Assessment & Evaluation

Assessment and Evaluation in Knowledge Building

Knowledge Building classrooms allow teachers to develop rich and meaningful assessment practices. One of the 12 foundational principles of Knowledge Building is**: Concurrent, Embedded, and Transformative Assessment.** This principle can be understood as *feedback that enables collective knowledge advances*. It is embedded as part of every-day knowledge work and occurs throughout the entire process, not just at the end. Accordingly, Knowledge Building relies heavily on **assessment *for* and *as* learning** to help students deepen their understanding and advance group knowledge. In a KB classroom, a teacher relies on multiple and varied forms of assessment and evaluation. Students also play a vital role in assessment practices and are continually contributing to their own evaluation. Moreover, because KB relies on group processes and community dynamics, both *individual* and *group level* assessment is critical. In the following pages we'll elaborate briefly on both individual and group assessment tools, and give a range of examples of both formative and summative tools and resources you could use and/or adapt for your own class. We also include a section on Evaluation and Reporting that also includes practical tools and activities.

In Knowledge Building, assessment information can come from a variety of sources, including:

- **student questions**
- **individual and group conferencing**
- **drawings and visuals**
- **whole class and small group discussions**
- **demonstrations and performances**
- **Knowledge Forum contributions and activity**
- **portfolios and e-portfolios**

- **peer and self-assessments**
- **self and group reflections**
- **written reports**
- **models and designs**
- **online assessment tools**
- **exit tickets**
- **success criteria and learning goals**

Think about the assessments tools and practices that you are already using. How can they be applied to Knowledge Building work?

For instance, if you regularly take anecdotal notes to assess communication skills, consider using this strategy during a KB Circle. Or, have students practice their writing skills by asking them to complete summaries or self-reflections after a KB circle to help them re-engage content and/or increase their awareness of their own contribution patterns and habits. Thinking about which tools can be used to target specific competencies during particular classroom activities and practices can be especially helpful for making assessment and evaluation meaningful and manageable.

Be inspired to innovate!

Teachers are continually innovating and designing new assessment tools and strategies that help them evaluate their students in meaningful ways. Below is a gallery of some popular assessment tools and ideas, many of them invented by Knowledge Building teachers, for both formative and summative evaluation of Knowledge Building communities.

The Knowledge Building Assessment Innovation Gallery!

KB Innovation Gallery features assessment tools and practices from practicing KB teachers as well as from wonderful resources such as *Natural Curiosity*. The tools are divided into Formative, Summative and Group Level sections, though all of these tools can be adopted and adapted to suit your own needs and purposes. For each of these tools, ask yourself: **Could this tool work for me? How could I adapt this tool to suit my class and my students?**

FORMATIVE ASSESSMENT TOOLS

Co-Constructing Knowledge Goals and Success Criteria

Knowledge Building students are deeply engaged in assessment and evaluation throughout their work. They are invited to co-construct knowledge goals and success criteria and reflect on their progress on an ongoing basis. One approach is to bring the curriculum out to students and introduce them to the Big Ideas. Students can formulate questions and wonderings about these Big Ideas and can also participate in co-designing success criteria along with the teacher. Likewise, students' own questions and "I wonders," inspired from engaging KB provocations, can form learning goals in themselves ("*I wonder how rainbows are made*?").

Example:

- At the beginning of a new unit of study, write the Big Ideas (as stated in the curriculum) on the board. For example, two Big Ideas under the Grade 4 Understanding Matter and Energy: Light and Sound are: 1. "Light and sound are forms of energy with specific properties;" 2. "Light is required to see."
- Explore these ideas with the class, and clarify their meaning. What questions and comments do students have about them? Which ideas are they most interested in? How could one go about starting to investigate these questions?
- Write down the major questions and problems of understanding that have emerged related to these big ideas. Do this knowing that these may be subject to revision or change as the work proceeds. "How does light travel?" "How are light and sound related?" "How do eyes work?"
- Record the main knowledge goals and post them around the classroom: "We will use various experiments to help develop our ideas and understand how light travels," "We will be able to explain how humans and even other animals can see with their eyes."

Exemplar: "Co-constructed Knowledge Goals" (Grade 5 Understanding Structures and Mechanisms), see pg. 119

Anecdotals: Students' Spoken Comments and Ideas

A teacher's rich documentation of students' questions and wonderings, their emerging ideas, and developing explanations and theories are the foundation for assessment reporting (*Natural Curiosity*, pg. 22). There are many opportunities within Knowledge Building work for the teacher to observe and assess student interaction, discourse, and idea development — for instance, during Mini-Conferences, Knowledge Building Circles or when students are engaging in small group discussions.

1. Anecdotal Organizers

Description: A lot of student discourse happens in KB classrooms. Anecdotal organizers can help teachers focus listening and observation to tune into and capture important aspects of students' idea development, including progress made, depth of understanding, or challenges encountered. Organizers can focus on students' ideas, questions, clarity of communication, etc.

Putting Assessment into Practice: Two of the documentation templates below are found in *Natural Curiosity* (pgs. 27-28), and can be used during these assessment opportunities and can help focus documentation on key markers of understanding. The third was created by KB teacher Bev Caswell (watch her describe her assessment practices here (http://learnteachlead.ca/projects/knowledge-building/?pcat=1102&sess=4)

Tool: Anecdotal Organizer

Students' Anecdotal Comments		
Date:		
Student Name	Comment	Understanding or Misconception

Found in *Natural Curiosity* (2011), p. 23

Tool: Assessing Students' Questions

Assessment Considerations Arising from…	
Name:	Date:
…the content of a student's question	**…the quality of a student's question**
What does this question tell me about this student's interests and curiosity?	Is this question fact-based in nature?
What does this question reveal in terms of gaps in this student's content knowledge?	Does this question represent this student's ability to make connections among ideas?
What evidence of existing content knowledge does this student's question reveal?	Does this student tend to ask questions that are fact-based, higher-order in nature, or a combination?
Does this question build on recently learned information or experiences, thereby revealing a consolidation of learning?	Has this student shown growth in the kind of questions that he or she asks?

Found in *Natural Curiosity* (2011), p. 28

Tool: Assessing Students' Activities and Progress Chart

Student name		

"So if you just imagine, you know, a piece of paper and it's divided into the size of square sticky-notes, and each of those squares has the student's name on it. So I have about three pieces of legal size paper, with the student's name and each time that we're doing inquiry or doing science, you know, I'm taking little notes on what students have done and at the end of the week, that whole chart should be filled. If by chance I notice that there are a couple of children who I've not been able to make any notes on, that's a fault of mine. That means I have let two of my students slip through the cracks that week and I don't know what they've been learning in science. And so sometimes it could be just listening to their conversations together. It might be that I work with one of the research groups and really find out what's there – whether they're experimental designs, let me see what you've got in the lab books. I'm not making red notes in their lab books. I've already told them that those are their notes." — Bev Caswell
(see http://learnteachlead.ca/wp-content/uploads/2014/10/QA-WITH-BEV-CASWELL.pdf)

2. Mini-Conferences

Description: Mini-conferences take place throughout the course of Knowledge Building work. The teacher develops an understanding of student knowledge and understanding related to key concepts, knowledge goals, and success criteria. Anecdotal notes taken during or just after conferences provide valuable information about students' strengths and achievements as well as any challenges or gaps in understanding students may be experiencing. The rich discussions between teacher and students allows students to go more deeply into their knowledge building and draw meaningful connections between their ideas. They also give insight to the teacher on how students are progressing over time. Key questions teachers ask during these conferences:

MINI-CONFERENCE QUESTION GUIDE

Student Name: _____   Date: _____

- What is your understanding so far of the knowledge goal or main problem/question?
- How have your initial theories and ideas developed so far?
- How do(es) your authoritative source(s) help you investigate your key questions/knowledge goals?
- What new knowledge are you gaining?
- What are you struggling with? Where are the gaps in your knowledge?
- Are there still things you're wondering about?
- How do your ideas relate to the real world and your everyday life?

ADD YOUR OWN QUESTIONS BELOW

- _____

- _____

- _____

- _____

Putting Assessment into Practice: During mini-conferences, the teacher is given the opportunity to get a sense of student's theories and ideas and the concepts they are digging into. Mini-conferences also give the teacher the chance to identify any misconceptions students' might be holding onto. The intent is not to use mini-conference time to "fix" these misconceptions, but to keep track and assess students' progress towards their stated goals: Is the research they are currently doing relevant and useful? Are they finding evidence to support their theories? Are the sources they are using reliable? Over time and repeated conferences the teacher can see if misconceptions are spreading, are not being addressed, or are blocking progress. If so, the teacher can design a mini-lesson, show a video, read a book, conduct a KB Circle, or co-design an activity focused on the tricky concept to help move the students forward. On the other hand, if students are progressing quickly, the teacher can help students dig deeper and make more connections between their goals, ideas, and findings. Mini-conferences also allow for differentiation instruction that can benefit ESL or students who are struggling, as the teacher can provide the student the opportunity to demonstrate their learning in an alternative way (not a pencil and paper task).

Knowledge and Understanding of Knowledge Goals
- Student understands the main knowledge goals and big ideas
- Student understands how the knowledge goal connects to curriculum expectations

COMMENTS:

Application of the Knowledge Goal to Everyday Life
- Student makes connections between disciplinary concepts and their everyday life
- Student describes connections, similarities, and differences between knowledge goals

COMMENTS:

Communication of Knowledge Goal:
- Student uses key terms and vocabulary to express ideas
- Student organizes information clearly and coherently

COMMENTS:

Thinking and Investigating:
- Student uses the KB process to gather relevant information
- Student uses critical and creative thinking skills to gather information
- Student investigates information from authoritative sources accurately

COMMENTS

"I use anecdotal notes in combination with teacher conferences as a method of assessment — so I went back to the curriculum and Growing Success and explored how to track their learning. I created the Teacher/Student Conference Assessment Reports. Each element tackles one of the Achievement Chart categories. Then I look at the co–created knowledge goals the class and I created together at the onset of the unit, and I decide which single knowledge goal I'm going to look at in my mini-conference according to each achievement chart category, simply because I can't cover everything. The teacher just takes notes here. It's time consuming but it's rich and meaningful assessment." — Jason Frenza

Student-Composed Assessments

In Knowledge Building communities, students themselves are given responsibility to reflect on their progress, their achievements, and setbacks. They are encouraged to engage in both individual and group reflection, and to be involved in the process of evaluation and assessment as part of everyday work. Below are examples of tools to help students reflect upon important aspects of KB work, including their engagement and contribution habits, successes, and challenges related to idea development, collaboration skills, research strategies, and so on.

3. KB Circle Rubrics

Description: The Knowledge Building Circle allows students to share their knowledge and build upon the knowledge of others in the classroom. The KB Circle Rubric is a cross-curricular assessment tool that students use as a form of self-assessment. The rubric helps to put one of the 12 Principles of Knowledge Building, *Knowledge Building Discourse*, into practice, and is used as an assessment for students' developing oral language and communication skills.

Putting Assessment into Practice: The use of the KB Circle Rubric supports differentiated instruction, as it allows students who sometimes struggle with the traditional pencil and paper tasks to communicate their ideas and develop confidence in sharing their knowledge with their peers and the teacher. The Success Criteria for KB Circles (see below) are given to students just prior to the very first KB Circle and is used as a self-assessment tool. After each KB Circle, students evaluate themselves on various communications skills such as: active listening, the communication of their ideas; connections and extensions of ideas to broader world or related problems; their expression and clarity of scientific concepts, etc. At the very end of the unit, students also self-evaluate their metacognition skills. They identify their strengths and next steps as a contributor to a KB Circle. As a summative extension to this assessment tool, the teacher completes a KB Circle Rubric for each student to evaluate his/her overall contribution level and development of communication and collaboration skills as evident by his/her participation in KB Circles during the length of the entire KB study.

Tool: Success Criteria for KB Circles

SUCCESS CRITERIA FOR KB CIRCLES

- ✓ I will explain my knowledge about key concepts I've been learning about using appropriate language and vocabulary
- ✓ I will contribute prior knowledge and ideas about the problems and questions being explored
- ✓ I will reflect and discuss new knowledge and learnings I have acquired
- ✓ I will reflect and share questions, ideas, and information I'm still wondering about
- ✓ I will ask questions that will help me move forward and improve my ideas
- ✓ I will build on others' ideas and connect my learnings to the ideas and questions of the group.

Tool: KB Circle Rubric, see pg. 120
Created by: Jason Frenza, Junior/Intermediate teacher

Tool: KB Circle Self-Evaluation, see pg. 121
Created by: Nizam Hussain, Intermediate teacher

4. Inquiry Lab Books

Description: In Knowledge Building work, students are continually observing, questioning, visualizing, theorizing, reflecting, and self-assessing. In KB, these practices are not separate or isolated steps to be done one at a time, but are dynamic and interdependent processes. For instance, students need to be reflecting as they observe, visualizing or self-assessing as they reflect, questioning and theorizing as they observe, and so on. Inquiry Lab Books can provide space for students to record, organize, and reflect on all aspects of their KB work. Students record and describe their observations, ideas, questions, and reflections with the help of diagrams, jot notes, sketch notes, lists, reports, and so on. While Lab books are commonly used in science, they are also valuable in other subjects. For example, investigating primary source documents for History or Social Studies can inspire rich questions, and can set students on a meaningful course of action to help them develop their ideas. For Language Studies, students could keep an ongoing record of current events.

"Each entry in an Inquiry Lab Book is dated, which as a whole, creates a portfolio of a learner's thinking and research processes over time. By reflecting on the qualitative nature of a learner's entries, the teacher gains a picture of his or her developmental growth. Conversely, a test completed in isolation and under time restrictions, although a more straightforward process of quantitative data collection, represents only a fragmented picture, a mere slice of a learner's knowledge, which may be distorted by the restraints and pressures of a test situation" (*Natural Curiosity*, 2011, pg. 24).

Inquiry Lab Books can provide a place for students to record and organize:

• initial questions
• theories/ideas
• observational sketches of, and reflections on experiments
• observations, reflections and notes on artifacts / primary sources
• research from books, internet sources, and guest speakers
• notes and/or drawings from field experiences
• new questions and theories

Adapted from *Natural Curiosity* (2011), pg. 24

5. My Investigations and Record of Observation Logs:

Created by: Jason Frenza, Junior/Intermediate teacher

Description: These logs encourage students to record observations, insights, and ideas that arise during classroom experiments or during primary document investigation and analysis. They can be included as a component within an Inquiry Lab Book or folder to support students' work. The Investigations and Record of Observation Logs can be used in any activity which requires careful observation, questioning and recording that can help guide future steps. The success criteria shown on the following page helps students to structure and reflect on their Investigation and Record of Observation Logs.

Putting Assessment into Practice: Students conduct an in-class experiment, or other investigative activity requiring close observation. During the process or directly afterwards, students create a Record of Observation Log in which they communicate their thinking and ideas by referring to direct observations

that took place during the investigation. To help them demonstrate their thinking skills, students are provided opportunities to use diagrams to help them explain their observations. A significant part of the Log is to record new learnings and new ideas that emerged from the investigation. Guided by the My Investigations andRecord of Observations Success Criteria, students are encouraged to actively integrate any new information and ideas that they acquired within their pre-existing ideas or theories, and to connect how their new learnings and understanding relate to their main questions and to the learning/knowledge goals.

Tool: My Record of Observations Success Criteria

MY INVESTIGATIONS AND RECORD OF OBSERVATIONS SUCCESS CRITERIA

- ✓ I recorded my observations of the activity/experiment I/we completed
- ✓ I used appropriate terms, definitions and vocabulary to explain and describe my observations
- ✓ I described my observations clearly
- ✓ I used diagrams, sketch notes, or images to help me explain my observations when needed
- ✓ I explained all the procedures, materials, and tools I/we used during the activity/experiment
- ✓ I recorded the findings and/or results of the activity/experiment and discussed their significance
- ✓ I completed my Record of Observations log.

MY OBSERVATIONS LOGS

- ✓ I discussed the procedures, materials, tools, and findings of the activity/experiment
- ✓ I discussed what I observed
- ✓ I used diagrams, sketch notes, or images to help explain my observations when needed
- ✓ I described my "New Learnings" (new information, questions, ideas that I gained as a result)
- ✓ I connected new ideas and learnings to my own and our community's previous theories and ideas
- ✓ I described and made connections between science concepts and the real world.

Exemplar: For an example of student Record of Observation Log, see pg. 124

6. My Self-Assessment Logs

Created by: Jason Frenza, Junior/Intermediate teacher

Description: With My Self-Assessment Logs students evaluate their own learning, ideas, and contributions to the KB community. These kind of logs can also be integrated within an Inquiry Lab Book or folder. Through the Self-Assessment Log, teachers gain an understanding of the following: how students articulate and understand the driving questions and learning/knowledge goals; how students are connecting authoritative sources to their theories and ideas; how they are making connections to real

world issues; how they are reflecting upon their participation in KB circles; and finally, how students perceive their strengths and next steps as a Knowledge Builder.

Putting Assessment into Practice: The My Self-Assessment Log supports meta-cognition practices in the classroom because it gives students an opportunity to actively reflect on their learning and helps them to chart the course of their own inquiry. The My Self-Assessment Log provides them the opportunity to self-reflect upon their strengths and next steps and where they need to continue to go with the knowledge goals.

Tool: Self-Assessment Log Success Criteria

SUCCESS CRITERIA FOR MY SELF-ASSESSMENT LOG

- ✓ I will use my knowledge from past learning experiences to help me complete my self-assessment log.
- ✓ I will evaluate my learning and participation in Knowledge Building Circle talks.
- ✓ I will include new learning and ideas that I've gained from Knowledge Building talks and science inquiries
- ✓ I will explain what I have learned by connecting [insert knowledge/learning goal here — e.g., *how forces act on and within structures* to my everyday life
- ✓ I will discuss my strengths when it comes to participating in class
- ✓ I will evaluate my goals and think about next steps regarding how I can improve my recording of (Insert activities here- e.g., *my Observations, my Picture Learning Logs, my contributions to Knowledge Talk Reflections, etc.*)

Exemplar: For an example of a Student Self-Assessment Log, see pg. 125

7. Knowledge Talk Reflections
Created by: Jason Frenza, Junior/Intermediate teacher

Description: A Knowledge Talk Reflection is a written reflection (approximately 1 page) that allows students to describe the learning that has taken place during the inquiry process. These are typically completed after a Knowledge Building Circle and provide students with an opportunity to reflect upon the circle discussion. In a Knowledge Talk Reflection, students explain the key concepts that they're engaging in, describe any new ideas or information that they have brought to that Knowledge Building Circle, comment on how their prior knowledge helped them to understand and make connections during the discussion, and reflect upon information and ideas that they are still wondering about or that puzzles them. The prompt for further questioning and wonderings can help students to develop higher-level questioning skills because they challenge students to keep probing and digging deeper.

Putting Assessment into Practice: Knowledge Talk Reflections give the teacher a sense of how a student is contributing to the KB community — how his/her discourse is developing over time, how his/her contributions help to advance shared knowledge, and how his/her communication and interpersonal skills are growing. Students are encouraged to use the KB Circle scaffolds ("My Theory", "I Still Need to

Understand", "Another Perspective Is," etc.) in their Reflection writing to help explain their thinking. The teacher can see how students are sharing what they have learned and how they are building on not only their own ideas but the theories that their classmates are sharing during the KB Circles.

Exemplar: See sample Knowledge Talk Reflections, see pgs. 122-123

Drawings and Visual Modes of Communication

To honour different learning styles and expressive modes, teachers can encourage students to communicate their ideas and understandings in visual forms. This allows students who have more difficulty expressing their thoughts in written form to showcase their ideas. It also allows the teacher a different access point to students' ideas.

1. Picture Learning Logs
Created by: Jason Frenza, Junior/Intermediate teacher

Description: The Picture Learning Log included in this resource is one example of embedding visual forms of communication for the purposes of assessment into the Knowledge Building process. The Picture Learning Logs both allow the teacher to see and assess students' thinking, and to also help students advance their own ideas and Knowledge Building work.

Putting Assessment into Practice: The Picture Learning Log directly connects to inquiry questions/problems and knowledge goals. The students select a part of the problem or goal that is meaningful to them and are then asked to create a visual representation of their learning that illustrates key disciplinary concepts and theories in the form of a picture, diagram, timeline, graph, etc. Through this visual they need to be communicating the knowledge they have gained through the inquiry process so far. This learning activity allows students to illustrate rich connections between disciplinary theories and concepts and their everyday lives. Students complete a Picture Learning Log once they are about a quarter way through the KB process (e.g., once they have done a fair amount of initial research, had a mini-conference, participated in KB Circles, have demonstrated an understanding of the knowledge goal/key concept, etc). The Picture Learning Log helps students to consolidate their understandings repeatedly through the KB process.

Tool: Success Criteria for Picture Learning Logs.

SUCCESS CRITERIA FOR PICTURE LEARNING LOGS

- ✓ I will show my learning and illustrate my ideas through clear diagrams, sketch notes, or images that relate to important (*historical, scientific, social studies, etc*) concepts and questions

- ✓ I will label my diagrams with appropriate terms and definitions

- ✓ I will explain how my diagram, sketch note or image relates to my/our theories and ideas, and how it represents any new learning.

Exemplar: For samples of student Picture Learning Logs, see pgs. 126-127

Knowledge Forum

We spent time discussing the Assessment Tools available on Knowledge Forum throughout pages 90 and 91 of this resource and so do not cover those here. However, we include teacher-invented assessment tools that can help both teachers and students engage in meaningful assessment of students' participation and contributions on Knowledge Forum.

1. Scaffold Use

Created by: Glenn Wagner, Senior teacher

Description: This assessment tool can be used in tandem with the automated assessment features on Knowledge Forum (e.g., the Scaffold Tracker Tool, the Contribution Tool). It is designed for student use and helps them keep track of all the different types of contributions that they are making to the online discussion. This helps increase students' awareness not only about their own ways of contributing but about how they are helping to advance community knowledge, and how they might be able to expand their contribution repertoires in meaningful ways.

Putting Assessment into Practice: Students are given weekly tracking sheets and keep their contribution tally for their own records. They can hand these in periodically over the course of KB work, they can hand them in as part of a Self-Selected Student Portfolio at the end of a unit, or they can simply be called upon at any point in the course of the study to show their contribution sheets.

Knowledge Building Contribution Tracking Sheet

WEEK 1

Scaffold	Tally	Weighting	Total Score
A definition		x 1	
An example		x 1	
New information		x 1	
Video with explanation		x 2	
Picture with explanation		x 2	
I need to understand		x 2	
This idea cannot explain		x 2	
Building on your idea		x 3	
An analogy		x 3	
Aha! moment		x 3	
Experimental evidence		x 4	
My theory		x 4	
A theory I found		x 4	
An alternate theory		x 4	
Putting our knowledge together		x 5	
Decision		x 5	

SUMMATIVE ASSESSMENT TOOLS

Many educators and students say that it can be difficult to put an "ending point" to a KB inquiry, as there are always more questions to pursue and new avenues to follow that go deeper into a knowledge problem. However, practical constraints and assessment requirements often demand summative assessments of KB work. Also, having a project towards which students can apply and channel the knowledge they gain during the KB process can be a fun and motivating way to consolidate students' understandings and close off the often challenging yet exciting process of improving ideas! Below are some examples of creative and effective summative assessments that are designed to help students articulate their own deepest understandings and showcase how their ideas have advanced.

1. Summative Knowledge Building (KB) Circles
Created by: Glenn Wagner, Senior teacher

Description: Students engage in a great amount of discourse and group discussion throughout the process of KB work. Summative KB Circles allow students to be evaluated in a similar mode, through verbal conversations with peers and with the teacher. Unlike a regular KB Circle, which is highly exploratory and not typically subject to evaluation, each student is asked to come to the table ready to be able to speak to the problem and/or question they have been working on in a deep, fluent, and knowledgeable way.

Putting Assessment into Practice: At the end of a KB study, small groups of students (3-4) who have been working on similar problems or questions meet together with the teacher in a KB Circle. The students are all asked to describe to the group the story of their greatest knowledge advance — "What questions and theories did they start out with?" "How did they grow their ideas?" "What authoritative sources did they turn to?" "Which of their peers' ideas helped them move their thinking forward?" "How did they contribute to others' ideas?" "How did they deal with contradictory information?" "Did they do any experiments to test theories?" They are also encouraged to identify challenges and existing gaps in knowledge, as well as directions that they could pursue and steps they could take in order to develop their ideas and extend their knowledge further in the future. Students are expected to be able to be responsive to any questions or comments that their peers or the teacher pose for them throughout this discussion. (*Suggestion:* Put this into a "fishbowl" for the rest of the class to observe.)

2. E-Porfolios
Created by: Glenn Wagner, Senior teacher

Description: E-Portfolios allow students to demonstrate their greatest knowledge advances and deepest understandings in writing. Students use the knowledge they and their community generated on Knowledge Forum as the main reference source for their E-Portfolio. Rather than take an essay style format, an E-Portfolio asks students to synthesize the process they went through developing their ideas and to communicate the best explanation possible to their main problem of understanding. Students are asked to describe and show the evolution of their ideas from their initial questions on to their final explanation. Students are expected to incorporate and elaborate on their own KF notes, include evidence from authoritative sources, and add contributions from the classroom community that helped them advance their ideas.

Putting Assessment into Practice: Students are given resources to help guide the development of their E-Portfolio, the "Steps to Creating an E-Portfolio" guide, and the E-Portfolio Rubric (see Tool: E-Portfolio Rubric directly below).

Tool: Steps to Creating an E-Portfolio, see pg. 128

Tool: E-Portfolio Rubric

E-Portfolio Rubric

Name: _____

The criteria for selecting 'best' notes are as follows. Did the notes you select represent:

(1 = not representative, 4 = very representative)

1. **Working at the cutting edge:**

   1   2   3   4

2. **Progressive problem solving**

   1   2   3   4

3. **Collaborative effort:**

   1   2   3   4

4. **Identifying high points:**

   1   2   3   4

Score   /16

Exemplar: For an example of a student E-Portfolio, see pgs. 129-130

3. Knowledge Building Project Contribution Rubric

Created by: Glenn Wagner, Glenn Wagner, Senior teacher

Description: The Knowledge Building Project Contribution Rubric allows students to self-assess their engagement and participation in all aspects of KB work (including KF, KB Circles, general discussion and group work, etc.)

Knowledge Building Project: Contribution Rubric

Name: _____

(1 = never, 4 = always)

1. **Consistently met target contribution score within Knowledge Forum:**

   1   2   3   4

2. **Contributions were in-depth, and attempted to bring together other people's work to synthesize with your own.**

   1   2   3   4

3. **Continually improved ideas and theories of your own and others in your area of expertise by building upon others' theories and ideas.**

   1   2   3   4

4. **Provided evidence of understanding through examination of primary sources of information**

   1   2   3   4

Score_____/16

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4. Showing a Learning Journey on a Road Map
Created by: Elaine Heaver, Junior teacher

Description: While pursuing explanations to their KB questions, students show their learning journeys on individual Road Maps.

Putting Assessment into Practice: On a large piece of blank ledger paper, students start by illustrating themselves in the top left corner with a thought bubble showing the question they were wondering about. From there, they draw a road/path/footsteps (or whatever mode of transportation they want) to their first stop (e.g., their desk to plan an experiment, a classroom iPad to find some information). The "road" would continue to show each step they took along the way. The key is to show that their journeys are not a straight road, but a winding path with a variety of obstacles and twists and turns. Students include such things as:

- speed bumps (things that slow them down, such as trouble finding needed materials),
- detours (when they have to take a different approach to get themselves back on track)
- forks in the road (when they have choices to make that affect their progress)
- road blocks (an unforeseen difficulty that may stop their progress)

The most rewarding part of the journey is seeing the steps students took to overcome each obstacle. As students see classmates struggle and overcome, it encourages them to persevere and look for creative solutions. As one student commented, "If your road to success is pretty straight, you didn't challenge yourself!"

5. Knowledge Building Self-Selected Student Portfolios (+ Accompanying Evaluation)
Description: As a culminating product, students are asked to collect and submit the work that they have done over the course of the Knowledge Building study that they feel represents their deepest understandings and greatest knowledge advances. These pieces can also be directly related to communal knowledge goals. These portfolios allow the teacher to assess and evaluate students' thinking and their ability to gather relevant information and work through the KB process.

The Self-Selected Portfolio itself includes various assignments and pieces of work that students have completed throughout the KB process. Each of the pieces included in the Portfolio applies directly to one out of the four achievement chart categories represented in the evaluation. For example, in Jason Frenza's science class, the Portfolios include: i) a student's Knowledge Talk Reflection (Knowledge and Communication); ii) a Picture Learning Log (Thinking and Application); iii) Record of Observations (Thinking and Application); iv) My Observation Journals (Thinking); v) a My Self-Assessment Log (Application); vi) a KB Circle Student Self-Assessment Rubric (Knowledge and Communication).

Putting Assessment into Practice: Knowledge Building Student Self-Selected Portfolios allow students to collect and research information directly related to their main questions and learning/knowledge goals. The teacher is able to assess and evaluate students' critical thinking skills, their knowledge and understanding of disciplinary concepts, their communication skills, their ability to express and organize

ideas and information, their ability to make connections between key concepts and the real world, and their ability to gather relevant information and work through the KB process.

6. Knowledge Surveys

Created by: Glenn Wagner, Senior teacher

Description: Knowledge Surveys are a great way for students to self-assess their own growth in knowledge advancement and understanding. It is also a wonderful way for a teacher to see how students have developed conceptual understanding and content knowledge.

Putting Assessment into Practice: Knowledge Surveys are administered at the very beginning and end of a KB study.

Exemplar: See a pre/post Knowledge Survey, see pgs. 131-133

Evaluation and Reporting

The sheer amount of documentation and artifacts you may accumulate from students at the end of a KB study can make evaluation and reporting a daunting task. On the other hand, you will likely not be short of material to turn to when report card time arrives. **KB teachers often find that the Learning Skills and Work Habits section is a great place to document important observations and evaluations** about students that have been amassed throughout the process of a Knowledge Building Inquiry. As outlined in *Growing Success* (2009, p. 11), the Learning Skills and Work Habits chart (see below) pinpoints desired behaviours and traits associated with each category. Many of the behavioural Look-Fors listed in the chart below are highly relevant to Knowledge Building and encompass competencies and skills needed for creative work with ideas.

Learning Skills and Work Habits	Sample Behaviours The student:
Responsibility	• fulfils responsibilities and commitments within the learning environment • completes and submits class work, homework, and assignments according to agreed-upon timelines • takes responsibility for and manages own behaviour
Organization	• devises and follows a plan and process for completing work and tasks • establishes priorities and manages time to complete tasks and achieve goals • identifies, gathers, evaluates, and uses information, technology, and resources to complete tasks
Independent Work	• independently monitors, assesses, and revises plans to complete tasks and meet goals • uses class time appropriately to complete tasks • follows instructions with minimal supervision
Collaboration	• accepts various roles and an equitable share of work in a group • responds positively to the ideas, opinions, values, and traditions of others • builds healthy peer-to-peer relationships through personal and media-assisted interactions • works with others to resolve conflicts and build consensus to achieve group goals • shares information, resources, and expertise and promotes critical thinking to solve problems and make decisions
Initiative	• looks for and acts on new ideas and opportunities for learning • demonstrates the capacity for innovation and a willingness to take risks • demonstrates curiosity and interest in learning • approaches new tasks with a positive attitude • recognizes and advocates appropriately for the rights of self and others
Self-Regulation	• sets own individual goals and monitors progress towards achieving them • seeks clarification or assistance when needed • assesses and reflects critically on own strengths, needs, and interests • identifies learning opportunities, choices, and strategies to meet personal needs and achieve goals • perseveres and makes an effort when responding to challenges

Below, KB primary teachers Angela Hoffman and Mubina Panju provide an example of evaluative comments that incorporate and reflect a student's growth in Knowledge Building capacities and skills in the Learning Skills and Work Habits section of the provincial report card (see the case study *Knowledge Building in Primary: What Makes a Community?* in the KB Case Studies package available via The Learning Exchange [www.thelearningexchange.ca]).

Kindergarten: (Science and Technology). _____ is encouraged to communicate her ideas clearly so that others can understand her thought processes and build/respond to her ideas. This helps to solidify understanding of concepts and will help Sarah think of new ideas for further inquiry. Sarah investigates and uses the computer and iPad with assistance, and is working to build independence when using these tools for Knowledge Building.

Grade One: (Learning Skills). _____ is able to use his own ideas and experiences to support his learning. Ali demonstrates curiosity and an interest in learning about the world around him. He is also open to new ideas and takes appropriate risks. During our Knowledge Building Inquiry Unit about the community, Ali readily participates and provides interesting and insightful comments and questions. Ali will be encouraged to think of new ideas to further inquiry.

Linking the Learning Skills to the KB Progressions

The **KB Progression Charts** (see pgs. 75-79) incorporate many of the elements described in the **Learning Skills and Work Habits** framework. The KB Progressions trace key qualities and Look-Fors across four main dimensions critical to successful Knowledge Building environments: *Fostering Collective Discourse; Community Norms; Developing Ideas;* and *Meta-Cognition/Meta-Talk.* Take, for example, these sample points found in the Community Norms KB Progression:

- Students are able to demonstrate collaboration and how they help build a sense of community.
- Students are using appropriate language and behaviours (e.g., turn-taking) to respectfully challenge or add on to each other's thinking.
- Students are showing evidence of helping to establish a culture of trust, acceptance, and safety.
- Students are open to diverse ideas and individual differences between one's own ideas and the ideas of others.

These behaviours are directly relevant to the descriptions of both *Collaboration* and *Initiative*, as outlined in the Learning Skills and Work Habits framework. The table below draws connections between the four KB Progressions and the Learning Skills and Work Habits categories.

KB Progression	Learning Skills and Work Habits
Fostering Collective Discourse	Collaboration, Initiative
Community Norms	Responsibility, Collaboration, Self-Regulation, Independent Work
Developing Ideas	Organization, Initiative, Collaboration
Meta-Cognition/Meta-Talk	Self-Regulation, Initiative

KB Principles and practices and align effectively with not only the Learning Skills and Work Habits, but also with 21st century skills and competencies. The chart below shows connections between the Learning Skills, 21st century competencies, and the 12 KB principles, in a coherent framework. Assessments that target particular behaviours relevant to each category are also considered.

Learning Skills & Work Habits	Ontario's Draft 21st Century/Global Competencies	KB Principles	Assessments targeted to:
Responsibility	**Global Citizenship**	• Community Knowledge, Collective Responsibility • Democratizing Knowledge	• Individual contributions to both personal and collective goals (e.g. KB Circle Reflections, Self-Assessment Logs, etc)
Organization	**Learning to Learn/ Self-Aware & Self-Directed Learning**	• Epistemic Agency • Knowledge Building Discourse • Constructive Use of Authoritative Sources	• Taking on high-level responsibilities like planning next steps, organizing or creating KF views, proposing experiments, surveys or designs to test ideas and gather data, setting top-level goals • Self and group reflection • Engaging with authoritative sources
Independent Work	**Learning to Learn/ Self-Aware & Self-Directed Learning**	• Epistemic Agency	• Individual contributions to both personal and collective goals (e.g. Self-Assessment Log, Learning Journey Road Maps, etc) • Summative assessments (Summative KB Circles, E-portfolios, Self-Selected Portfolio)
Collaboration	**Collaboration, Communication**	• Community Knowledge, Collective Responsibility • Democratizing Knowledge • Knowledge Building Discourse	• Community dynamics, student attitudes and collective culture (e.g. KB Circle and other Student Anecdotals) • KF activity, such as degree students are reading and responding to each other. • Using appropriate scaffolds in discourse to foster a critical and kind collective culture
Initiative	**Innovation, Creativity & Entrepreneurship** **Critical Thinking & Problem Solving**	• Epistemic Agency • Improvable Ideas • Idea Diversity • Rise Above • Pervasive Knowledge • Real Ideas, Authentic Problems • Embedded, Concurrent, & Transformative Assessment	• Demonstrate a "KB" stance (e.g. willingness to contribute ideas, take risks, consider multiple perspectives and ideas, encourage and ensure equitable participation, draw real-world connections, give and respond to critical feedback, developing rich questions, • Engage in high-level knowledge work such as being reflective, designing next steps for work, setting top-level goals
Self-Regulation	**Learning to Learn/ Self-Aware & Self-Directed Learning**	• Epistemic Agency • Pervasive Knowledge • Embedded, Concurrent & Transformative Assessment	• Taking on high-level responsibilities for individual and group • Engaging in self and group reflection and assessment

TOOLS FOR EVALUATION

The Ontario Provincial Curriculum includes an **achievement chart** that provides a common framework for assessing performance standards for each Grade across each discipline. As described in *Growing Success*, the achievement chart "enables teachers to make consistent judgments about the quality of student learning based on clear performance standards and on a body of evidence collected over time. It also provides teachers with a foundation for developing clear and specific feedback for students and parents (2009, p. 16). The achievement chart is comprised of the following categories:

- **Knowledge and Understanding:** Subject-specific content acquired in each Grade/course (knowledge), and the comprehension of its meaning and significance (understanding).

- **Thinking:** The use of critical and creative thinking skills and/or processes.

- **Communication:** The conveying of meaning through various forms.

- **Application:** The use of knowledge and skills to make connections within and between various contexts (p. 17).

Using the achievement chart categories as a framework, we introduce two KB evaluation tools that can be used to inform final reporting (Ideas, Connections, Extensions (ICE) Rubric and the Knowledge Building Student Self-Selected Portfolio Rubric). We also list the relevant assessment tools, described in the Innovation Gallery, that can be used to inform reporting for each of the achievement chart categories. Note that many of the assessment tools are applicable to more than one of the achievement chart categories depending on how they are used in the classroom.

KNOWLEDGE AND UNDERSTANDING

Knowledge of content entails use of facts, terminology, definitions, safe use of tools, equipment, and materials. *Understanding* of content entails use of concepts, ideas, theories, principles, procedures, and processes.

1. The ICE Rubric to Assess Idea Development

Description: The ICE Rubric developed by Fostaty-Young and Wilson (2004) is featured in *Natural Curiosity* (2011) and provides a useful tool applicable across Grades and subject matter for assessing growth in student understanding and idea development. The ICE rubric can be applied to students' written, verbal or online discourse. The ICE Rubric can be used to explore the depth of student theories and ideas, the extent to which they elaborate their ideas in their contributions, as well as the clarity with which they communicate those ideas to the community. Similarly, jotting down whether students are expressing Ideas, making connections, or demonstrating extensions of ideas during KB Circles can provide rich data on the extent and depth of student understanding.

Two examples of ICE Rubrics are given below. The first depicts guiding principles for each category, and the second is adapted for junior Grades. The guiding principles can be used to help inform the design of customized ICE Rubrics.

Tool: Found in *Natural Curiosity* (2011), pg. 33

IDEAS	CONNECTIONS	EXTENSIONS
• the fundamentals • basic facts • vocabulary/definitions • details • elemental concepts	• explain the relationship or connection among the basic concepts • explain a relationship or connection between new learning and what they already know • use phrases such as, "Oh, that reminds me of…" or "That's just like…"	• apply their new learning in novel ways, apart from the initial learning situation • answer conjectural questions such as: "So, what does this mean?" "How does this shape my view of the world?"

Tool: Found in *Natural Curiosity* (2011), pg. 34 ("Where do energy sources come from?")

ELEMENTS/CATEGORIES	IDEAS Level 1	CONNECTIONS Level 2	EXTENSIONS Level 3	 Level 4
Knowledge and Understanding *(facts, terminology, definitions, concepts)*	• I can give a basic definition for the meaning of renewable and non- renewable resources	• I can use examples to support definitions • I can connect everyday activities to renewable or non-renewable energy sources • I can explain the pros and cons of each source of energy	• I can propose suggestions for conserving energy	• I can explain what I might do differently • I can explain what others can do
Communication *(expression and organization of ideas and information)*	• I can communicate clearly and get my point across so that others understand what I am trying to say • I can express my ideas in an organized and logical manner	• I can expand my thinking by connecting ideas to information from my own experiences and other sources	• I can explain how and why my thinking has changed	• I can ask new questions • I can invite my classmates to participate

2. Knowledge Building Student Self-Selected Portfolio Evaluation

Description: Grading of Student Self-Selected Portfolios is guided by the accompanying Student Self-Selected Portfolio Evaluation framework adapted from the Achievement Chart outlined in the curriculum document (Ontario Elementary Science Curriculum, 2007, p. 26-27). The Self-Selected Portfolio itself includes various assignments and pieces of work that students have completed throughout the KB process, each of which applies directly to one out of the four achievement chart categories represented in the Evaluation (as described on pg. 106).

Putting Assessment into Practice: This evaluation is an example of the kinds of assessment and evaluation innovations that teachers create to bring together formal evaluations with important KB competencies. The evaluation is completed at the conclusion of a KB inquiry.

Tool: Knowledge Building Student Self-Selected Portfolio Evaluation. The evaluation below is focused on science, but can be easily adapted for other subjects.

Created by: Jason Frenza, Junior/Intermediate teacher

Knowledge Building Student Self-Selected Portfolio Evaluation

Achievement Chart Category	Level 1	Level 2	Level 3	Level 4
Knowledge and Understanding Student demonstrates knowledge of science content during knowledge building talks Student understands new science concepts learned	Student demonstrates little understanding of science content when sharing information during knowledge building talks Student understands very little new information learned in class when sharing knowledge during knowledge building talks	Student demonstrates some understanding of science content when sharing information during knowledge building talks Student understands some new information learned in class when sharing knowledge during knowledge building talks	Student demonstrates an understanding of science content when sharing information during knowledge building talks Student understands new information learned in class when sharing knowledge during knowledge building talks	Student confidently demonstrates an understanding of science content when sharing information during knowledge building talks Student precisely understands new information learned in class when sharing knowledge during knowledge building talks
Thinking Develops ideas through science inquiry process Picture Learning Logs demonstrate critical thinking skills by analyzing, interpreting and drawing conclusions Record of Observations demonstrates use of processing skills and strategies	Student develops very few ideas through the inquiry process Picture Learning Logs demonstrate very few critical thinking skills of analyzing, interpreting and drawing conclusions Student records observations using very few critical and creative ideas	Student develops some ideas through the inquiry process Picture Learning Logs demonstrate some use of critical thinking skills by analyzing, interpreting and drawing conclusions Student records observations using some critical and creative ideas	Student develops many new ideas through the inquiry process Picture Learning Logs demonstrate many critical thinking skills by analyzing, interpreting and drawing conclusions Student records observations using critical and creative ideas	Student develops excellent ideas through the inquiry process Picture Learning Logs demonstrate excellent critical thinking skills by analyzing, interpreting and drawing precise conclusions Student records observations using many critical and creative ideas
Communication Expression and organization of ideas and information Use of conventions, vocabulary, and terminology	Student expresses and organizes ideas and information unclearly Student uses very few science conventions and terminology	Student sometimes expresses and organizes ideas and information clearly Student sometimes uses science conventions and terminology	Student expresses and organizes ideas and information clearly Student uses many science conventions and terminology	Student precisely expresses and organizes ideas and information clearly Student uses excellent science conventions and terminology
Application Transfer of knowledge and skills Makes connections between science concepts and the real world	Student transfers very little knowledge and information to new concepts Student makes very few connections to the real world	Student transfers some knowledge and information to new concepts Student makes some connections to the real world	Student transfers knowledge and information to new concepts Student makes connections to the real world	Student confidently transfers knowledge and information to new concepts Student makes excellent connections to the real world

Assessment Tools to Inform Evaluation and Reporting for "Knowledge and Understanding"

The following assessment tools, as described in the Innovation Gallery, can be used to help evaluation and reporting for this achievement category.

Formative Tools
- *Anecdotals*: Anecdotal Organizers; Mini-Conference notes
- *Student-Composed Assessments*: Inquiry Lab Books; Knowledge Talk Reflections

Summative Tools
- Learning Journey Road Map; Summative KB Circles; E-Portfolios

Knowledge Forum Tools (see pgs. 90-91 for an overview of Knowledge Forum assessment tools)
- Vocabulary Tool; Qualitative contribution assessment

THINKING

- Use of initiating and planning skills and strategies (e.g., formulating questions, identifying the problem, developing hypothesis, scheduling, selecting strategies and resources, developing plans).

- Use of processing skills and strategies (e.g., performing and recording, gathering evidence and data, observing, manipulating materials and using equipment safely, solving equations, proving).

- Use of critical/creative thinking processes, skills, and strategies (e.g., analyzing, interpreting, problem solving, evaluating, forming and justifying conclusions based on evidence).

Assessment Tools to Inform Evaluation and Reporting for "Thinking"

The following assessment tools, as described in the Innovation Gallery, can be used to help evaluation and reporting for this achievement category.

Formative Tools
- *Anecdotals*: Anecdotal Organizers; Mini-conference notes
- *Student-Composed Assessments*: Inquiry Lab Books; My Investigations and Record of Observations Journal
- *Visual Modes*: Picture Learning Logs

Summative Tools
- Learning Journey Road Map; Summative KB Circles; E-Portfolios

Knowledge Forum (see pgs. 90-91 for an overview of Knowledge Forum assessment tools)
- Scaffold Tracker Tool; Use of advanced features such as Rise Above', Promising Ideas Tool, or creating/re-organizing KF views

COMMUNICATION

- Expression and organization of ideas and information (e.g., clear expression, logical organization) in oral, visual, and/or written forms (e.g. diagrams, models).

- Communication for different audiences (e.g., peers, adults) and purposes (e.g. to inform, to persuade) in oral, visual, and/or written forms.

- Use of conventions, vocabulary, terminology of the discipline in oral, visual, and/or written forms (e.g., symbols, formulae, scientific notation, SI units).

Assessment Tools to Inform Evaluation and Reporting "Communication"

The following assessment tools, as described in the Innovation Gallery, can be used to help evaluation and reporting for this achievement category.

Formative Tools
- *Student-Composed Assessments:* KB Circle Rubrics, Knowledge Talk Reflections, Inquiry Lab Books, My Self-Assessment Rubric
- *Visual Modes*: Picture Learning Logs

Summative Tools
- Learning Journey Road Map; Summative KB Circles; E-Portfolios

Knowledge Forum (see pgs. 90-91 for an overview of Knowledge Forum assessment tools)
- Contribution profiles (# of contributions written, read, # of build-on notes, # of reference notes); Qualitative contribution assessment; Use of diagrams and images in contributions; Vocabulary Tool; Scaffold Tracker Tool

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APPLICATION

- Application of knowledge and skills (e.g., concepts and processes, use of equipment and technology, investigation skills) in familiar contexts.

- Transfer of knowledge and skills (e.g., concepts and processes, use of equipment and technology, investigation skills) in unfamiliar contexts.

- Making connections between science, technology, society, and the environment (e.g., assessing the impact of science and technology on people, other living things, and the environment).

- Proposing courses of practical action to deal with problems relating to science, technology, society, and the environment.

Assessment Tools to Inform Evaluation and Reporting for "Application"

The following assessment tools, as described in the Innovation Gallery, can be used to help evaluation and reporting for this achievement category.

Formative Tools
- *Anecdotals:* Assessing Students' Activities and Progress Chart; Mini-Conference notes
- *Student-Composed Assessments*: Inquiry Lab Books, My Self-Assessment Logs
- *Visual Modes*: Picture Learning Logs

Summative Tools
- Summative KB Circles; E-Portfolios

Knowledge Forum (see pgs. 90-91 for an overview of Knowledge Forum assessment tools)
- Making connections across multiple views; Qualitative assessment of student contributions