacy
 - Creative Process
 - Conflict Resolution Education
 - Cultural Competency Education
 - Design Thinking
- Ecological Literacy
- Education Technology
- Environmental Education
- Food Literacy
- Gaming to Learn
- Geospatial Literacy
- Global Education
- History and Environmental History
- Holistic Education

- Mindfulness
- Oceans Literacy
- Social Emotional Learning
- Systems Thinking and System Dynamics Education
- Engineering and Design
- Biomimicry
- Biophilic Design
- Cradle to Cradle Design and Manufacturing
- Ecological Design and Architecture
- Human Centered Design
- Life Cycle Analysis with Full Cost Accounting
- Regenerative Design and Architecture
- Sustainable Community Design
- Sciences
 - Adaptive Systems
 - Atmospheric Science
 - Biology
 - Biomimicry
 - Botany
 - Chemistry and Green Chemistry
 - Climate Science
 - Earth System Science
 - Ecology
 - Environmental Science
 - Geography
 - Geospatial Science
 - Global Environmental Change
 - Human Geography
 - Natural Sciences
 - Neuroscience (particularly related to learning, re-framing/re-wiring, creativity and moral decision making)
 - Oceanography
 - Physics

- Resilience Science
- Quantum Physics
- Science and Technology Studies
- System Dynamics
- Social Sciences
 - Conservation Psychology
 - Contemplative Sciences
 - Creativity and The Arts
 - Ecological Psychology
 - Ethics and Environmental Ethics
 - Future Studies
 - Game Theory
 - Organizational Learning and Change
 - Philosophy
 - Positive Psychology
 - Science of Happiness
 - Well Being

APPENDIX III

ALIGNED 21ST CENTURY INNOVATIONS/ STANDARDS/ STRATEGIC INITIATIVES/ FRAMEWORKS

- Character Education
- Common Core Standards
- Critical Thinking Model (Paul-Elder)
- Cultural Competency (Jones)
- C3 Framework for Social Studies State Standards
- Entrepreneurial Mindset
- Green and Sustainability Career and Technical Education (CTE) Standards (NASDCTEc)
- Growth Mindset (Dweck)
- Habits of Mind (Costa and Kallick)
- Mindfulness Attributes
- Next Generation Science Standards (NGSS)
- Neuro-Leadership (Rock)
- Partnership for 21st Century Skills (Kay)
- Social-Emotional Intelligence Attributes (Goleman)
- Systems Thinking Habits (Booth Sweeney, Waters Foundation)
- True Grit (Duckworth)
- Understanding by Design (Wiggins)
- Whole New Mind (Pink)

APPENDIX VI

Research and Evaluation

(A partial list—a comprehensive list is being developed by The Green Schools National Network, Abby Rusky for the Pisces Foundation and USGBC Center for Green Schools)

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APPENDIX V

Definitions of Sustainability

“The possibility that human and other life will flourish on the planet forever”

John R. Ehrenfeld

“A sustainable society is one that is far-seeing enough, flexible enough, and wise enough not to undermine either its physical or its social systems of support.”

Donella H. Meadows, et al., The Sustainability Institute, “Beyond the Limits”

A quality of life for all, within the means of nature

The Global Footprint Network

Sustainability encompasses the simple principle of taking from the earth only what it can provide indefinitely, thus leaving future generations no less than we have access to ourselves.”

www.foe-scotland.org.uk/campaigns/sustainable-scot/

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

World Commission on Environment and Development. Our Common Future.

(Oxford, Great Britain: Oxford University Press, 1987), p. 8.

(Frequently referred to as the Brundtland Report after Gro Harlem Brundtland)

“Improving the quality of human life while living within the carrying capacity of supporting eco-systems.”

Caring for the Earth: A Strategy for Sustainable Living. (Gland, Switzerland: 1991). (IUCN - The World Conservation Union, United Nations Environment Programme, World Wide Fund for Nature).

“Sustainability is ‘long-term, cultural, economic and environmental health and vitality’ with emphasis on long-term, ‘together with the importance of linking our social, financial, and environmental well-being.’”

www.scn.org/sustainable/susthome.html

“Sustainability is meeting the needs of all humans, being able to do so on a finite planet for generations to come while ensuring some degree of openness and flexibility to adapt to changing circumstances.”

Jerry Sturmer, Santa Barbara South Coast Community Indicators

“Sustainability may be described as our responsibility to proceed in a way that will sustain life, and that will allow our children, grandchildren, and great-grandchildren to live comfortably in a friendly, clean, and healthy world.”

www.avenue.org/Gov/TJPDC/sustain.html

"Sustainability is an economic state where the demands placed upon the environment by people and commerce can be met without reducing the capacity of the environment to provide for future generations."

Paul Hawken, The Ecology of Commerce

“Sustainable Development is positive change which does not undermine the environmental or social systems on which we depend. It requires a coordinated approach to planning and policy making that involves public participation. Its success depends on widespread understanding of the critical relationship between people and their environment and the will to make necessary changes.”

[Hamilton Wentworth Regional Council, www.hamilton-went.on.ca/vis2020/thevis.pdf](http://www.hamilton-went.on.ca/vis2020/thevis.pdf)

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