Instructional Tools to Support the Implementation of BC's Redesigned Curriculum

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"Google it!" How many times have you heard this phrase? The Internet has changed the way that we access information. Instead of going to a library to read a book or encyclopedia on a topic, we now have access to information in a matter of seconds. Webpages present knowledge in multiple forms, including text, video, pictures, and interactive activities. How does this rapid movement of technological advances in our society impact our current education system? Our ability to access information, and the speed in which this has occurred has made it evident that it is not possible to prescribe the knowledge and skills students will need in the future (Zhao, 2012). Since students can access the same information as their teachers, the Ministry of Education recognized that our educational system requires a transformation. This is an exciting time for teachers, as this transformation opens new opportunities for teaching and learning.

In October 2011, the Ministry of Education (MoE) launched the British Columbia (BC) Education Plan, which recognized that their current education system is not designed to meet the needs of the 21st century learners. The plan states, "many of the opportunities and jobs we're preparing our students for don't even exist today" (BC Ministry of Education (MoE), 2011. p. 3). In order to better prepare students for this rapidly changing economic, social, and technological 21st century society, the Ministry of Education outlined a plan to transform our educational system (BC MoE, 2011). Part of this transformation includes redesigning the curriculum in order to create a more flexible system that will reflect the core competencies, skills, and knowledge that students need to succeed in the 21st century (BC MoE, 2011). These core competencies, skills and knowledge are presented in the draft curriculum documents published on the Ministry website under the heading 'Transforming Curriculum and Assessment" (BC MoE, 2014).

The draft redesigned curriculum is focused on literacy and numeracy foundations, concepts and content to support deeper learning, core competencies, and personalized learning (BC MoE 2014). In the current curriculum, there are high standards for literacy and numeracy, and these high standards are reinforced in the draft redesigned curriculum. For example, in the draft curriculum there remains a focus on reading, writing, numeracy and literacy foundations in each grade level (BC MoE, 2014).

In the current curriculum, the Prescribed Learning Outcomes (PLOs) represent the content standards for the province's educational system (BC MoE, 2005). In the draft redesigned curriculum, the PLOs are replaced with concepts and content learning standards, which identify what students should know and understand in a given subject and grade (BC MoE, 2014). Compared to the PLOs in the current curriculum, the concepts and content listed for each subject/grade in the draft curriculum have been restructured and redefined in order to balance essential content with higher order concepts (BC MoE, 2014). For example, the current 2005 Grade 9 science IRP has four PLOs and fifteen 'Suggested Achievement Indicators' for the topic: Atoms, Elements, and Compounds. In addition, the current curriculum provides a list of 'Key Elements' for each curriculum organizer, which includes lists of vocabulary, knowledge, and skills and attitudes. In the redesigned Grade 9 science curriculum draft, there is one 'Concepts and Content' topic that is related to the Atoms, Elements, and Compounds on the Ministry website. By hovering over this topic on the Grade 9 science curriculum webpage, four more detailed descriptors are provided (BC MoE, 2014). This example illustrates the shift from heavily prescribed content, skills and attitudes, outcomes, and achievement indicators in the current curriculum to a redesigned curriculum that is focused on process and competency development.

Outlined in the draft redesigned curriculum are essential key disciplinary concepts and content that the Ministry has determined to be critical for deeper learning (BC MoE, 2014).

Deeper learning is "learning that emphasizes the use of key disciplinary concepts, principles, and generalizations to think critically, solve problems, and communicate ideas" (Deeper Learning, 2015). Deeper learning goes beyond memorizing facts and passively receiving content, and involves actively developing and explaining knowledge (BC MoE, 2014). Students demonstrate deeper learning when they transfer knowledge to new contexts, solve problems, and effectively communicate their understanding (BC MoE, 2014).

Core competencies are at the heart of the draft redesigned curriculum (BC MoE, 2014). Core competencies are "sets of intellectual, personal, social and emotional proficiencies that all students need to develop in order to engage in deeper learning" (Core Competencies, 2015). The three core competencies identified in the draft redesigned curriculum are:

1. Thinking
2. Communication
3. Personal and Social

These three core competencies develop across all grades and subjects and support students with deeper learning (BC MoE, 2014).

The draft redesigned curriculum outlines the importance of placing students at the centre of their education through personalized learning**.** "Personalized learning is tailoring the curriculum, methods and approaches and learning environments to meet the interests, learning needs and aspirations of learners" (Personalized Learning, 2015). Personalized learning encourages a student-driven, inquiry-based approach since inquiry-based approaches can provide choices in what students learn and how they learn (BC MoE, 2014). In addition, the shift from PLOs towards concepts and content learning standards provides teachers with the flexibility to create community-focused and place-based learning experiences that are based on student interest and ability (BC MoE, 2014).

In addition to the core competencies and content and concepts, other key elements outlined in the draft curriculum include big ideas and curricular competencies (BC MoE, 2014). A big idea is "broad and abstract, contains two or more key concepts, is timeless and transferable to other situations, and is key to one's understanding in an area of learning" (Big Idea, 2015). Curricular competencies are another type of learning standard. Curricular competencies are "explicit statements of what students are expected to do in a given grade and area of learning" (Curricular Competencies, 2015). The curricular competencies in the draft curriculum are similar to the 'processes of science' outlined in the current curriculum, as both are organized for scientific exploration.

The focus on process and competency development in the redesigned draft curriculum can be viewed as positive changes. However, novice teachers could struggle with the absence of prescribed outcomes, key elements, and achievement indicators since they may not have the experience and resources to draw from. For example, consider the content statement in the Grade 9 science curriculum draft: "element properties as organized in the periodic table" (BC MoE, 2014). For a novice teacher, the limited amount of information provided in this statement may result in feelings of uncertainty regarding how to teach the periodic table. In the current science curriculum, the Key Elements, PLO's, and achievement indicators are heavily prescribed, but this direction can be helpful for new science teachers to gain ideas for developing lesson plans, activities, and labs (BC MoE, 2005). Therefore, the goal of this project is to create sample conceptual organizers, lesson plans, and assessment strategies using the science draft redesigned curriculum. The target audience is novice science teachers, as the sample conceptual organizers, plans, and assessment strategies could potentially support these teachers by demonstrating how the draft redesigned curriculum can be put into practice.

Conceptual Organizers Development

In the summer of 2013, I met with my supervisor, Dr. David Blades, to discuss potential Master of Education (M.Ed) project ideas. My goal for the final project was to create something useful for teachers that aligned with the BC Education Plan. In August 2013, I met with Rod Allen, Superintendent of Learning, and we discussed potential projects that could be useful and support the implementation of the BC Education Plan. In September 2013, I met with Nancy Walt (Director, K-12 Curriculum) and Brent Munro (Manager, Learning Division) to further discuss project ideas. Since I was working on my final courses, I decided to postpone starting my project until the following year. I reconnected with the curriculum team in September 2014 when I met with Nancy Walt, Angie Calleberg (Science Curriculum Coordinator), Arnold Toutant (Consultant), and Brent Munro. At the meeting, we discussed how I could align my project with the BC Education Plan, and determined that I would create instructional tools to support the implementation of BC's redesigned curriculum. The team requested that the instructional tools integrate key components, including the big ideas, competency links, cross-curricular opportunities, assessments, and local connections. Based on the team's suggestions, I generated goals for my project, which were to align the tools with the key concepts and principles outlined in the draft curriculum and provide useful samples that are linked to these key concepts and principles.

In order to design instructional tools that would be useful for teachers, I reflected on my experiences teaching science at the Middle and Secondary levels and chose specific classes that I have taught in the past to provide a context for the tool design. After reviewing the draft curriculum and identifying the key components and principles, I began creating conceptual organizers that represented my interpretation of the plan and how the key components could fit together. I reviewed my draft conceptual organizers with Nancy Walt and Dr. David Blades and made adjustments based on the feedback I received. When designing the sample conceptual organizers, I chose to create three different samples in order to show the flexibility that the draft curriculum offers, and to demonstrate the variety of approaches and interpretations that teachers can take when creating lesson and unit plans.

The sample conceptual organizers illustrated in Figure 1, Figure 3 and Figure 5 are models that I have created as three possible, different ways to view the flow of the redesigned curriculum. These conceptual organizers align with the goals of the project since they act as tools to illustrate how each key component in the draft curriculum could be organized and considered in a lesson/unit plan. My idea is that novice teachers could use one of these organizers as a guide when planning units and/or lessons. I also included a key for each conceptual organizer that provides additional information about each component referenced in the sample organizers (Figure 2, Figure 4, Figure 6). Each component in the conceptual organizer is further expanded upon in the 'Interpreting the Conceptual Organizer Designs' section of the report. Including both the conceptual organizer and information about each key component should better support teachers in using these samples as planning tools.

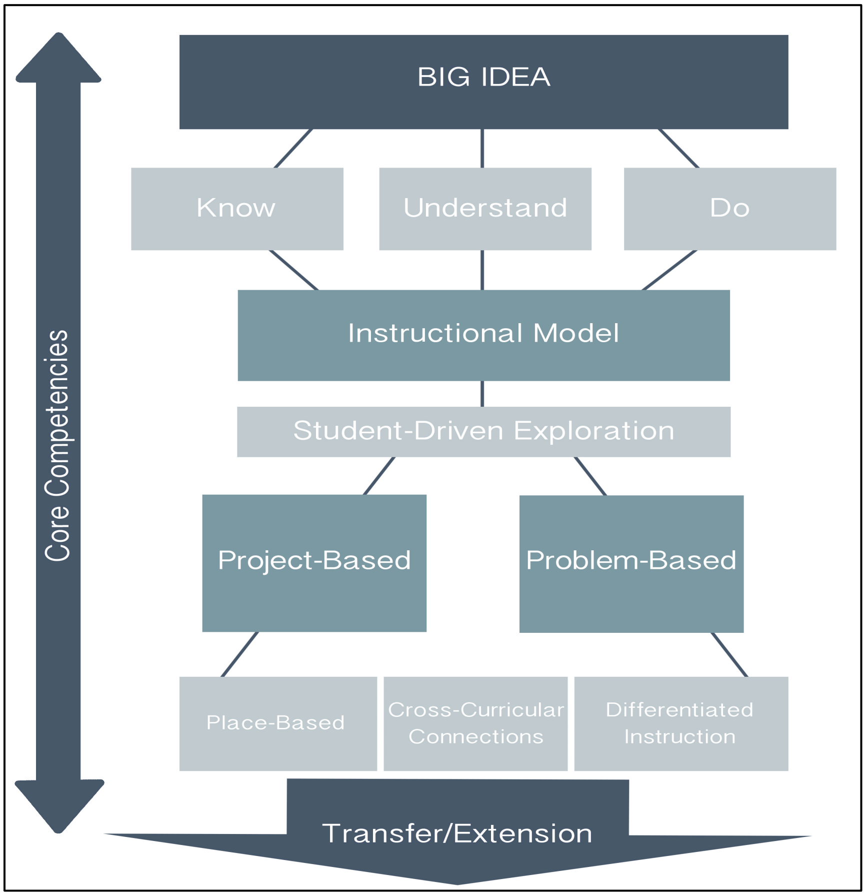

Figure 1. Sample conceptual organizer 1

Core Competencies: sets of intellectual, personal, and social and emotional proficiencies that all students need to develop to engage in deeper learning and to support lifelong learning: communication, thinking, and personal and social responsibility
Big Ideas: broad and abstract statements that are central to one's understanding in an area of learning
Know: concepts and content
Understand: big ideas
Do: curricular competencies
Instructional Model: provides a framework using a constructivist approach for effectively teaching science
Student-driven Exploration: choice in what and how students learn
Project-based: form of inquiry-based learning where students are actively engaged in creating a personalized project
Problem-based: form of inquiry-based learning where the focus of the inquiry is on a problem that is typically provided by the teacher
Placed-based: learning experiences are adapted to the local environment and have a focus on "real-world" issues and problems.
Differentiated Instruction: an approach to learning in which instruction and assessment are based on the specific needs, learning style, interests, developmental level, and other learning preferences of the individual student.
Cross-Curricular Connections: multiple disciplines/viewpoints represented, which shifts the focus from a fragmented view of each subject area to a holistic view of the subjects
Transfer/Extension: activities that provide opportunities to transfer knowledge to new contexts

Figure 2: Terms and definitions for conceptual organizer 1

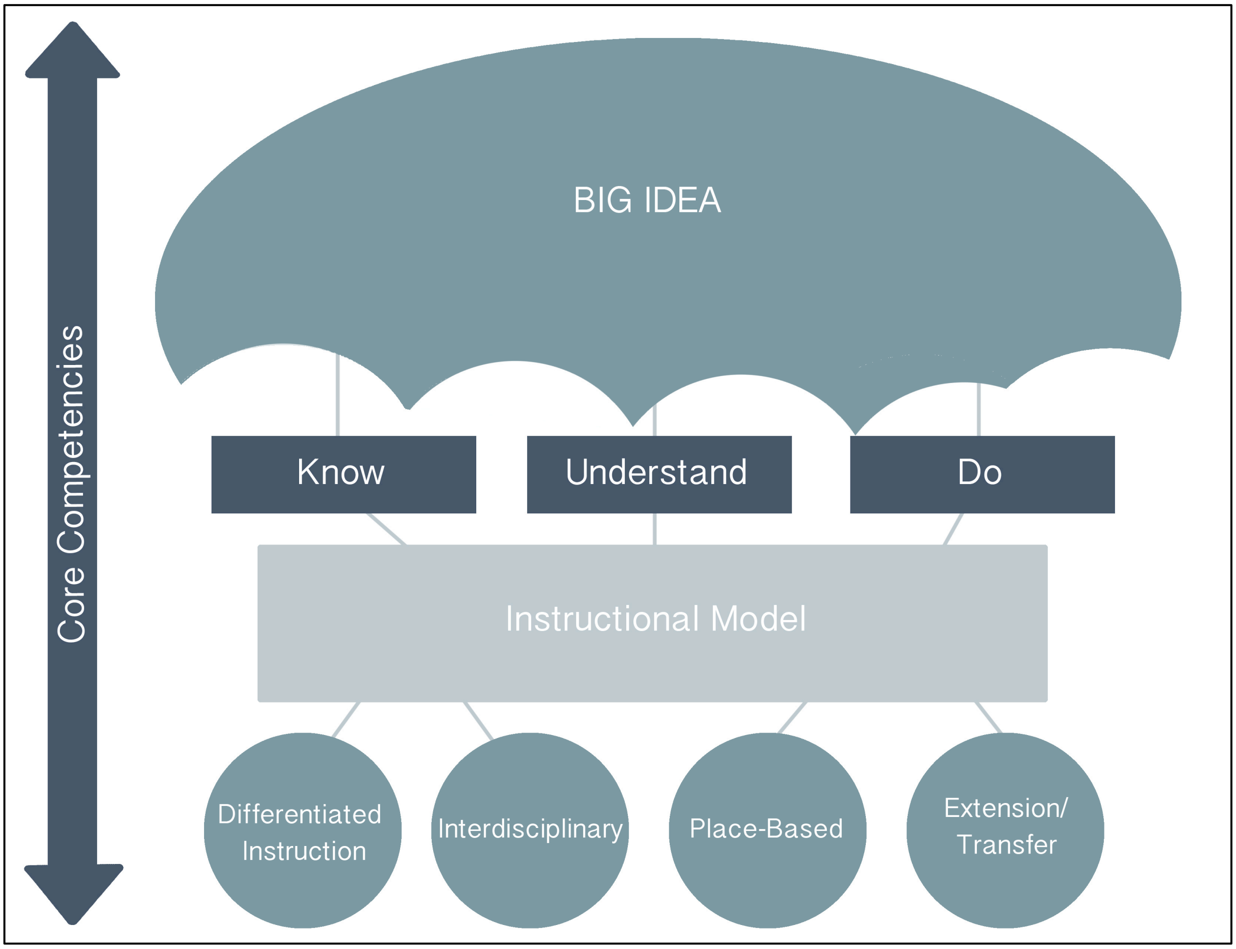

Figure 3. Sample conceptual organizer 2

Core Competencies: sets of intellectual, personal, and social and emotional proficiencies that all students need to develop to engage in deeper learning and to support lifelong learning: communication, thinking, and personal and social responsibility
Big Ideas: broad and abstract statements that are central to one's understanding in an area of learning
Know: concepts and content
Understand: big ideas
Do: curricular competencies
Instructional Model: provides a framework using a constructivist approach for effectively teaching science
Placed-based: learning experiences are adapted to the local environment and have a focus on "real-world" issues and problems.
Differentiated Instruction: an approach to learning in which instruction and assessment are based on the specific needs, learning style, interests, developmental level, and other learning preferences of the individual student.
Interdisciplinary: multiple disciplines/viewpoints represented, which shifts the focus from a fragmented view of each subject area to a holistic view of the subjects
Extension/Transfer: activities that provide opportunities to transfer knowledge to new contexts

Figure 4: Terms and definitions for sample conceptual organizer 2

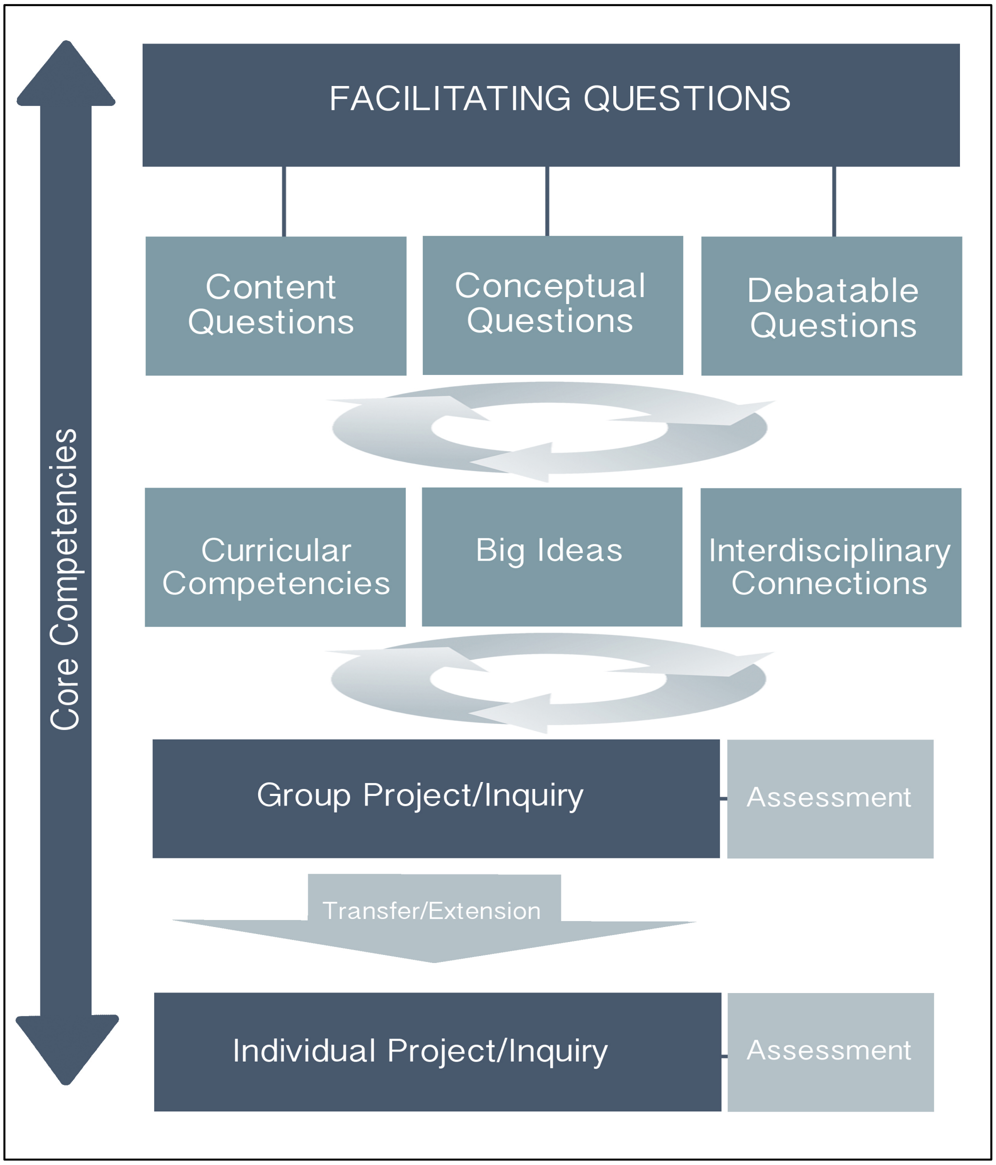

Figure 5. Sample conceptual organizer 3

Core Competencies: sets of intellectual, personal, and social and emotional proficiencies that all students need to develop to engage in deeper learning and to support lifelong learning: communication, thinking, and personal and social responsibility
Facilitating Questions: questions that promote thoughtful examination of the content, concepts, big ideas
Content Questions: formed from the content
Conceptual Questions: formed from the concepts and encourage thinking about the big ideas
Debatable Questions: questions that promote deeper learning
Big Ideas: broad and abstract statements that are central to one's understanding in an area of learning
Curricular competencies: explicit statements of what students are expected to be able to do in a given grade and area of learning.
Interdisciplinary connections: multiple disciplines/viewpoints represented, which shifts the focus from a fragmented view of each subject area to a holistic view of the subjects
Extension/Transfer: activities that provide opportunities to transfer knowledge to new contexts

Figure 6: Terms and definitions for sample conceptual organizer 3

Interpreting the Conceptual Organizer Designs

This section of the report provides additional information about each component referenced in the conceptual organizers illustrated in Figure 1, Figure 3, and Figure 5.

Big Ideas

The ‘big idea’ is included at or near the top of the conceptual organizers as outlined on the previous pages with the intent that the big idea guides and shapes the lesson or unit plan. For example, a big idea in the Grade 9 science redesigned curriculum draft states, “the interaction of electrons allows atoms of different elements to form compounds” (BC MoE, 2014). By framing instruction around this big idea, students will have an opportunity to understand this big idea through an exploration of the periodic table. Students can gain a deeper understanding of compound formation through interactive demonstrations, drawings, labs, and a number of other activities that build a conceptual understanding of the formation of compounds. Having the big idea listed at the top of the conceptual organizer can help to align the activities and assessments with that big idea, therefore rooting the big idea deeply into the planning phase.

Know/Understand/Do

The next step in planning is to consider the concepts and content connected to the big idea(s), which are outlined in the learning standards section of the draft redesigned curriculum. There are two types of learning standards listed in the draft redesigned curriculum: the concept and content standards and the curricular competency standards. Referring to the example from the Grade 9 science redesigned draft curriculum, the students should know the concepts and content: “element properties as organized in the periodic table” (BC MoE, 2014). This is not very specific, so hovering over this concept in the digital landscape provides more detailed content, including “the arrangement of electrons in atoms,” “information on the periodic table can be used to write chemical formulae for compounds” and “atoms combine to form compounds when their electrons interact" (BC MoE, 2014). This additional information provides a clearer picture of the content that students are expected to know. When choosing activities that will build knowledge of this content, it is helpful to create opportunities for students to connect this knowledge to the big idea(s) that relate to this content, which in this example is, "the interaction of electrons allows atoms of different elements to form compounds" (BC MoE, 2014). The curricular competency learning standards outline what students can do to illustrate their understanding of the concepts, content and big ideas. Through activities, labs, projects, and demonstrations, students will have opportunities to place the content knowledge into a larger framework of understanding and make connections to the big ideas (Wasserman, 2009).

Instructional Models

In both Figure 1 and Figure 3, an instructional model section is included to assist teachers with their planning. A prominent viewpoint represented throughout the draft curriculum is constructivism, which is illustrated in the statements, "students build on prior knowledge" and "student-driven inquiry-based approaches to teaching and learning" (BC MoE, 2014). To align with this viewpoint, the instructional models that are represented in the sample conceptual organizers are constructivist. The two constructivist instructional models that were chosen as frameworks for developing unit/lesson plans are the 5E Model (Dunbar, 2012) and the EDU Model (Blades, 2001).

The 5E model. The 5E Model was developed by The Biological Science Curriculum Study (BSCS) team, which was led by Roger Bybee (Dunbar, 2012). The 5Es are: Engage, Explore, Explain, Extend (or Elaborate), and Evaluate. In the Engage stage, students' interests are piqued and prior understanding is assessed. In the Explore stage, students directly interact with the topic using inquiry-based approaches, typically working in a team setting. Explain is the stage when learners communicate what they have learned to each other and the instructor, and a variety of approaches can be used. In the Extend stage, students move beyond the topic and transfer their knowledge to other concepts and to the world around them. Finally, Evaluate is the stage when the learners and teachers assess student understanding using a wide variety of evaluation tools. When moving through the flow of the 5E model, it is clear that the model is encouraging higher levels of thinking at each stage.

The EDU model. The EDU Model, developed by Dr. David Blades (University of Victoria), has similar elements to the constructivist Play-Debrief-Replay model developed by Wassermann and Ivany (1996). EDU stands for: Explore, Discuss, and Understand. In the EDU model, Explore is when students are actively involved in an activity and making connections to their prior knowledge (Blades, 2001). This is an extremely important step in the learning process as this is where the teacher can identify misconceptions. In this stage, students also have the opportunity to engage in scientific inquiry and discover concepts through the inquiry (Blades, 2001). In the Discuss stage, the teacher facilitates a discussion, which expands students' thinking and challenges misconceptions (Blades, 2001). The focus is on making connections between science and the environment, technology, and society, which coincides with the draft redesigned curriculum's focus on place-based education. Finally, in the Understand stage, students have the opportunity to apply their understanding using a variety of assessment strategies (Blades, 2001).

The similarities between these constructivist models are that they provide students an opportunity to make connections to their prior knowledge. Each model starts with an engaging activity that allows students to explore a topic and gives teachers an opportunity to address presumptions and challenge misconceptions (Ward, 2007). Another similarity between these models is that they are both built on the 'learning cycle' model, and are therefore cyclic in nature. Each model has an evaluative stage (Evaluate/Understand) where students demonstrate their understanding of the desired concepts and content. By transferring this knowledge into another investigation, the students return to the Engage/Explore stage; hence a cyclic approach.

Student Driven Exploration: Inquiry-Based Approach

Student-driven exploration is included as a key category to encourage a personalized learning approach. Student-driven explorations are at the heart of constructivism, since students are encouraged to relate concepts and content to their personal lives and build on prior knowledge (Slavkin, 2004). One student-driven exploration approach is inquiry-based learning. Inquiry is "the mindset students use to build their own knowledge and understanding through an active, open-minded exploration into a meaningful question, problem, or issue" (Inquiry, 2015). Inquiry-based learning explores and addresses local or global issues and problems (Slavkin, 2004). For example, in Victoria BC, students could explore topics such as sewage treatment plans, bee colony collapse disorder, energy alternatives, and Garry Oak ecosystem recovery. Using an inquiry-based approach enables students to have more control over their learning since the inquiry can be shaped around their interests and abilities.

Creating an inquiry-based learning environment has numerous benefits for students. According to Pepper (2009), inquiry-based learning encourages deeper thinking rather than surface learning. In addition, using inquiry-based approaches encourages competency development in the areas of thinking, problem solving, creativity, and research (Akinoglu, 2008). For example, students in Victoria, BC can develop a wide range of competencies when working on a project about the sewage treatment plans. Students can read news articles to research the options being proposed, think deeply about the issues at hand when listening to various perspectives at town hall meetings, and develop problem solving skills and communication skills through class discussions.

In an inquiry-based learning environment, the teacher and students are working together to create and organize the learning environment (Slavkin, 2004). Inquiry-based approaches encourage students to be involved in their educational path, as they have the opportunity to explore areas of interest within a topic. In an inquiry-based classroom, the teacher is the leader who offers guidance and designs instruction around individual/group needs. This approach encourages a flexible learning environment since it allows time for teachers to gauge the ability of each student/group and provide as-needed support through class lectures, small group lectures, field trips, and/or workshops (Zhao, 2012). The teacher's knowledge of their students' abilities enables the teacher to create and facilitate an appropriate inquiry-based learning experience in their classroom. The inquiry-based approaches that are included in Figure 1 are project-based learning and problem-based learning.

Project-based learning. Project-based learning is a form of inquiry-based learning where students are actively engaged in creating a personalized project that ideally gives them the opportunity to make connections to the local community (Zhao, 2012). For example, in Victoria BC, one community project that local schools have participated in is the Garry Oak ecosystem recovery project. In the beginning stages of the project, students are involved in the design and given space within the project to be creative and to specialize in specific areas of interest (Zhao, 2012). Being involved in the design process and having space to be creative empowers the students and encourages them to take ownership of their project (Slavkin, 2004). As students move through the process of completing their project, they could potentially develop a wide range of competencies including: thinking, problem solving, creativity, accessing information, processing information, questioning, drawing conclusions, and negotiation (Akinoglu, 2008).

Problem-based learning. Problem-based learning is similar to project-based learning except the focus of the inquiry is usually on a problem that is provided by the teacher. For example, the sea star/starfish wasting disease is killing sea stars along the West Coast, so a problem-based learning question relevant to a student in Grade 3 in Victoria, BC could be: "The starfish/sea stars in the Pacific Ocean are sick. You are a scientist who learns about ocean ecosystems. You need to work with your team to find out about the environment that the starfish live in." Students tackle the problem in small groups so that knowledge, ideas and information can be shared and negotiated and used to propose possible solutions (Lambros, 2002). By having a number of groups work on one problem, students learn there can be multiple solutions to a problem, and that resolution can be achieved by consensus; an important understanding underpinning the democratic process (Lambros, 2002). Students also learn that information sources are vast, so determining valid sources is an important part of the research process (Lambros, 2002).

Differentiated Instruction

Differentiated instruction is included as a category in the sample conceptual organizers illustrated in Figure 1 and Figure 3. Differentiated instruction is a framework for effective teaching in which "instruction and assessment are based on the needs, learning style, interests, developmental level, and learning preferences of individual students" (Differentiated Instruction, 2015). Teachers can differentiate the learning in three areas: content, process, and product (Bender, 2002). Content includes what the student needs to learn and how they will access the information (Thousand, Villa, & Nevin, 2007). Observations or pre-assessments can provide insight into students' readiness levels, learning profiles, and interests (Tomlinson, 2005). Based on these observations/results, appropriate levels of content materials, activities, and products can be considered (Tomlinson, 2005). When modifying the process, teachers can use a variety of strategies, including grouping students based on reading levels, flexible time on assignments, adjusting questions during group discussions, and presenting information in manageable chunks.

Another strategy is using tiered activities, which "ensures that students with different learning needs work with the same essential ideas and use the same key skills" (Tomlinson, 2005, p. 83). A tiered activity targets each student's readiness level and provides an appropriate level of challenge for each learner. The goal is that all students learn the same important concepts and skills, but proceed with different levels of support, challenge, or complexity (Tomlinson, 2005). The third area that teachers can differentiate the learning is the product. Due to the varied learning styles within the class, students need an opportunity to express their knowledge and understanding in ways they prefer (Bender, 2002).

Note: In the sample plans illustrated in the next section of the report titled, "Sample Unit/Lesson Plans" I reflected on classes I have taught in the past when creating these plans. In order to create the unit/lesson plans and consider differentiated instructional strategies, I considered a previous class and reflected on those students' readiness levels, learning profiles, and interests.

Cross-Curricular/Interdisciplinary

Cross-curricular/interdisciplinary instruction is included in each sample conceptual organizer (Figure 1, Figure 3, and Figure 5). Teaching using a cross-curricular approach shifts the focus from a fragmented view of each subject area to a more holistic view of knowledge (Parker, Heywood, & Jolley, 2012). A recent study found that teachers who used an interdisciplinary approach in their planning reported numerous benefits for their students, including the ability to grasp concepts more quickly and a demonstrated deeper level of understanding (Brand & Triplett, 2012). In addition, these teachers observed that cross-curricular connections enhanced their students' ability to retain, recall, and transfer their knowledge (Brand & Triplett, 2012). Therefore, there are clear cognitive and motivational benefits for students when subjects are presented using a cross-curricular approach.

Facilitating Questions

Facilitating questions are an extremely helpful tool for teachers to utilize in the classroom, as they can promote a thoughtful examination of the big ideas (Wassermann, 2009). By planning clearly-worded questions, students will understand what is being asked, which should encourage students to respond with confidence. In addition, preparing open-ended questions promotes thinking and encourages multiple responses (Walsh & Sattes, 2010). Teachers can also prepare follow-up questions that dig deeper into exploring the big ideas and concepts (Wasserman, 2009). The learning environment that is created by using facilitated questions supports the development of the core competencies outlined in the draft redesigned curriculum: thinking, social and personal, and communication (BC MoE, 2014).

Transfer/Extension

Transferring knowledge into another context provides students an opportunity to practice deeper thinking by applying competencies, knowledge and prior experiences into the new situation (BC MoE, 2014). The transfer/extensions could include using facilitating questions to explore concepts at a deeper level, engaging in inquiry-based projects or problems, or participating in a debate or town hall meeting.

Sample Unit/Lesson Plans

To illustrate how the sample conceptual organizers outlined in Figure 1, Figure 3, and Figure 5 can serve as tools to create unit/lesson plans, I created a number of sample lesson plans in order to demonstrate how the redesigned draft curriculum can be put into practice. The lesson plans are created using activities and assessments that I have used in previous classes. Using the conceptual organizer outlined in Figure 1, I created two plans for Grade 3 science with a focus on ecology (Figure 7 and Figure 8). Following the conceptual organizer outlined in Figure 5, I created two plans for Grade 6 science with a focus on biology (Figure 9 and Figure 10). Finally, I used the conceptual organizer outlined in Figure 3 to create two plans for Grade 9 science with a focus on Earth science (Figure 11 and Figure 12). Creating two different plans for each grade that use the same big idea(s), concepts, and content demonstrates the flexibility that the draft redesigned curriculum provides. In each of the sample plans, I included thought callout bubbles so that teachers can gain insight into my thinking when I created the plan. Thought callout bubbles are also used to include some general tips for teachers to implement these ideas in their own classrooms.

These conceptual organizers and lesson plans are my personal interpretation of how the Ministry guidelines could be interpreted into practice. These examples provided are only intended to serve as examples, and I recognize that teachers will most likely develop individual interpretations. The Ministry of Education encourages this flexibility in interpretation, and these lesson plan samples are not meant in any way to be viewed as a prescribed format.

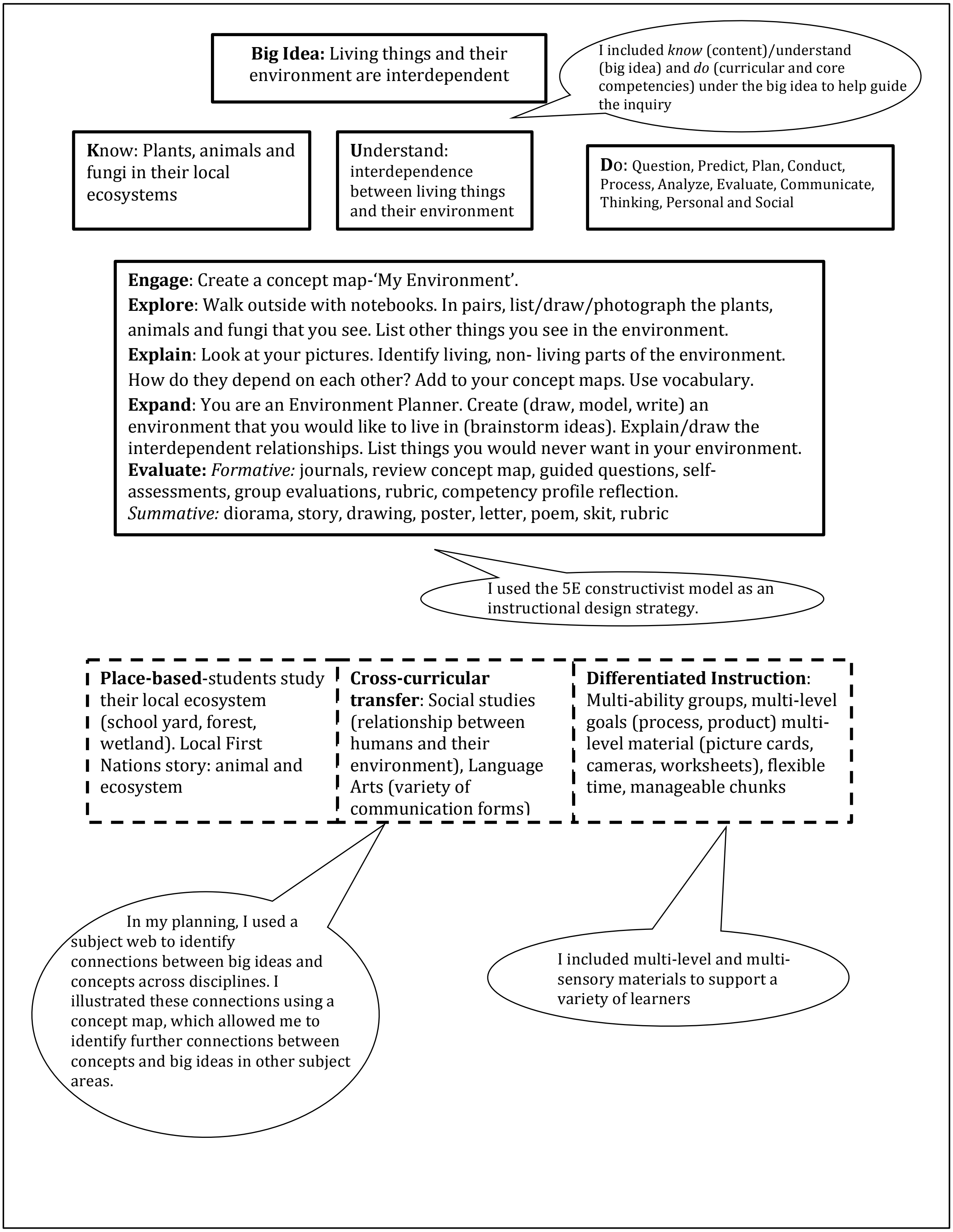

Figure 7. Sample plan 1. Grade 3 science (ecology)

(sample plan 1 continued)

Transfer/Extension:
PROBLEM BASED: The starfish/sea stars in the Pacific Ocean are sick. You are a scientist who learns about ocean ecosystems. You need to work with your team to find out about the environment that the starfish live in.
Key Q's: How do the starfish survive? Why are starfish important in the ocean? What might happen to the ocean's ecosystem if the starfish all die? What are some reasons that the starfish are dying? Guide students through the problem: provide background information and facts, assist with identifying questions, provide time, access to resources, and discuss reporting methods/options.

To encourage a transfer of learning, I used a problem-based inquiry and chose a problem that affects the local community. To identify relevant problems, I scanned news articles for environmental issues relevant to the region.

Tips for problem-based learning *(Lambros, 2002; Barell, 2007):*

- ✓ Create a list of credible resources and materials available for students to use
- ✓ Create a story line that is interesting with some facts provided
- ✓ Start the problem statement with: You are a (describe role) responsible for (task).
- ✓ Read the problem as a class, and create lists to identify 'know' and 'need to know'
- ✓ Students to work in small groups to share knowledge, ideas, and discuss resources needed

Big Idea: Living things and their environment are interdependent

I included *know* (content)/understand (big idea) and *do* (curricular and core competencies) under the big idea to help guide the inquiry

Know: Plants, animals, and fungi in their local ecosystems

Understand: interdependence- living things and their environment

Do: Question, Predict, Plan, Conduct, Process, Analyze, Evaluate, Communicate, Thinking, Personal and Social

Engage: Word Sort: students given words, cut them out, and place into self-identified categories
Explore: Tiered activity approach for Grade 3 Science concept: Animals, Plants and Fungi in local ecosystem (see Differentiated Instruction example on following page)
Explain: Students in multi-tiered groups can share their findings with each other. Choose 3 key points to share with the class.
Expand: Choose one project to work on in a group (see below)
Evaluate: *Formative:* Questions, journals, outlines, observations, guided questions for discussions, peer evaluations, self-assessments, and group evaluations. *Summative:* portfolios, presentations, poems, letters, webpages, graphs, poster, skits, reports, tests

I used the 5E constructivist model as an instructional design

PROJECT BASED: Brainstorm ideas around local ecosystems with the students to identify possible topics. Here is a list of ecosystems in BC for project topic ideas: http://www.for.gov.bc.ca/hfd/pubs/docs/bro/bro01.pdf .
Next, sort the ideas into categories/topics. Each student group can choose one project to focus on. The teacher facilitates opportunities for goals setting, task identification, and timelines. Also, each group can propose a product. Criteria can be co-created and based on competencies (curricular and core). Resources, classroom organization (groups or individual), and teaching instruction that may be required should also be considered.

I tried to incorporate the importance of flexibility since it is vital that project planning is flexible and based on student interest.
Tips for project-based learning *(Sulla, 2011; Zhao, 2012)**:***

- ✓ Brainstorm ideas around the big ideas and content with the class.
- ✓ Sort and group the ideas so students can see potential projects (could sort based on region, ecosystem, a threat to the ecosystem, etc)
- ✓ Topic webs are also helpful to identify interdisciplinary connections
- ✓ Goal setting and task identification help to keep students focused

Figure 8. Sample plan 2. Grade 3 science (ecology)

(sample plan 2 continued)

Place-based-students study their local ecosystem (school yard, forest, wetland). Local First Nations story: animal and ecosystem

Cross-curricular transfer: Social studies (relationship between humans and their environment), Language Arts (variety of communication forms)

Differentiated Instruction: Multi-ability groups, multi-level goals (process, product), multi-level material (tiered activity), flexible time, manageable chunks

I used a topic web to identify links between other subject areas.

To differentiate instruction, I created a tiered activity that targets various levels of difficulty. This allows all students to learn the big ideas and concepts, but take an appropriate path based on their readiness level.

	Instructional Strategies/Tasks
Tier 1	Choose a picture of an animal and it's habitat. Describe the habitat by filling in an outline. List 3 reasons why the animal likes to live there.
Tier 2	Choose a picture of an animal that you want to pretend to be. Describe the habitat and the conditions (other things) that allow you to live there. List 3 reasons why your habitat must be preserved.
Tier 3	Research an endangered species in the local region, and choose one animal. Write a description of the conditions needed to survive. From the perspective of the animal, list 8-10 reasons of why the habitat must be preserved.

Transfer/Extension- How do you depend on your environment? How does your environment depend on you? What are things that can change an environment? What are things humans can do to help the environment? Why is this important? Use this knowledge to create an ecosystem (draw/model/video).

To encourage a transfer of learning, I listed guiding questions that are focused around what students have learned and how they can apply that knowledge to other projects/subjects/their lives. I included a follow-up project that will further reinforce this knowledge through a creative type of exploration.

FACILITATING QUESTIONS:

Content Questions:	**Conceptual Questions:**	**Debatable Questions**
What are the structures and functions? What is the difference between mechanical and chemical digestion? How does food move through the digestive system?	How is the digestive system connected to other body systems? How can disorders of the digestive system impact a person's life? How does a person's lifestyle impact their digestive system?	Should schools have rules about what lunches are acceptable? Should schools have nutritional guidelines? Should the government ban fast food restaurants?

I used the content to generate content questions, and the big ideas and concepts to create conceptual and debatable questions. I created 2-4 questions in each category and ensured the questions are simple and have a purpose in mind. In addition to the questions, it is also helpful to prepare potential responses to guide a rich discussion. *Note: questions can be generated by students using KWL strategy*

The concepts and content, big ideas, and interdisciplinary connections are central to the facilitating questions

Curricular Competencies:	**Big ideas:**	**Interdisciplinary Connections:**
Inquire, plan, communicate, social and personal, thinking	Multi-cellular organisms rely on internal systems to survive and interact with the environment	*Language Arts* (writing to critique or defend positions, discussing and comparing ideas and opinions through debating) *Math* (rate of digestion)

Figure 9. Sample plan 3. Grade 6 science (biology)

(sample plan 3 continued)

Explore:

Facilitating questions: ***What are the structures and functions of the digestive system? How does food move through the digestive system?***

Group Exploration: Create a Human Digestion System poster. Prepare a script or story describing the process of digestion.

Using the EDU model, I created an explore group activity based on 2 facilitating questions from the factual category.

Transfer/Extension

Transfer from factual to conceptual level of thinking

Discuss

Facilitating Question: ***How can disorders of the digestive system impact a person's life? How does a person's lifestyle impact their digestive system?***

Individual inquiry: Choose a disorder of the digestive system to investigate. Determine questions to investigate (organs affected, symptoms, causes, treatment/lifestyle implications).

For the teacher-facilitated discussion, I chose 2 facilitating questions from the conceptual and debatable categories. I then chose an individual inquiry activity that will enable student to further explore those questions to investigate.

Transfer/Extension

Understand

Facilitating Question: ***Should the government ban fast food restaurants?***

Set up a debate using the question above. Students can work in groups to prepare an argument for the debate, which will be a demonstration of their understanding of the content and concepts. Competencies can be assessed using rubric (thinking, personal and social, communication).

To demonstrate students' understanding of the content and concepts, I chose one question from the debatable questions section for students to debate.

FACILITATING QUESTIONS:

Content Questions:	**Conceptual Questions:**	**Debatable Questions**
What are the structures and functions? What is the difference between mechanical and chemical digestion? How does food move through the digestive system?	What does the phrase, "you are what you eat" mean? How are the digestive system and nutrition connected? How did Indigenous people maintain a balanced diet throughout the year in this region?	Should schools have unhealthy food in the cafeteria? Should schools ban all products with nuts? Should the government ban fast food restaurants?

The concepts and content, big ideas, and interdisciplinary connections are central to the facilitating questions

I used the content to generate content questions, and the big ideas and concepts to create conceptual and debatable questions. I created 2-4 questions in each category and ensured the questions are simple and have a purpose in mind. In addition to the questions, it is also helpful to prepare potential responses to guide a rich discussion. *Note: questions can be generated by students using KWL strategy*

Curricular Competencies:	**Big ideas:**	**Interdisciplinary Connections:**
Inquire, plan, communicate, social and personal, thinking	Multi-cellular organisms rely on internal systems to survive and interact with the environment	*Language Arts* (writing to critique or defend positions, discussing and comparing ideas and opinions through debating) *Math* (rate of digestion)

Figure 10. Sample plan 4. Grade 6 science (biology)

(sample plan 4 continued)

Explore:

Facilitating questions: ***What are the structures and functions of the digestive system? What is the difference between mechanical and chemical digestion?***

Group Exploration: Stations to explore (discover) each section of the digestive system. Engaging activities at each station focused on exploring structures, functions, mechanical and chemical digestion.

> Using the EDU model, I created an explore group activity based on 2 facilitating questions from the factual category.

Transfer/Extension

> Transfer from factual to conceptual level of thinking

Discuss

Facilitating Question ***How are the digestive system and nutrition connected? What does the phrase "you are what you eat" mean?***

Individual inquiry: Keep a journal of food eaten for 2 days. Break down the nutritional components of each food. Track the path of your food: where in the digestive system the food is absorbed, how your body uses it.

> For the teacher-facilitated discussion, I chose 2 facilitating questions from the conceptual questions category. Through the discussion students will learn about carbohydrates, proteins, fats, and vitamins. I included an individual inquiry activity that will enable student to further explore those questions.

Transfer/Extension

Understand

Facilitating Question: ***Should schools have unhealthy food in the cafeteria?***

Set up a debate using the question above. Students can work in groups to prepare an argument for the debate, which will be a demonstration of their understanding of the content and concepts. Competencies can be assessed using rubric (thinking, personal and social, communication).

> To demonstrate students' understanding of the content and concepts, I chose one question from the debatable questions section for students to debate.

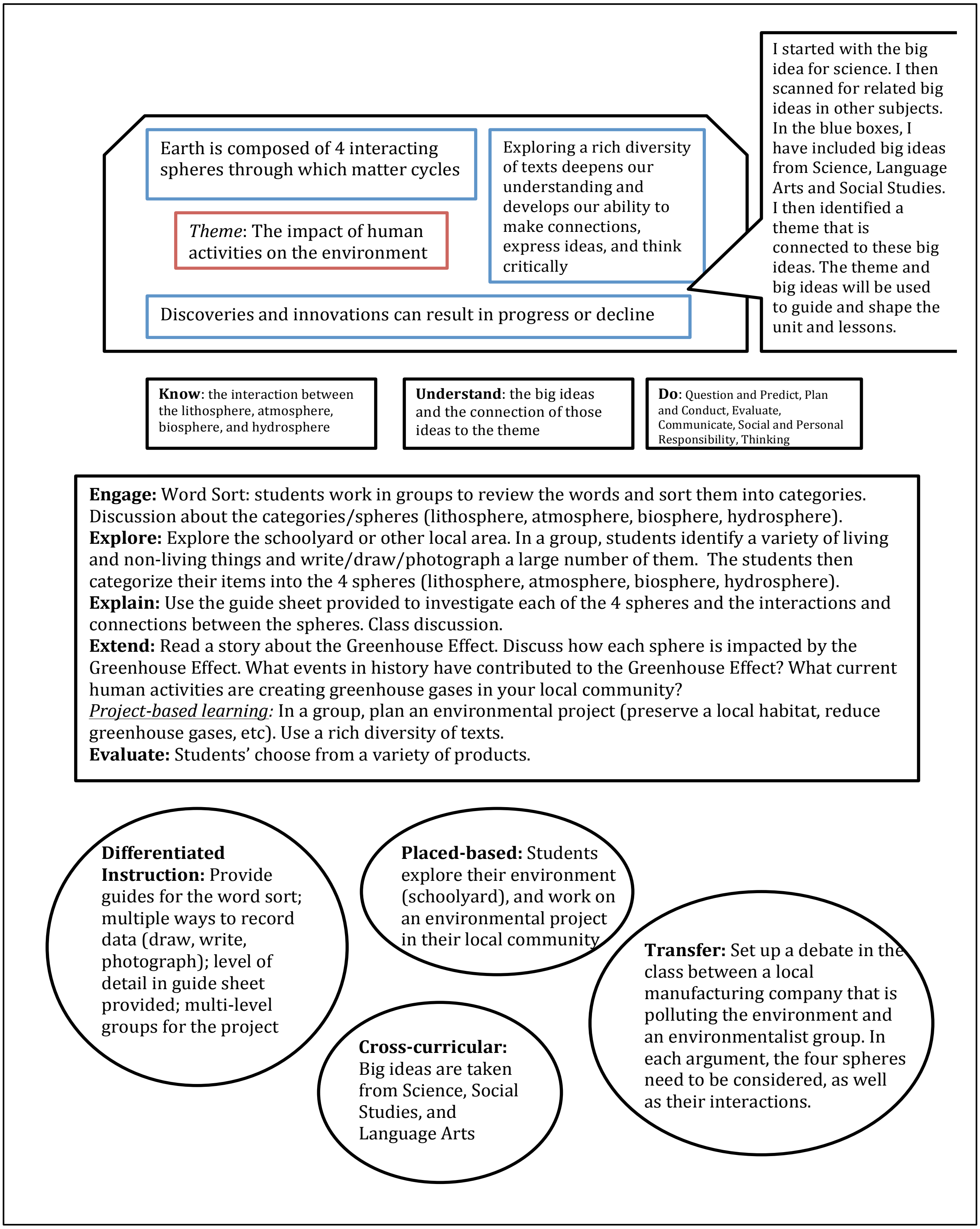

Figure 11. Sample plan 5. Grade 9 science (earth science)

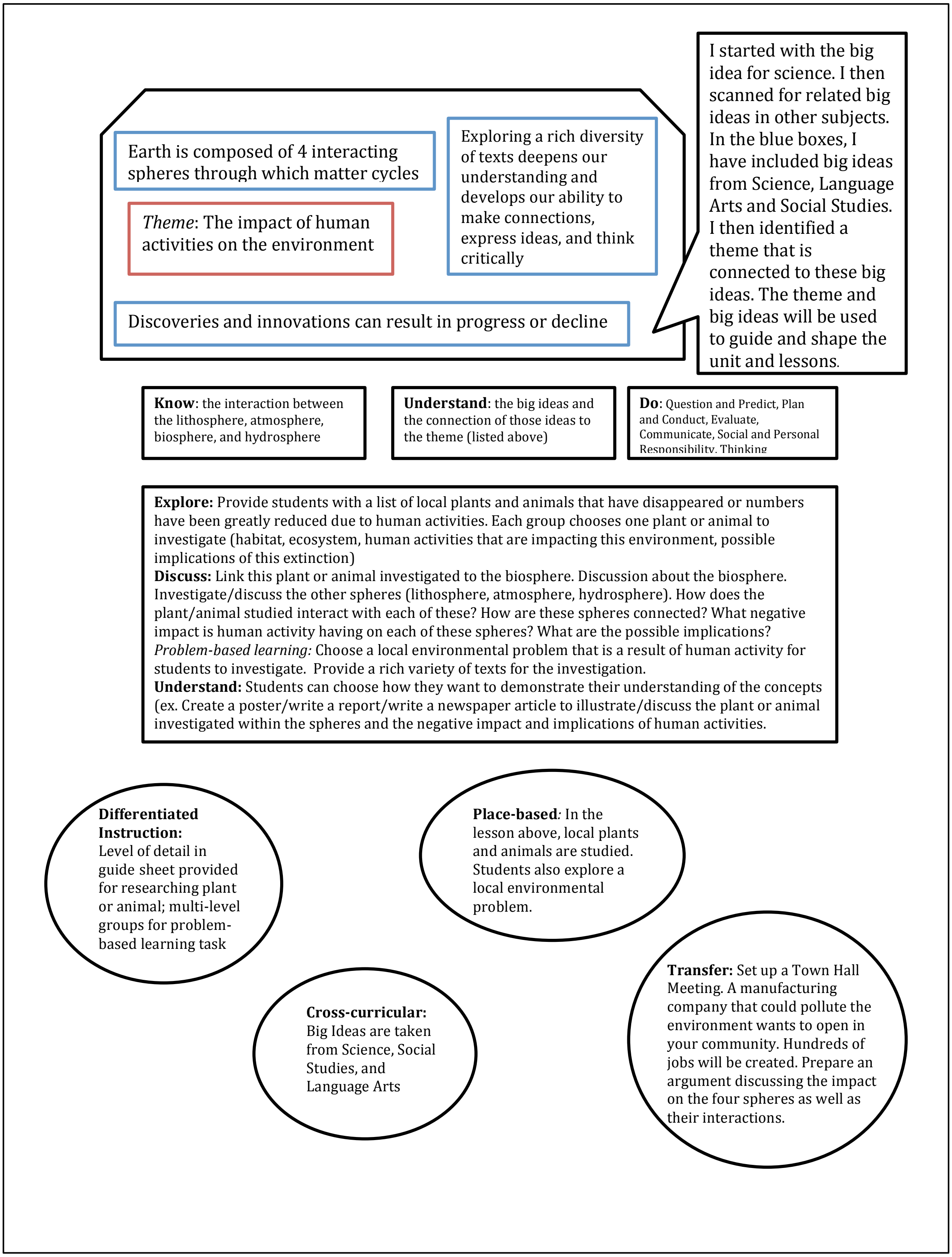

Figure 12. Sample plan 6. Grade 9 science (earth science)

Competency-Based Assessment

The final aspect of this project is assessment. There are three forms of assessment that the Ministry is involved with: support for classroom assessment, provincial assessments and examinations, and national and international assessments (BC MoE, 2014). To align with my project goals of creating assessment tools to support novice science teachers, I will focus on support for classroom assessment.

As outlined in the Advisory Group on Provincial Assessment Final Report, there are a number of challenges when designing assessment that is based on competencies, standards, and understandings rather than content (Magnusson & Frank, 2014). Questions that the Advisory Group considered are: "How to link assessment to a competency-based curriculum?" and "How to separate content from competencies?" (Magnusson & Frank, 2014, p.5). Another consideration was the fact that using a more flexible, personalized approach to learning could alter the content being explored from classroom to classroom, which produces a challenge when creating a valid province-wide assessment (Magnusson & Frank, 2014). The goals of the assessment outlined in the Advisory Group Final Report are that assessment needs to show improvement over time, utilize a personalized learning approach, and be linked to a competency-based curriculum (Magnusson & Frank, 2014).

Using a competency-based curriculum in education encourages thinking, problem solving and creativity, which can assist students in dealing with new situations and problems they could encounter in our rapidly changing world (Kasindorf, 1979). The draft redesigned curriculum identifies and defines curricular and core competencies. The curricular competencies in the science curriculum include questioning and predicting, planning and conducting, processing and analyzing, evaluating, and communicating (BC MoE, 2014). The core competencies include communication, thinking, and personal and social responsibility (BC MoE, 2014). To support this shift towards competency development, both the curricular and core competencies should be included in the assessment strategy.

Difficulties can arise with competency-based assessment when there is a lack of resources or clarity as to what the competency actually means (Nickse & McClure, 1981). The assessment resources need to include clearly defined competency criteria, or the varied perspectives of teachers, students, and the community can lead to problems (Hall & Jones, 1976). Therefore, in order to effectively assess the core and curricular competencies, there should be assessment resources available to support teachers and students.

Science curricular competencies outlined in the draft redesigned curriculum framework have the same categories across all grade levels; therefore, one possibility is to create a standard rubric using the curricular competencies for each subject. The three core competencies could also be included in the rubric, since these three competencies are consistent across all subjects and grades. By using the same rubric year after year with the same category headings but an increase in competency development, the curricular competencies will become common language within the classrooms. The standard rubric could be used for inquiry-based investigations to provide clear information to students on expectations. Having set criteria in place can also support instruction since teachers can use the rubric to identify and determine student progress towards their goals (Nickse & McClure, 1981).

A standard rubric can also be used to guide instruction and learning, not just to assess the final product (Sulla, 2011). Using the standard rubric as a guide to teaching and learning is similar to the Backwards Design Process outlined by Wiggins and McTighe (1998). The backward approach to curricular design starts with the question, "What would we accept as evidence that students have attained the desired understandings and proficiencies-*before* proceeding to plan teaching and learning experiences?" (Wiggins and McTighe, 1998, p. 8)

Therefore, the standard rubric can be used to consider the assessment at the beginning of the planning phase rather than at the end. In addition, a standard rubric will assist teachers as they will not need to spend the time creating rubrics, and will eliminate the problems that varied perspectives can create. In a recent article, Dunning (2014) outlined the process of implementing a common assessment rubric at Troy University. By having groups of teachers create a common rubric between classrooms, students had clear expectations of the competencies and outcomes (Dunning, 2014). The objective of creating a standard rubric would not be to make every science project the same, but instead would be to ensure that each student has the chance to acquire the competencies to succeed in a globally competitive environment (Dunning, 2014).

To illustrate a standard rubric, I created a rubric using the curricular competencies listed in the Grade 3 science curriculum (Figure 13). I created a second rubric for the Grade 9 science curriculum (Figure 14) to illustrate that the same curricular competencies are used, but that the level of inquiry is deeper. To ensure validity and acceptance, it is recommended that a group of teachers in each grade/subject create the rubric. It is also recommended that the rubric include space for individual teachers to add content criteria that is specific to a project/activity.

LEVEL/ CURRICULAR COMPETENCY	Developing (Reproduction) (1)	Accomplished (Application) (2)	Advanced (Transfer) (3)
QUESTIONING AND PREDICTING	Guided to generate questions about the natural world Guided to describe an object and it's role in the environment and the ecosystem Makes observations and guided to generate questions about familiar objects and events Guided to make predictions based on prior knowledge	Questions indicate a curiosity about the natural world Independently describes an object and it's role in the environment and the ecosystem Makes observations and generates questions about objects and events that can be investigated scientifically Makes predictions based on prior knowledge	Questions indicate a curiosity about the natural world and make connections between natural systems Independently describes an object and it's role in the environment and connections between ecosystems Observes connections between objects and events and generates questions that can be investigated scientifically Uses prior knowledge to make predictions and articulate the reasoning behind those predictions
PLANNING AND CONDUCTING	Guided to plan and conduct an inquiry to find answers to questions Is prompted to consider ethical responsibilities when deciding how to conduct an experiment Guided to use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate Guided to collect simple data	Suggests ways to plan and conduct an inquiry and assists with the planning Considers ethical responsibilities when deciding how to conduct an experiment Safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate Collects simple data	Independently plans and conducts an inquiry to find answers to their questions Considers and incorporates ethical responsibilities in the planning and conducting stages. Independently chooses appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate Collects simple data using a variety of methods

Figure 13. Sample rubric. Grade 3 science

(Sample rubric continued)

PROCESSING AND ANALYSING	Guided to sort and classify data and information using methods such as drawings or provided tables or using technology to display results Guided to use methods such as tables and simple bar graphs to represent data Guided to compare results with predictions	Sort and classify data and information using methods such as drawings or provided tables or using technology to display results Use methods such as tables and simple bar graphs to represent data and show simple patterns and trends Compare results with predictions, suggesting possible reasons for findings	Independently sorts and classifies data and information using methods such as drawings, tables or technology to display results Uses tables and bar graphs to represent data and show patterns and trends Analyses results, compares results with predictions and suggests possible reasons for findings
EVALUATING	Guided to make simple inferences based on their results and prior knowledge Guided to consider whether an investigation was a fair test Guided to identify some simple implications of their and others' actions on the environment	Make simple inferences based on their results and prior knowledge Reflects on whether an investigation was a fair test Identifies some simple implications of their and others' actions on the environment	Makes inferences based on their results and prior knowledge Reflects on and explains whether an investigation was a fair test Identifies and articulates connections and implications of their and others' actions on the environment
COMMUNICATING	Guided to represent and communicate ideas and findings in a variety of ways	Represent and communicate ideas and findings in a variety of ways such as diagrams and simple reports, using digital technologies as appropriate	Independently represents and communicates ideas and findings in a variety of ways such as diagrams and reports, using digital technologies as appropriate

LEVEL/ CURRICULAR COMPETENCY	Developing (Reproduction) (1)	Accomplished (Application) (2)	Advanced (Transfer) (3)
QUESTIONING AND PREDICTING	Encouraged and guided to demonstrate an intellectual curiosity about a scientific topic or problem of personal interest Make observations and guided to identify questions about the natural world Guided to formulate a hypothesis and predict at least one outcome	Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest Make observations aimed at identifying their own questions about the natural world Formulate a hypothesis and predict multiple outcomes	Through research and analysis, identify a scientific topic or problem of personal interest to pursue Make observations and formulate questions, including increasingly abstract ones, about the natural world Formulate a well-researched hypothesis based on background information collected through research. Predict multiple outcomes supported by research
PLANNING AND CONDUCTING	Guided to plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data Identify risks and ethical issues associated with their proposed methods Guided to select and use appropriate equipment, including digital technologies, to collect and record data	Collaboratively (or individually) plan, select, and use an appropriate investigation method, including field work and/or lab experiment, to collect reliable data Assess risks and address ethical issues associated with their proposed methods Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data	Collaboratively (or individually) plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data Research and identify ethical issues associated with the proposed methods. Assess the potential risks and take responsibility by addressing each ethical issue Select and use a variety of appropriate equipment, including digital technologies, to systematically and accurately collect and record data
PROCESSING AND ANALYSING	Guided to analyze patterns, trends, and connections in data, including describing relationships between variables Guided to use knowledge of scientific concepts to draw conclusions	Seek and analyze patterns, trends, and connections in data, including describing relationships between variables Use knowledge of scientific concepts to draw conclusions that are consistent with evidence	Identify and analyze patterns, trends, and connections in data, including describing relationships between variables and identifying inconsistencies Apply knowledge of scientific concepts to draw conclusions that are consistent with evidence

Figure 14. Standard rubric. Grade 9 science

(Sample rubric continued)

EVALUATING	Guided to evaluate their methods and experimental conditions, including identifying sources of error or uncertainty	Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty and confounding variables	Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions
	Guided to describe specific ways to improve their investigation methods and the quality of the data	Describe specific ways to improve their investigation methods and the quality of the data	Propose alternative methods that could improve their investigation and the quality of the data
	Guided to evaluate the validity of and limitations of a model in relation to the phenomenon modeled	Evaluate the validity of and limitations of a model in relation to the phenomenon modeled	Evaluate the validity of and limitations of a model or analogy in relation to the phenomenon modeled
	Guided to demonstrate an awareness of assumptions, question information given, and identify bias in their own work and secondary sources	Demonstrate an awareness of assumptions, question information given, and identify bias in their own work and secondary sources	Demonstrate an awareness of assumptions, question information given, and identify and analyze bias in their own work and secondary sources
	Guided to exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in secondary sources	Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in secondary sources	Exercise a healthy, informed skepticism and use scientific knowledge and findings to propose their own investigations to evaluate claims in secondary sources
	Guided to consider social, ethical, and environmental implications of the findings from their own and others' investigations	Consider social, ethical, and environmental implications of the findings from their own and others' investigations	Analyze social, ethical, and environmental implications of the findings from their own and others' investigations
	Guided to analyze the validity of information in secondary sources and evaluate the approaches used to solve problems	Analyze the validity of information in secondary sources and evaluate the approaches used to solve problems	Critically analyze the validity of information in secondary sources and evaluate the approaches used to solve problems
COMMUNICATING	Guided to create physical or mental theoretical models to describe a phenomenon	Create physical or mental theoretical models to describe a phenomenon	Formulate physical and mental theoretical models to describe a phenomenon
	Guided to communicate scientific ideas and information for a specific purpose and audience constructing evidence-based arguments and using appropriate scientific language, conventions, and representations	Communicate scientific ideas and information for a specific purpose and audience constructing evidence-based arguments and using appropriate scientific language, conventions, and representations	Communicate scientific ideas, information, and a suggested course of action, for a specific purpose and audience constructing evidence-based arguments and using appropriate scientific language, conventions, and representations

To accompany the standard rubric for Grade 3 science, I also created a scientific process diagram that includes the curricular competencies (Figure 15).

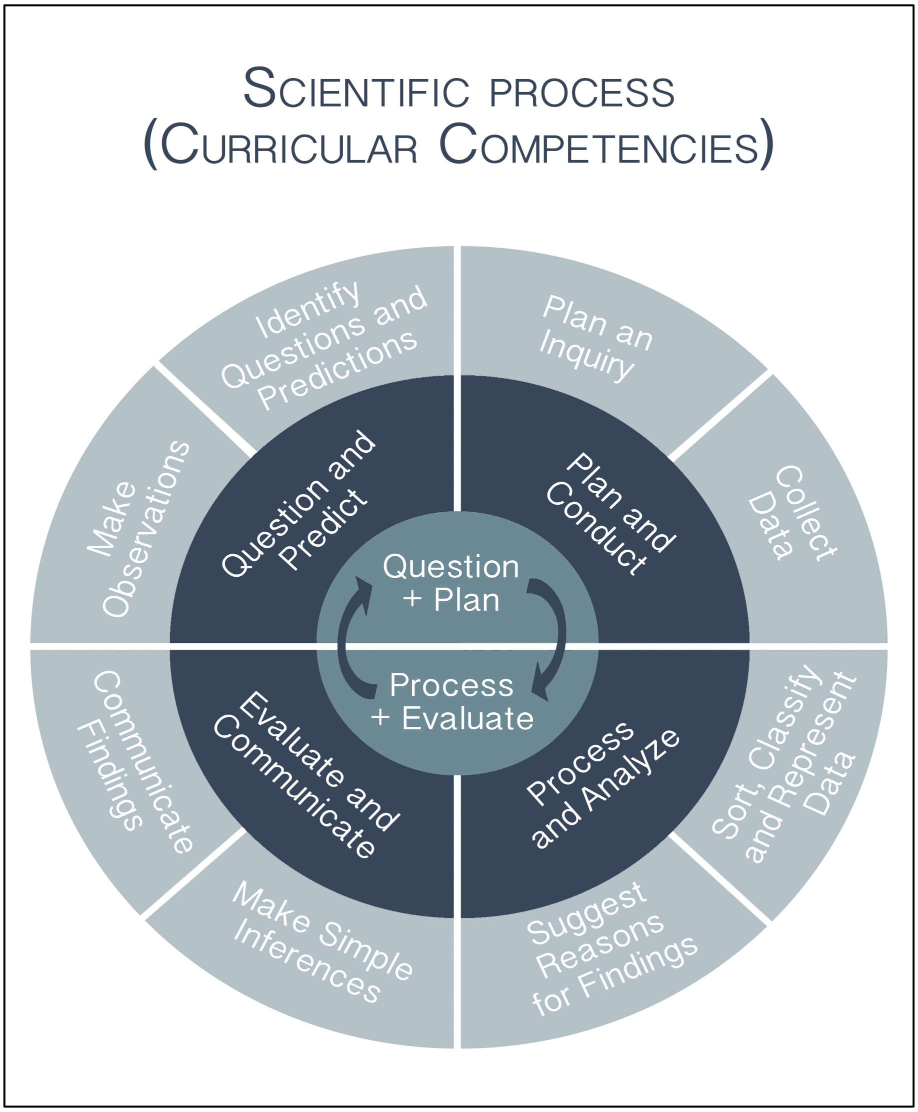

Figure 15. Curricular competency diagram. Grade 3 science

In Figure 15, the cyclic nature of the scientific process is illustrated, which allows students to see that the evaluation/communication stage raises more questions and new areas to investigate, thus leading back to the question/predict stage. A more accurate representation would be a spiral, as there are new questions raised and therefore there is not a return to the original question. This spiral/cyclic nature of the scientific process is important to reinforce to students, as this constant state of inquiry is true science. This diagram also allows students to see the connections between the curricular competencies, which are the same competencies outlined in the standard rubric in Figure 13.

Core competency profiles are listed on the Ministry website and describe ways that students can demonstrate core competencies at different phases of development (BC MoE, 2014). The three competency profiles listed on the Ministry website are communication, thinking, and personal and social. Each competency profile provides an in-depth description of the competency and identifies interrelated facets within that competency. For example, the Communication Competency Profile identifies 4 interrelated facets, which include: connect and engage with others (to share and develop ideas); acquire, interpret, and present information (includes inquiries); collaborate to plan, carry out, and review constructions and activities; explain/recount and reflect on experiences and accomplishments. Under each facet statement, there are three 'I' statements written from a student perspective. To illustrate how the communication profile and 'I' statements could be used for reflection during group inquiries, I created a reflection tool that students could use regularly over the course of a project, or at regular intervals over the course of the year to identify areas of development (Figure 16). Teachers can use this tool to gain an understanding of where students see themselves in regards to this competency, and to support students to further develop this competency.

Reflecting on my Communication Competency:

Name:___________________________

Project:__________________________________

Connect and engage with others (to share and develop ideas)	Beginning	Developing	Continuing
I ask and respond to simple, direct questions. Example:			
I am an active listener; I support and encourage the person speaking. Example:			
I recognize that there are different points-of-view and I can disagree respectfully. Example:			

Acquire, interpret, and present information (includes inquiries)	Beginning	Developing	Continuing
I can understand and share information about a topic that is important to me. Example:			
I present information clearly and in an organized way. Example:			
I can present information and ideas to an audience I may not know. Example:			

Figure 16: Communication competency reflection tool

(Communication competency reflection tool continued)

Collaborate to plan, carry out, and review constructions and activities	Beginning	Developing	Continuing
I can work with others to achieve a common goal; I do my share. Example:			
I can take on roles and responsibilities in a group. Example:			
I can summarize key ideas and identify the ways we agree (commonalities). Example:			

Explain/recount and reflect on experiences and accomplishments	Beginning	Developing	Continuing
I give, receive, and act on feedback. Example:			
I can recount simple experiences and activities and tell something I learned. Example:			
I can represent my learning, and tell how it connects to my experiences and efforts. Example:			

The standard rubric, curricular competency diagram, and the core competency reflection are tools that can be used to personalize learning by providing information on competency development over time. Teachers can support students to use these competency-based assessment tools for generating learning goals, self and peer assessments, and for designing inquiries. These assessment tools will reinforce the core and curricular competencies, which can assist students and teachers to work together towards their goals of competency development.

Summary

The curriculum redesign for the schools of British Columbia and other transformations outlined in the BC Education Plan is an exciting change that will open opportunities to create student-driven educational experiences. Using inquiry-based and personalized frameworks for learning will provide students with an opportunity to develop the core and curricular competencies outlined in the draft redesigned curriculum. Through the sample conceptual organizers, lesson plans and assessment tools illustrated in this project, I have provided my interpretation of the redesigned science curriculum with the intent to show the flexibility and diverse range of opportunities that this curriculum provides.

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Appendix A

Lesson Plan Template A

BIG IDEA

Know:
(content)

Understand:
(big idea)

Do:
(*core and curricular competencies)*

INSTRUCTIONAL MODEL

Engage: (interest piqued, prior knowledge assessed)

Explore: (inquiry based activity)

Explain: (communicate understanding to teacher and peers)

Expand: (transfer/extension)

Evaluate: (assess student understanding)

Place-based-

Cross-curricular transfer:

Differentiated Instruction:

Appendix B

Lesson Plan Template B

Content Questions	Conceptual Questions	Debatable Questions

Curricular Concepts	Big Ideas	Interdisciplinary Connections

Explore: (students explore content questions)

Group Project/Inquiry (through group inquiry, students connect prior knowledge, teacher can identify misconceptions)

Transfer/Extension

Discuss: (teacher facilitates a discussion focused around conceptual questions-expands thinking, challenges misconceptions)

Individual Project/Inquiry (can be set up to further expand on discussion)

Transfer/Extension

Understand (students apply their understanding using assessment strategies. One example is to choose a debate question and set up a debate)