ENVIRONMENTAL SCIENCE 20

A distance education proposal for:

St. Mary High School
Prince Albert Catholic School Division

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Introduction

This proposal is being presented to the Prince Albert Catholic School Division as its first distance education class offering. It will be taught as a pilot to determine the feasibility and sustainability of a new distance education program at St. Mary High School, the division's largest urban high school in Prince Albert, Saskatchewan. It was decided that the first course to be taught through distance education at St. Mary's will be the Environmental Science 20 course as it is a new curriculum and thus it won't be renewed in the near future. It is a course that will assist students in meeting their high school credit requirements for graduation. And finally, it will be well suited to be taught via distance education especially in northern communities due to the access to the natural environment.

Institutional Considerations

The institutional context for this course is Prince Albert Catholic School Division in Prince Albert, Saskatchewan. This is a small urban school division that has two high schools, six elementary schools and one outreach school. This distance education course will be taught as an extension of St. Mary High School. The school division is publically funded. (See Appendix A for full cost breakdown.)

Prince Albert Catholic School Division's vision is learning for life through Catholic Education. Our course aligns with their vision in that it provides students with a positive distance learning experience which will enable them to continue on with distance education classes to realize their goal of 'learning for life.' Their mission is to celebrate the richness of their Catholic faith through lived action and to optimize learning for all students, improving outcomes for First Nation and Metis students. Our Environmental Science 20 course aligns with their mission as it increases accessibility for all students including numerous northern First Nations and Metis students.

The biggest issues that we have are within the context of readiness. This is a pilot project for the school division therefore organization structure needs to be well defined. "Abedor and Sachs (1978) identified organizational structure, a receptive reward system for faculty, the availability of resources, and institutional policies that encourage instructional innovation [are] among the most potent factors in achieving organizational readiness." (Simonson, Smaldino, Albright, & Zvacek, 2012, p. 319) First of all, we'll need to appoint one leader that is in a position of power so that we can ensure that what needs to be done gets done efficiently and effectively. This newly appointed leader will be responsible for working with the board to review existing policy that may impact distance education as well as create a new distance education policy. The new policy will include Gellman-Danley and Fetzner['s] (1998) …seven critical areas of policy development for distance education: academic, fiscal, geographic, governance, labor-management, legal, and student support services. (Simonson et al., 2012, p.326) A well-defined distance education policy should prevent institutional problems in the future.

Prince Albert Catholic School Division is supporting this endeavor first and foremost by offering funding that will provide instructors, IT support, student support and resources. The instructors will develop and implement the course. The IT department will maintain the technological supports required to effectively teach a distance education class. The supports Simonson et al., (2012) describes in the WCET's "Web of Student Services for Online Learners" will be thoughtfully employed. Students will receive support with administrative services, academic services, communications, personal services and student communities. (p. 323)

Standards for Quality

To ensure that we develop a quality distance education course we have isolated the common "Red Flags" characteristics as described by Simonson et al. (2012) and provided our planned interventions.

	Red Flag	Planned Intervention
Institutional Awareness	• "Inability of senior administrators to articulate the role of distance education within the overall mission of the institution" • "New classes launched without evidence of need"	• Senior Admin will meet with the distance education leader monthly to be updated on the progress of the course development and during implementation. • In the event that this class is a successful endeavor, studies will be done to help identify which additional courses are needed.
Faculty	• "Rapid turnover of faculty who teach online courses" • "Faculty overload" • "Insufficient technical support"	• All faculty members will receive training in distance education before beginning to teach an online course. • Faculty teaching distance education courses for the first time will be given extra preparation time and be relieved of their volunteer duties for the year. (Yearbook, coaching etc.) • Class sizes will be capped at 25. • Faculty will have direct communication with IT support people and their concerns will be first priority.
Course Design	• "Curriculum design that does not appear to consider the needs of the intended student group" • "Absence of specified learning outcomes"	• A student needs assessment will be completed for each course. • Each course will be designed with high expectations for learning and numerous

	• "Underutilization of online discussions" • "Inattention to the unique characteristics of distance education pedagogy"	opportunities for application of student learning. • A clear syllabus will be available at the onset of the class that identifies topics, learning outcomes, assignments, a timeline and assessment tools (rubrics) • Each topic of study will include an online discussion component. • Students will complete mandatory course evaluations upon the completion of the course. • As suggested by Simonson et al. (2012) programs will be evaluated by fellow distance education faculty members every 3 years to ensure overall effectiveness, quality, and appropriate student support. (p. 333)
Student Support	• "Insufficient technical support" • "Student Support Services not accessible from a distance"	• Students will be supplied with video training tutorials at the beginning of each course. These videos will be available throughout the course. • Students will have access to resources from a distance including: Text and library resources that will be mailed with postage paid envelopes to return at the end of the course.

		Technical resources from an IT support department.

(Adapted from: Simonson p. 331-333)

Pedagogical Dimension

In Saskatchewan high school sciences are divided into 10, 20, and 30 level courses. Typically speaking; level 10 is a grade 10 level course, level 20 is a grade 11 level course, and level 30 is a grade 12 level course. Environmental Science 20 is a prerequisite for taking the 30 level Biology course or Earth Science 30 in Saskatchewan. In order to enroll in Environmental Science 20 a student must have successfully completed a basic Science 10 course. (See Appendix B) Science 11 can also allow a student to take Environmental Science 20 but that course is currently in development.

Learner Needs

In the context of this Environmental Science 20 course the learners have most likely not had a lot of experience with distance education as it is the first time this opportunity is being offered within their school division. It may be necessary for students to take the course through the school division for different reasons. Some students may be taking the course as additional credit to graduate, some taking it due to scheduling issues with other face to face courses, and some, which is what the focus of our planning is around, may be taking the course from a northern distance location where access to the course is not available. The learner enrolls through the St. Mary High School at a distance in order to stay in home locations. Due to the variety of reasons that learners are choosing to take Environmental Science 20 through distance education they may have specific learning needs.

Learner Need	How Its Addressed
Flexibility	Learners may need flexibility with regards to time. Having both asynchronous and synchronous course work will allow students to complete requirements mostly on their own schedule.
Facilitation/Guidance/Help	A teacher will be assigned to facilitate the distance education course. They will be responsible for providing material, answering questions, providing office hours, tutoring, lecturing when necessary etc.
Accessibility	Content is offered entirely online, therefore allowing students to begin, work on, and complete the course without leaving their home location.
Motivation	Some students may be enrolling due to necessity therefor the student motivation will be addressed using synchronous meeting times, required discussion board participation, and clear course requirements.

The timeline of the course for the learner will follow the regular high school program within their division due to the student's possible need of completing subsequent courses. A semester will be 5 months aligning with the high school the course is being offered through. This particular course could be taught in semester one or two because the order of the units covered can be rearranged to allow experiments/activities outdoors. (See Appendix C)

By taking this course learners will "learn how to examine local and global environmental issues from a systems perspective while considering the effects of human actions and a growing global population on the climate and environment, as well as the effects of the environment on human health. They will explore the mechanisms and importance of aquatic and terrestrial ecosystems and the sustainability of past and current practices and technologies humans have developed to live with and within the environment." (Environmental Sciences Curriculum 2014)

Learner Analysis	
Cognitive *General Characteristics* General Aptitude	Learners are of average aptitude.
Reading Level	Learners are working at reading levels on grade level or slightly below.
Language Development	Learners use language appropriately.
General World Knowledge	Learners living in Prince Albert and surrounding rural areas including more remote northern communities outside of the schools boundaries.
Prior Knowledge	Learners must have successfully completed Science 10 or 11. Science 10 includes an ecosystem component.
Physiological Racial/Ethnic Background	Learners coming from northern communities are 85-95% First Nations people. Learners from Prince Albert and area will come from a variety of backgrounds including First Nations and Metis.
Sensory Perception	Learners have no sensory issues.
General Health	Learners will be considered healthy enough to participate in the course.
Age	16-21 (There could be a few outliers that require a Science 20 level to graduate or have returned to upgrade their marks.)

Psychosocial	
Moral Development	Learners are moving from a conventional morality phase where they do what is expected to please authority or because they think it is what they should do to a principled morality where behaviour is guided by universal principles such as human dignity and fairness. (Smith & Ragan, 2005, p. 68)
Motivation to Learn	Motivation to learn is average to high. Learners are open to distance education learning experiences as it is seen as a means to graduation, and allows them to stay in home communities.
Attitude toward Subject Matter	Learner has an interest in the area of Environmental Science or a required course chosen by the learner.

Theory

The theories of learning that will guide our designs and ground our decisions are constructivism and situated cognition. Constructivism requires student to reason, think critically, understand and use knowledge, self-regulate and reflect. (Driscoll, 1994, p. 422) This course will employ all of these learning outcomes. Situated cognition stresses the importance of learning in context and doing what experts in the field do. (Driscoll, 1994, p.156) It is not a passive learning environment but rather one where students are expected to get up and go outside and learn about their environment *in* their environment.

Virtual Learning Communities (VLC) will be vital to the success of this Distance Education course. Students will be gathering together online to learn together. Ongoing communication will be important in discussions and during collaborative activities. Schwier's (2007) research outlines the approaches to developing rich learning environments using computer mediated communication and various strategies to connect people in varied and robust ways. His research guides this course's VLC in

that it will have common purpose, on-going communication opportunities with the instructor and peers, individual participation expectations, reflection, and trust.

Research

After reviewing current research, we concluded that a combination of asynchronous and synchronous instruction will best meet the needs of our students and insure our course sustainability.

Bernard et al. (2004) concluded that, in terms of achievement and attitude outcomes, asynchronous environments had more positive effects than synchronous ones. In spite of the positive outcomes for asynchronous instruction, the authors also found that retention rates were lower and dropout rates substantially higher in asynchronous versus synchronous DE. (Murphy, Rodriguez-Manzanares, & Barbour pp.584-585)

We will use asynchronous online teaching opportunities including Blackboard Learn discussions to build positive relationships with our students. "As one teacher observed, '…the kids prefer to chat and not talk on Skype'. Asynchronous communication may be the preferred form of communication for instruction because students prefer it." (Murphy, Rodriguez-Manzanares & Barbour p. 588)

Of central concern while designing a distance education course for high school students is student motivation. Murphy & Rodriguez-Manzanares extensively studied factors that improve student motivation within distance education high school classes across Canada. They identified the following three categories and 16 subcategories that prove to improve student motivation in a distance education context. (Murphy & Rodriguez-Manzanares, pp.1-7)

Communication, Interaction, and Social Presence	Intrinsic and Extrinsic Motivators	Learner-Centered Designs
• Personal Relationships • Humour • Tone of Voice • Face-to-Face Meetings • Teacher Feedback • Teacher-Initiated Communication • Student-Initiated Communication • Student Comments • Interactions and Discussion	• Tracking, Checking, and Monitoring • Carrots on Sticks (rewards - marks, points, etc.) • Self-Motivation • Support of Others • Encouragement	• Engaging Designs • Pace of Learning

(Adapted from: Murphy & Rodriguez-Manzanares, pp. 1-7)

The design of our course provides students and instructors the best opportunities to maintain the students focus and motivation throughout the course. The instructors will have an on-going open communication with their students throughout the course through synchronous meetings, discussions, teacher feedback, and other dialogues. Instructors will be monitor students' use of the CMS through the available tracking features to make sure that students are 'keeping up' with their work. Instructors will actively encourage their students while engaging parents in the students learning with progress reports. The course will be designed with the learner's needs in mind. The students will be provided with detailed syllabus and timelines to encourage them to maintain their motivation and avoid procrastination. The learner's tasks will be engaging throughout the course and encourage much interaction among instructors and fellow classmates.

In the spirit of a pilot program, we will ask that the instructors collect artifacts including student work and anecdotal records describing their experiences with distance education at St. Mary. This research data will be collected to accompany the field test that will be on-going during the pilot year.

Technology Considerations

Technologies Incorporated

Based on what we know about our learners we have selected the technologies that will best suit their needs and supply the course designers with the appropriate technology to teach the course. We anticipate the learners will range in age from (age 16 - 21) depending on their purpose for obtaining this credit. The learners could be learning in a variety of environments including urban and remote areas of the province. The topic work that is included needs to be sensitive to the fact that streaming media might not work as well in remote communities and therefore offer additional resources where streaming media is requested of the learner. Additionally, we have included print resources in the form of a textbook that can be incorporated throughout the topics.

> Blackboard Learn is an appropriate choice as our course management system if you consider The Masie Center's five "abilities" that e-learning standards should enable:
> 1. Interoperability
> 2. Reusability
> 3. Manageability
> 4. Accessibility
> 5. Durability
>
> (Simonson et al, 2012, p. 140)

The Blackboard Learn CMS is able to meet these requirements. It is able to work with a variety of systems. The learning topics can be reused. The system offers diagnostic tools that can track student's use of the system and keep track of ongoing progress. Students can access Blackboard Learn from a variety of devices; including the use of the Blackboard Mobile Learn app for increasingly popular mobile devices such as smart phones and tablets. Blackboard Learn is almost never closed (with the exception of the odd maintenance fix.) Blackboard Learn is evolving to meet the needs of the learner and the instructor.

In addition, the institution that we are designing the course for influenced our decision to use Blackboard Learn as our CMS. St. Mary High School and The Prince

Albert Catholic School Division have indicated that they would prefer to use a well-established CMS that requires very little technical support. The extra expense initially will outweigh the long term required expense of the IT support persons they will need to hire to maintain an open source option such as Moodle.

The following technologies will be required:

Student Technological Requirements:	- Access to computer with an internet connection - Webcam - Headset or microphone - Digital camera with video capability. - SMART phone / digital camera - Optional: Google Drive Account
Institutional Course Requirements:	Course Management System: Blackboard Learn & Blackboard Collaborate Including the following features: - Discussions / Forums - Calendar - In-Course Mail - Video Conferencing capabilities - Repository for documents - text, image, audio, and video file - Blogs - Flexible Design - Pages can be added for - Syllabus - Module / Topic Work - Assignment Descriptions - Rubrics & Assessment tools - Student Samples - Resources - Web Links - Group Creator Options - Quiz creator Additional Resources: Google Docs <u>may be</u> used for collaborative activities.

Training Requirements

The learners as well as the instructors will have varied ability levels with regard to technology. The course will need to offer in house tutorial services so that the students and/or instructors can learn how to use unfamiliar technologies. This training will be in the form of video tutorials to lessen the cognitive load on the students. The tutorials will be available on Youtube as well as a thumb-drive that can be mailed to them if streaming video is not a viable option. The instructors will receive training before they begin planning the content of the course so that they are aware of all of the capabilities of the CMS. They will have access to a trial class to test out the functionality. The students will be introduced to the CMS training videos during the first week of classes. Students will then need to use their new skills as a part of an activity at the end of the week. An example activity might require the student to log onto Blackboard Learn and introduce themselves via a post in the discussion board. This will ensure that all students have the necessary skills at the onset of the course. It will also provide the students with a readily available resource throughout the course when technological assistance is required. Keeping in mind, they will have access to technical support through the school divisions IT department but the access hours are limited.

Interface Design

Course Management System

The Environmental Science 20 course will be offered through a course management system. Blackboard Learn has been chosen as the preferred course management system due to its ease of use and flexible design. The course will be offered with both synchronous and asynchronous components that Blackboard Learn and Blackboard Collaborate are able to support. Both Blackboard Learn and Blackboard Collaborate have an app for mobile devices. The app is free for download on both Android devices as well as Apple devices. Elements of the course available within Blackboard Learn that will be used include:

Asynchronous Discussion Boards	• Students will be able to respond to questions from the instructor through the use of discussion boards as well as create dialogue through comments to classmates.
Calendar	• Students will be able to confirm and check meeting times and due dates through the use of a course calendar thus acting as a timeline.
Document Repository	• Students will be able to access text, audio, video, and image files provided by the instructor.
Pages	• Students will be able to access course materials organized by page such as the syllabus, assignment descriptions, resource links, rubrics, and exemplars.
Synchronous Collaborate	• Students will be able to access real time video conferencing software (Blackboard Collaborate) through the Blackboard Learn interface.

Blackboard Collaborate has some system requirements for users. In order to properly run and use Blackboard Collaborate software on your computer the following system requirements are needed:

Operating System	• Windows XP or later • MAC OS 10.5 or later

Fully Supported Certified Browser
 	
Note other browser versions may be may be compatible but are not certified by Blackboard software.
	• Windows XP/Windows Vista
	   o Internet Explorer 9
	• Windows 7
	   o Internet Explorer 9 and 11
	   o Firefox
	   o Chrome
	• Windows 8
	   o Internet Explorer 10 and 11
	   o Firefox

	o Chrome
	• MAC
	o Safari
	o Firefox
Other Necessary System Requirements	• Up to Date Version of JAVA • 256 MB of RAM • 20 MB of free disk space • Soundcard • Webcam

(Blackboard Collaborate Support Portal 2014)

Visual Design

Interface set-up will be designed using visual design strategies to support student learning.

FUNCTIONAL CHARACTERISTICS *What does it need to accomplish?*	FORMAL CHARACTERISTICS *What does it look like?*
Audience *Perceptive Function* Give students a grade specific instructional journey.	Text Based Knowledge • Uses icons for explanation • Chunked information by importance • White space used to separate ideas and for readability Screen Based Knowledge • Text is grade appropriate • Simple, clear, and consistent • Colour used when necessary
Purpose *Cognition Function* Give students an understanding of the environmental science.	Text Based Knowledge • Student Task Instruction pages will be available through the Blackboard Learn CMS • Information will be grouped step by step whenever possible on pages • White space used to separate ideas and for readability • Icons included where necessary for comprehension

	• Specific instructions are chunked together in pages Screen Based Knowledge Information will be presented using a program (Blackboard Learn CMS) students are not familiar with so the following will be considered: • Display not text heavy • Use of images • Colour is incorporated where necessary

Instruction
Instruction Function
Give students the concrete information necessary to be successful in Environmental Science 20.
	Text Based Knowledge
	• Student Informational Content will be available will be available through the Blackboard Learn CMS as well as through an e-text by Pearson or McGraw-Hill.
	• Informational text chunked by pages
	• Text Features are used to enhance learning
	    o Bold Text
	    o Underline

	VISUAL CHARACTERISTICS/PRINCIPLES
Layout	Screen materials read left to right and top to bottom. Simple→Clear→Consistent Multiple pages used to keep information chunked in screen materials within the CMS White space utilized to break up instructions, and new ideas. Justifications used include left and center in print materials.
Text	Font Size 16 pt-24 pt for readability in screen materials Font Style Bold has been used where necessary to highlight important headings and terms in screen materials. Font Style Sans Serif used in screen materials • Arial
Graphics	Representational graphics used in the form of photos and images throughout the course content that showed physical resemblance to the concept.

	Analogical graphics were also used in the form of photos and images in the concept attainment screen activity that implied a similarity.
Icons	Representational icons used to help learners recognize functions of the programs being used. • Blackboard Learn • Blackboard Collaborate Representational icons also used to help learners navigate within the programs they are working. decode→learn→recognize→remember

(Misanchuk, Schwier and Boling, 2006) (Schwier, 2011)

Learner Assistance

Interface help will be addressed for participants through the school division's technology services. Communication can be set up with tech services through the instructor or a direct line contact with a tech services representative.

Evaluation

Student Assessment

Formative and summative evaluation will be a part of this course. The student's success is our number one priority so we want to make sure that we are providing regular descriptive feedback including rubrics so that our students will be well equipped to successfully complete this course. As these learners are between age 16-21 it will be the first time that many of these students will have registered for an online class so we want to make sure the experience is a positive one. "Students gain a sense of control and can take on greater responsibility for their own learning if they know how well they're doing, compared with an established set of criteria." (Simonson et al., 2012, p. 263) We are hoping that the ongoing feedback will help maintain the student's motivation throughout the entirety of the course. In addition, the students will receive a midterm progress report.

A. Formative Evaluation

Prince Albert Catholic School Division and therefore St. Mary High School value formative evaluation as assessment for learning. Many of these students are new to the world of distance education and we want to make sure that the students are successful in their endeavours. Before students start the class they will be asked to complete a survey that establishes the student's readiness for online learning. The student will then have a more accurate feel for what online learning with entail and what will be required of them. As Simonson et al., (2012), suggest the survey will identify the factors of learner success including attitude, experience, and elements for success (general ability, prior knowledge, and learning styles.) (pp. 222-227)

Kolowich (2009) suggests that early predictors of student success is evident during the students first week of class. "...unlike traditional classrooms, these environments can keep a detailed log of everything that happens [within the CMS], providing [us] information… new diagnostic tools."

According to Kolowich (2009), Rio Salado College examines the CMS metrics to predict the success rate of their students in their distance education classes. They look at the following:

1. Has the student logged into the course home page during that first week?
2. Did he/she login prior to the first day of class?
3. Are they taking more than one class?
4. Have they been successful in previous online courses?
5. Are they retaking the course?
   (Kolowich, 2009)

We will be tracking these predictors for student success to help ensure our students have a positive first experience with distance education.

B. Summative Evaluation

As suggested by Simonson et al. (2012) a week before the course begins the students will be provided with the course syllabus that will clearly outline the course

logistics (timeline, meeting times, instructor information, required textbook and course materials), course policies (attendance, homework, and participation) instructional activities (outcomes, topic list, reading assignments, links to topics, discussion questions, assignments, test and examination information, evaluation criteria and interactive study guides for the course. (See Appendix D)

Rubrics (See Appendix E) will be posted and available for students at the beginning of the class. Students will always be cognizant of the course outcomes and the skills and knowledge that they are to acquire after successfully completing the topics and the overall course.

St. Mary provides students the opportunity to resubmit assignments given they have taken the time to improve upon them according to the feedback provided. The assignments outlined in this distance education class will provide the students the same opportunities.

Course Evaluation

It is of the utmost importance for this class to be evaluated so that we can determine if the course is indeed meeting the needs of our students as well as the institution that is funding the class. The students are registering for a distance education class offered through St. Mary High School therefore St. Mary High School's reputation as offering students a quality education is at stake. The Prince Albert Catholic School division is diverting much needed funds to this online distance education endeavour in hopes that this course will be able to successfully fill an educational need within the community. Proper and thorough evaluation of course will help the institution to provide their students with a valuable educational experience. This evaluation will occur in two stages. The first is during the initial development of the course prototype. This stage will include usability testing as well as formative testing (one-to-one, small group, & field testing). (See Appendix F)

The second evaluation stage will follow Kirkpatrick & Phillip's evaluation approach. As Simonson et al., (2012) describes Kirkpatrick and Phillip's evaluation

approach will help us to determine the effectiveness of the course. The following data will be collected from the students and instructors throughout the course to provide the institution with the necessary feedback required to improve the course and / or make decisions regarding the courses feasibility.

	Student Data
LV1: Reactions (Did they like it?)	• Upon the completion of each topic the students will be asked to complete a quick Likert response survey to determine their reactions (learner satisfaction) to the lesson materials effectiveness and the degree to which the student work required matched the objectives of the lessons. (5 topics = 5 Likert scales) • One optional open ended question will be included at the end of each survey for students to include more qualitative statements about their reactions to the topic.
LV2: Learning (Did they learn it?)	• The students will be asked to complete a vocabulary quiz each topic. This quiz will be given to them twice. Once before they begin their topic work (pretest) and again upon the complete of their topic work (post-test) to identify 'how much' and 'what specifically' the students learned. • Students will be given assignments to complete for each topic area. These assignments will be assessed using a rubric which will help instructors to determine the degree to which the students mastered the required content.
LV3: Transfer (Will they use it?)	• The assignments the students will be required to complete will have an application component embedded in them. Therefore students will be required to not only show what they know but put their knowledge to use to solve authentic real world problems.
	Instructor Data

LV4: Results (Will it matter?)	Instructors will research the following:
	• Enrollment in Additional Courses & Learning Motivation:
	  ○ This is the first course we are creating for this institution. Therefore, upon the completion of the course we will survey the students to ask them to reflect upon their experiences in this online course and answer the following questions:
	    ▪ What is the probability that you will sign up for additional online courses?

	- Were you motivated to learn throughout the course? - What helped you to keep your motivation? - Lesson Material - Activities - Discussions - Quizzes - Other: - Educational Achievement - Instructors will compare student results from the face-to-face (f2f) Environmental Science 20 class and the results from the distance education Environmental Science class to determine the effectiveness of the online class as compared to its f2f counterpart.
LV5: Return on Investment	Instructors will: - Collect level 4 data to determine if the data indicates that it is favorable to continue to teach the course as a distance education offering. - Identify what (specifically) worked in the distance education course and contributed to improved student performance. - Determine how much the course cost the institution to plan. - Determine (after the initial implementation year) how much this course will cost to deliver annually. - Determine if this course costs the institution more or less than a f2f course annually. (How much more or less?) - Determine if the monetary benefits outweigh the costs.

(Adapted from: Simonson et al., p. 349-350)

Course Management

Students will register through St. Mary High School in Prince Albert in order to obtain credit for the course. Registration may take place in person with school staff or for those unable to attend in person through communication via phone and email with school administration. School staff such as guidance councillors and administration will play a vital role in successful registration of distance education students.

Notifications for both students and parents/guardians will be distributed through email addresses that will be provided to the facilitator during the registration process. This will ensure that such things as the class syllabus, expectations, assignments, assignment due dates etc. are made known. It will be the responsibility of the facilitator to ensure these notifications are sent simultaneously to all learners thus transferring the responsibility of the course components to the learner. There will also be an element of communication with the student through the Blackboard Learn and Blackboard Collaborate including calendars and message boards.

If students or parents have any comments or concerns, they will be able to reach the facilitator through an email address or phone number provided at registration and listed on the St. Mary distance education webpage. The instructor will then have the responsibility of responding in a timely manner.

The scheduling for the Environmental Science 20 program will ultimately be the responsibility of the school's administrative team. The team will need to take into consideration such factors as the required amount of instructional minutes the curriculum sets out and prep time required for the facilitating teacher.

The instructors responsible for its successful implementation will manage the majority of aspects of this course. Management concerns, such as registration and scheduling will be based upon school specific information. The management of the learning environment will be the instructor's responsibility. The Blackboard tools were selected for their ease of use. It is also important that other potential instructors of the course are able to also access the material and tools quickly and easily, as support will not be readily available from the designers. Therefore, everything that is needed will be kept together in a readily available package that can be distributed with ease.

Resource Support

Resources for such courses as Environmental Science 20 are continuously evolving with the course itself. Resources will initially be offered through the internet. Public resources will be posted within Blackboard Learn. This will secure the learning material and ensure quality. The facilitator of the course will be in charge of making sure the resources being offered are current, purposeful and respect the material and the users of the course along with copyright laws.

Counseling services will be put in place for at-risk students and 'students in need'. Contact information will be provided for the divisions counseling services. This will ensure that the needs of all students are respected.

Suggested Resources
- No single resource will completely meet the needs of this entire course but it is intended that teachers rely on some of the outside agencies in Saskatchewan and Canada to help with course content and delivery.   - A list of suggested resources from the Ministry's Environmental Science 20 curriculum page.   - The text chosen for this course {either Pearson Environmental Science or McGraw-Hill Environmental Science} also has an e-text available. The e-text includes online documents, videos, interactive activities (flash files), and spreadsheets needed to support the learner when completing some investigations in their environment.   - Downloadable PDF's: - Climate Change: Evidence & Causes → Available from the Royal Society's website   - What we know about Climate Change → From the AAAS.org website   - Royal SK Museum document: Can We Live Sustainably   - Website: Climate Change - Royal Society   - Website: http://whatweknow.aaas.org/ this is an American site but has relevant data for Canadian climates as well.   - Various lesson resources from the Science section of the Stewart Resource Centre   - My Blueprint or Career Cruising to support outcome ES20-CE1: Analyze and explore environmental science related career paths in Saskatchewan, Canada and the World.

Student Support
- Instructors will Collaborate weekly with students for discussions and allow time for students to ask questions or clarify course content.   - Students will have access to the instructor's email address for course-related questions.   - Sample projects/experiments can be posted for students to compare their results with another source.   - Technical support will be available via online tutorial videos as well as access to an IT department.

Ethical Considerations

It is important that all student receive equal access to technology to complete this course. The design of this course carefully considers the needs of all learners within their contexts to ensure positive impact and effectiveness. Students with special needs who wish to take part in the course could receive further assistance from the support team within the extension school. Adaptations could be made where needed and the learning device in which they choose to utilize could also be chosen to best fit their needs. Students who identify as second language learners will need to access the learning facility during school hours so that they are able to receive support from a tutor or EAL educator. Various learning strategies will be incorporated to ensure differentiation is occurring to meet students varied needs including age, cultural sensitivity, and interests.

Another concern that may arise is the accessibility to the internet in rural settings. With internet access required to fully benefit from the teachings, students will be notified during registration that this is a must. Possible "other" locations exist that students could access such as the local public library or within the school computer lab.

Protection of student personal information in an online learning environment is also an ethical concern that must be taken into account. It will be required that the

learning environment meets the Saskatchewan Board of Education's privacy guidelines and approved by those supervising such guidelines.

As creators of the course, it is important to protect our work. Therefore, proper copyright guidelines must be followed to ensure the subject matter stay true to its original intent. The works of others should not be used without their permission unless the use is permitted by the Copyright Act or permission is requested and granted by the owner. Everyone must be cognizant of the copyright status of resource materials being used.

Appendices

Appendix A: Cost Analysis (3 pages)

NEW: Environmental Science 20 Distance Education Class Cost Analysis

- Incorporating an open-university model for our virtual campus
  - Keeping in mind this is a high school course
- The budget to create a new DE course is broken into two parts:
  - Assuming an initial course size of 25 student

Initial Development & Design	Marketing & Delivery
➢ Developed by faculty experts ➢ The actual course time is approximately 95 hrs, in order to make an hour of online course material that can be delivered without the use of the instructor; it would take about 18 hours per hour of actual course time*. That would be about ~ 1710 hours total ➢ Two teachers will be released for one semester to develop the course materials	➢ Marketing will be primarily through our current guidance department ➢ The student completes the course by working through the course materials prepared by the faculty experts, but only interacting with a single instructor or tutor who specializes in the course delivery ➢ Counseling, assessment and library resources will need to be considered to support the student ➢ Support for software and hardware issues will be available

∗ Boettcher, J. (2006, January 15). How Much Does It Cost to Develop a Distance Learning Course? It All Depends.... Retrieved November 15, 2014, from http://www.designingforlearning.info/services/writing/dlmay.htm

Resources

Student Resource: Environmental Science: A Canadian Perspective - Primary resource

Instructor Resources:

- Environmental Science 20 - Saskatchewan curriculum
- Curriculum Correlation - This link opens best in a Google Chrome browser.
- Environmental Science: A Canadian Perspective A curriculum correlation was written to assist in the implementation of the new provincial curriculum. This resource includes many of the Environmental Science topics as well as a section on career explorations.

Cost Analysis:

Initial Development & Design:		COST
Developing Materials	Assuming two class V teachers at the top of the STF pay grid for one semester each	$83584.^{00}
Technical Support	Existing technicians will be taking on these additional responsibilities (no additional salary cost)	$0.^{00}
Teacher Resources	• Teacher guide • Connect School (5 years) • Examview (test generator)	$315.^{00} $299.^{00} $285.^{00}
Student Resources	Text: to support the implementation of our new curriculum and to help students meet all their outcomes for environmental science.	$67.00 per text x 25 students = $1 675.^{00}
	Subtotal	**$86 158.^{00}**
Marketing & Delivery:		
Course Management System	Blackboard will be used, but it is assumed the cost for setup and training of IT people has already been absorbed by the Division {since the cost would be shared by other courses in in the division.}	$0.^{00}
Administrative Service	Recruiting, marketing, admissions and postage fees.	$1 500.^{00}
System Maintenance	Technology infrastructure already has a solid plan that includes hardware replacement on a 3-yr cycle. This amount is available for upkeep or replacement of equipment as a contingency allowance.	$10 000.^{00}
Teacher Salary	Assuming one class V teacher, at the top of the salary grid (because it will be an experienced teacher with a specialization in science) with a 10% teaching load	$8358.^{40}
Student Workbook	Used to supplement the student resource. It provides alternate ways to view problems and helpful notes	$15 per student x 25 students

	and tips on how to be successful throughout the course	= $375.^{00}
Connect School for Students	Online resources for the student that includes an interactive student resource online, video clips, activities, and online questioning capabilities.	$5 per student x 25 students = $125.^{00*} *with purchase of student resource
	Subtotal:	**$20 358.^{40}**
	First Year Total cost	**$106 516.^{40}**

Potential extra School Division funding = (~$10 000.^{00} per student[**]) x (25 students) = ~$250 000.^{00}

[**] based on value given by the CFO of the Prince Albert Catholic School Division → Funding is based on an amount per student, whether they take one course or ten. The only condition is the student must be registered in the Division as of 4:30pm on September 30 of that school year.

Appendix B: Prerequisite Paths (1 page)

Saskatchewan School Science Curriculum Renewal Prerequisite Paths.
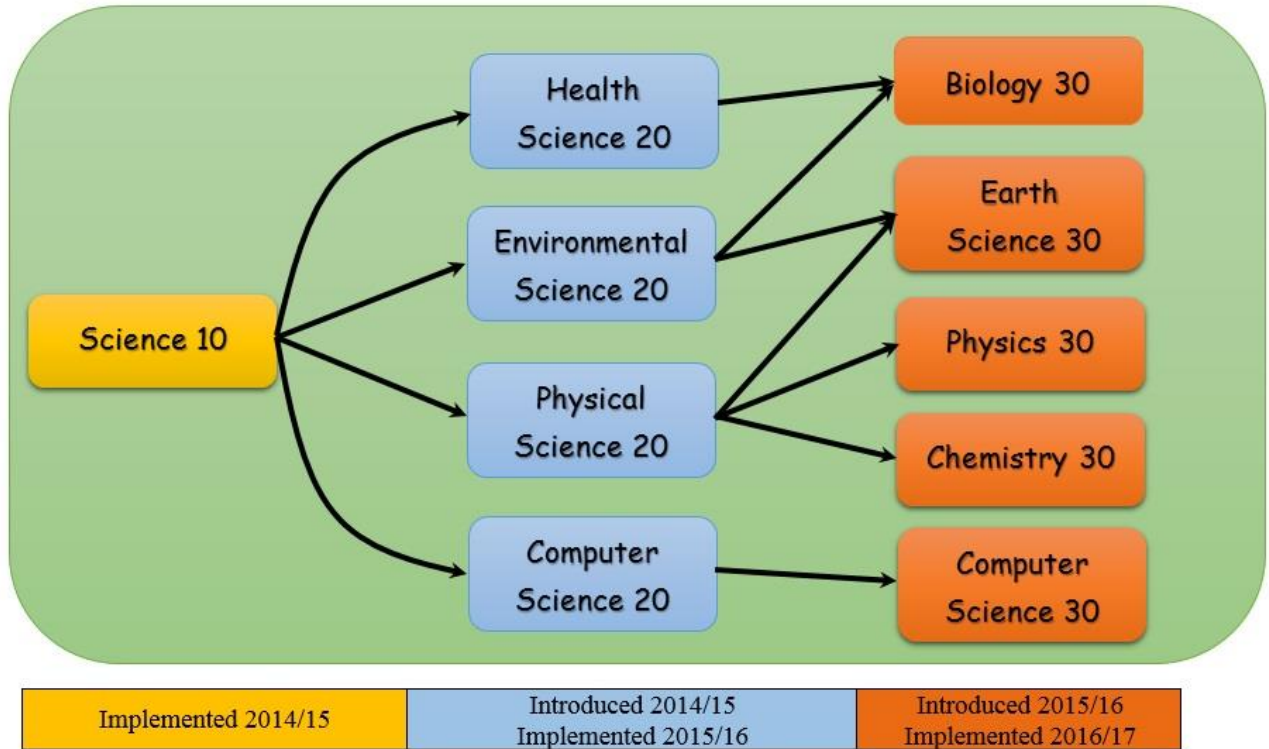
Appendix C: Course Organization (2 Pages)

Environmental Science 20

Topic 1
Integrative Nature of Environmental Science
4 Weeks

IN1 Examine the interdisciplinary nature, systems approach, and applications of environmental science and indigenous perspectives living with and in the environment.

Topic 2
Atmospheric Systems
4 Weeks

AS1 Assess the impact of air quality on human and environmental health and the need for regulations and mitigating technologies.

AS2 Analyze current and potential future effects of global climate change on Earth and humans, including the need for adaptation and mitigation strategies.

Topic 3
Human Population
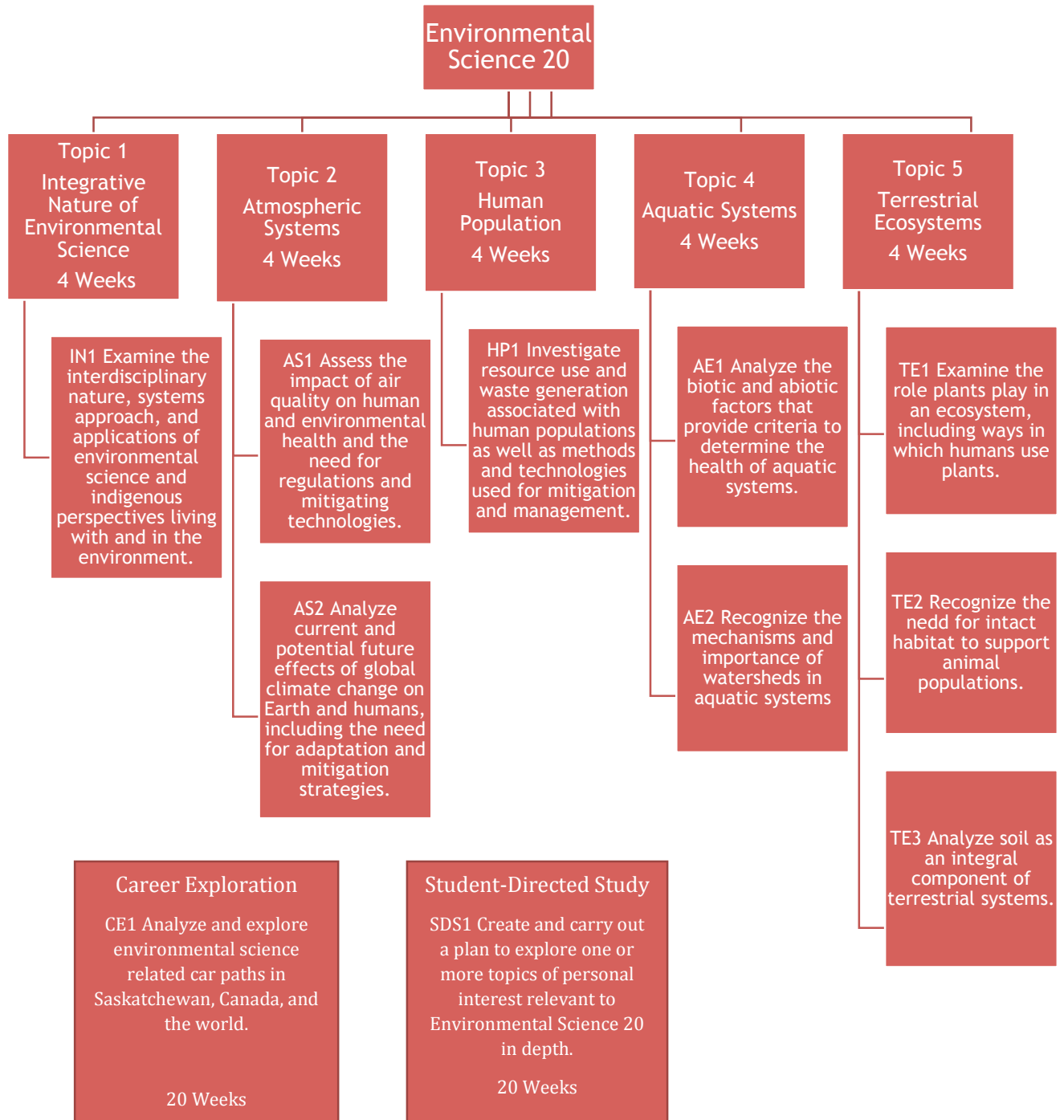4 Weeks

HP1 Investigate resource use and waste generation associated with human populations as well as methods and technologies used for mitigation and management.

Topic 4
Aquatic Systems
4 Weeks

AE1 Analyze the biotic and abiotic factors that provide criteria to determine the health of aquatic systems.

AE2 Recognize the mechanisms and importance of watersheds in aquatic systems

Topic 5
Terrestrial Ecosystems
4 Weeks

TE1 Examine the role plants play in an ecosystem, including ways in which humans use plants.

TE2 Recognize the nedd for intact habitat to support animal populations.

TE3 Analyze soil as an integral component of terrestrial systems.

Career Exploration
CE1 Analyze and explore environmental science related car paths in Saskatchewan, Canada, and the world.

20 Weeks

Student-Directed Study
SDS1 Create and carry out a plan to explore one or more topics of personal interest relevant to Environmental Science 20 in depth.

20 Weeks

Course Curricular Expectations

Course Layout

This course will include a variety of assignments and some choice to allow for students varied learning styles. Students will be expected to complete all assignments by the due dates provided in the Course Syllabus.

The topics are based on the outcomes provided by the Environmental Science 20 curriculum guide. Some outcomes may be combined and / or used as assessment pieces. Each topic will take approximately four weeks for students to complete.

The topics:

1. Integrative Nature of Environmental Science
2. Atmospheric Systems
3. Human Population
4. Aquatic Systems
5. Terrestrial Ecosystems

Each topic will include:

1. **Discussion Questions** that will be posted in a forum. Students will be required to participate in the discussion by creating a post of their own and commenting on the posts of other students within the class.

2. **Vocabulary Quiz**

3. **Career Research** - within each topic, the students will research and briefly describe a career that would directly use the information covered in that topic.

4. **Lab / Environmental Experience -** evidence of learning their outcomes.

Major Assignment:

1. Student-Directed Study

   - environmental topic of student choice

   - continuous over 20 weeks

Environmental Science 20 Syllabus
September-January 2015/2016 Semester One

Instructor Information

Instructor
Mr. Murray Henry

Email
mhenry@cec.pacsd6.sk.ca

Office Location & Hours
St. Mary High School-Prince Albert
Monday to Friday 8:00-4:30
(306) 953-7544

General Information

Description

Students will learn how to examine local and global environmental issues from a systems perspective while considering the effects of human actions and a growing global population on the climate and environment, as well as the effects of the environment on human health. They will explore the mechanisms and importance of aquatic and terrestrial ecosystems and the sustainability of past and current practices and technologies humans have developed to live with and within the environment.

Prerequisite: Science 10 or 11

Expectations and Goals

The course will include a variety of assignments and some choice to allow for students varied learning styles. The students will be expected to complete all assignments by the due dates provided.

The topics will be based on the outcomes provided by the Environmental Science 20 curriculum guide.

The topics:

1. Integrative Nature of Environmental Science
2. Atmospheric Systems
3. Human Population
4. Aquatic Systems
5. Terrestrial Ecosystems

Each topic will include:
1. **Discussion Questions** that will be posted in a forum. Students will be required to participate in the discussion by creating a post of their own and commenting on the posts of other students within the class.
2. **Vocabulary Quiz**
3. **Career Research** - within each topic, the students will research and briefly describe a career that would directly use the information covered in that topic.
4. **Lab / Environmental Experience -** evidence of learning the outcomes.

Major Assignment:

1. Student-Directed Study: Environmental topic of student choice

Course Materials

Required Materials

Computer

Reliable Internet Connection

Email Address

Blackboard Collaborate Software (link available from instructor at no additional cost to student)

> System Requirements

- Windows XP or later/Mac OS 10.5 or later
- Certified Internet Browser (see instructor for complete list)
- JAVA
- 256 MB of RAM
- 20 MB of free disk space
- Soundcard

Optional Materials

For use with Blackboard Collaborate Software:

- Web Camera
- Headphones with attached microphone

Google Drive Account

Required Text

Pearson Environmental Science, e-text,

McGraw Hill Environmental Science, e-text

The e-text will be provided for student use at no additional cost.

Course Schedule

Weeks	Topic	Reading	Exercises
1-4 Sept 1st-25th	Integrative Nature of Environmental Science	Chapters 1-4 PDF	Discussion Posts Vocabulary Quiz Career Connections
5-9 Sept 28th-Oct 23rd	Atmospheric Systems	Chapters 5-9 Web-site	Discussion Posts Vocabulary Quiz Career Connections
10-14 Oct 26th-Nov 20th	Human Population	Chapters 10-14 PDF	Discussion Posts Vocabulary Quiz Career Connections
15-19 Nov 23rd-Dec 18th	Aquatic Systems	Chapters 15-19 Web-site	Discussion Posts Vocabulary Quiz Career Connections
BREAK Dec 19th -Jan 3rd	Student Directed Study	Student Chosen	Student Chosen
20-24 Jan 4th-27th	Terrestrial Ecosystems	Chapters 20-24 Web-site	Discussion Posts Vocabulary Quiz Career Connections

Assessment Schedule

Date	Topic Due Date
September 25th	Integrative Nature of Environmental Science Lab/Experience
October 23rd	Atmospheric Systems Lab/Experience
November 20th	Human Population Lab/Experience
December 18th	Aquatic Systems Lab/Experience
January 27th	Terrestrial Ecosystems Lab/Experience
January 29th	Student Directed Study Final Project

Additional Resources and Information

Instructor Provided Resources

- Downloadable PDF's:
    - Climate Change: Evidence & Causes → Available from the Royal Society's website
    - What we know about Climate Change → From the AAAS.org website
    - Royal SK Museum document: Can We Live Sustainably
- Website: Climate Change - Royal Society
- Website: http://whatweknow.aaas.org/ this is an American site but has relevant data for Canadian climates as well.
- Various lesson resources from the Science section of the Stewart Resource Centre
- My Blueprint or Career Cruising to support outcome ES20-CE1: Analyze and explore environmental science related career paths in Saskatchewan, Canada and the World.

Additional Information

Response Time

Instructor can be reached via phone or email Monday to Friday from 8:00-4:30. Students can expect a reply within 24 hours during the Monday to Friday office hours. Inquiries made on weekends may not be responded to until the following Monday during office hours.

Technical Support

Technical support is available to students Monday to Friday from 8:00-4:30. Requests for support can be made by phone at (306) 763-1723 or email at DEsupport@pacsd.ca. All efforts will be made to respond to requests during the above time frame within an hour. Frequently asked questions, updates, and trouble shooting is available 24/7 through the St. Mary Distance Education web-site.

Appendix E: Sample Rubrics (1 page)

<div style="background-color: #8CC63F">

Integrative Nature of Environmental Science

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ES20-IN1 Examine the interdisciplinary nature, systems approach, and applications of environmental science and Indigenous perspectives on living with and in the environment.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I can make a connection between issues/perspectives and their connection to environmental science.	I am able to identify that the environment will be affected by a variety of circumstances/perspectives and issues, and that some are long term and some are short term.	I am able to express how my environmental decisions connect to other areas of impact, like economics and social and cultural.	I can see the connections of the factors that have affected and continue to affect the environment, through action and inaction, and can express the effect.

<div style="background-color: #8CC63F">

Atmospheric Systems

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ES20-AS1 Assess the impact of air quality on human and environmental health and the need for regulations and mitigating technologies.

Beginning (1)	Approaching (2)	Proficiency (3)	Mastery (4)
I still have questions about how contaminants affect air quality. I know there needs to be rules, but can't think of an example. I can identify either a residential, commercial or industrial.	I can identify contaminants that cause poor air quality. I understand the need for rules about air quality, and one example would be. I can identify a residential, industrial, and/or commercial technology for air quality.	I can identify factors that and give examples of how air affects living and non- living things. Identify legislation surrounding air quality in Canada and worldwide. I can **identify differences in technologies** that are being used to produce clean air in multiple applications.	I can show in a unique way how air quality, rules and technology would be required or necessary to preserve our population.

(Sample Rubrics taken from: Saskatchewan Rivers School Division, 2014)

Evaluation of the Environmental Science 20 DE Prototype Course

The instructional designers of this course will complete usability and formative evaluation testing to ensure that it is put through rigorous quality control testing and revising so that St. Mary High School and The Prince Albert Catholic School Division will be successful with their first distance education course offering Environmental Science 20.

Usability Test

A usability test will be performed before the course is deployed for student use. A small voluntary group of students and environmental science 20 instructors will confidentially test the class for us. They will be supplied with the material the future students and instructors will be expected to have in order to complete the course. These materials include:

1. Access to the Environmental Science 20 Blackboard Learn course
2. Access to the various print resources (textbooks etc.) that will be distributed to the students

The participants will be given specific instructions indicating that their abilities to complete the environmental science 20 course <u>are not</u> being evaluated. We are evaluating the course itself. We will explain to them that we need them to find the problems within the course so that we can improve the course before it is offered as a distance education class to a real class of students. They will be made to understand that this is not the final version. We will be making changes as a result of your suggestions. We will request that they explore different areas of the course while using a think-aloud protocol so that we will be aware of struggles or questions that they have during the test. We will reiterate that if they feel frustrated or struggle we need to know. That will provide us with very useful information that we can use to

improve our course. We will provide them with a debriefing questionnaire before they leave the usability test so that we can gather additional information. After the usability test has been completed we will review the notes that we kept during the test as well as the survey results to identify where revisions are required within our course. St. Mary High School will provide release time for the instructors to make the required changes to the course as a result of the usability test. Making the necessary improvements as determined by the usability test, will greatly improve our chances of deploying a successful Environmental Science 20 distance education course on behalf of the Prince Albert Catholic School Division.

Formative Evaluation Testing

Formative evaluation of the course will be fully supported by St. Mary High School and The Prince Albert Catholic School Division. The instructors will be provided release time from the teaching responsibilities to ensure that the formative evaluation testing is completed successfully and the necessary revisions are completed in a timely manner.

Formative Evaluation Testing will be done in three stages:

Stage 1: One-to-One Testing:

This test will be completed after the changes have been made as a result of the usability test. It will be very similar to the usability test but this time only students will be asked to confidentially volunteer. The students will be predetermined to be of low, average, and high ability as identified by the pre-screen quiz the students are required to take before they begin the online course. The learners will be again put at ease as we explain we are evaluating the course not their abilities. As they work through the course materials we will keep jot notes with regards to performance information, process information, and other suggestions the students make. Students will again use the think aloud protocol so that we will get additional insight to their metacognition as they work through the course. We explain that while we will be present for the course evaluation session we will not interfere unless necessary. The learners will understand that their role is to help us find the

problems in our course. Our role as designers is to collect data from this one-to-one testing and analyze it to make the necessary revisions.

Stage 2: Small Group Testing

We will begin small, five students that are high achieving and willing to take Environmental Science 20 as a distance education offering from St. Mary High School. The course will be implemented as designed. These students will be enrolled at St. Mary High School. They will be required to meet with the facilitating teacher weekly throughout the course to help identify issues with the course design and possibly even offer suggestions for improvement. The learners will again understand that their role is to help us improve the course for future students by discovering the problems embedded in the course design. Our role will be to improve upon the course by using the data that has been collected during the weekly meetings as well as any additional data that may have presented itself to the instructor during the small group test.

Stage 3: Field Testing

During the field test the course is live and we will register a full class of students to the Environmental Science 20 course. This test is to be as authentic as possible so we will want to make sure that we have students registered for the class that are living in both remote areas of the province as well as local students that cannot fit the course into their schedule. The class will be instructed as the design dictates. The instructor will keep reflective notes throughout the process so that course can be further improved for future students. Upon the completion of the course the students will be asked to complete a post-test to see learn more about their experiences in the Environmental Science 20 distance education course. We will want to find out if they felt this course meet their needs as a distance education course? After completing this course will they be willing to take additional distance education courses offered through St. Mary High School? We will compare the students' final marks in the Environmental Science distance education class as compared to the in class offering at the high school. Were they comparable? Were the students successful? St. Mary High School will be using the data collected to make

important decisions about future distance education offering provided by their institution. The Prince Albert Catholic School Division will need this information to ultimately decide if distance education is a venture that they want to continue to develop or if they will opt out.

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