An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum

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This assignment is for assessment from EDUC6800 and used for educational purposes only.

Abstract

In this proposal draft, an executive summary of primary methodological approaches and structures will be highlighted in this paper. The primary purpose of this capstone project is to create a meaningful resource curriculum for science education that is in-tuned with the values of diverse learners within the local high school community of Charles Hays Secondary School (CHSS) located in Prince Rupert, BC. In this executive survey of my preliminary process, the following parameters will be discussed: (1) Project Summary, (2) Goals and Objectives, (3) Barriers and Constraints, (4) Timeline Development, and (5) Research Findings. The focus of this paper is for communicational transparency among the course community of EDUC6800, by Cape Breton University for Spring 2021.

Keywords: proposal, executive summary, methodological approaches, structure, communicational transparencies.

Project Summary

This capstone project is an assignment pre-requisite for EDUC6800: Sustainability, Creativity, and Innovation Project from the Cape Breton University (CBU) as part of the Master of Education (MEd) in Sustainability, Creativity, and Innovation (SCI) graduate program. In this capstone, a survey-based approach to insightful learning will take place to provide educational information and professional development that will allow for the tailored scaffolding of a new curriculum science resource that aligns to research findings.

In this process, a series of preliminary steps were sought for the required approval for this project. This includes the successful completion and approval of Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2) (Appendix 1.; Page 11), Research Methods: Participant Consent Form (Appendix 2.; Page 12), and Letter of Support – Organization (Appendix 3.; Page 16) from respective supervisors.

A broad range of questionnaires have been designed to holistically capture and represent a larger diversity of learners within a non-binary spectrum of learning. A collective of 33 questionnaires has been designed that uses a 5-star rating-system for relative, personal, alignment to each statement (Appendix 4.; 17). The questionnaires are broken down into seven sections (Table 1.; Page 3)

Table 1. Compartmentalization of survey questionnaires.

Sections	Categories	Questionnaires
I	School Community & Climate	5
II	Personal Values	5
III	Learning Styles	5
IV	Curriculum Learning	5
V	Mindful Education	5
VI	Teaching Methodology	5
VII	Student Values	3

Preliminary findings form this survey will be juxtaposed to peer-reviewed educational psychology research from various sources. The combination of community data and literature reviews will be used to make an informed decision on the scope, depth, and content of a science curriculum resource.

Goals and Objectives

The purpose of this research project is to understand more about student learning at CHSS. The primary goal of this study is to facilitate a survey as a reflection and insight into the dynamic and diverse learning indicators, needs, and styles to foster lifelong learning (Table 2.; Page 4). Mr. Yue is interested if there is any relationship between the learning needs, styles, and pedagogy that influences the growth mindset of high school students. The findings from this preliminary survey will be used to create a sustainable, creative, and innovative science curriculum that is inclusive of the holistic needs of all learners.

Table 2. Capstone goal summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science*.

Goals	Descriptors
Primary	To facilitate a survey as a reflection and insight into the dynamic and diverse learning indicators, needs, and styles to foster lifelong learning
Secondary	To be able to recognize the diverse spectrum of learners when creating a framework for learning
Tertiary	To analyze literature findings to preliminary survey data for interpretational purposes
Quaternary	To apply theory-based findings to professional practice in the form of curriculum development and personal teaching

With regards to the objectives of this capstone, the dichotomy of direct and indirect objectives are outlined (Table 3.; Table 4.; Page 5). Direct objectives centralize around the overt learning objectives that is scaffolded by stakeholder inclusion and collaboration to foster authentic learning for transformative curriculum development and pedagogy. In conjunction, indirect objectives decentralize pre-existing assumptions of student learning that may be engrained within the high school community.

Table 3. Capstone (indirect) objective summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science*. DOs = Direct Objectives.

DOs	Descriptors
I	Create stakeholder inclusion into the curricular and pedagogical development of teaching practices
II	Provide educators an insight into student perception of learning
II	Transform the state of educational practices with merit-based innovation

Table 4. Capstone (indirect) objective summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science*. IOs = Indirect Objectives.

IOs	Descriptors
I	Demystify generalizations and stigmas of student learning
II	Paradigm shift of mechanistic root metaphors that are deterministic in nature
II	Eliminate reductionistic assumption of high school learning

Barriers and Constraints

It is undeniable that global COVID-19 pandemic has drastically changed societal behaviours, values, and normalities on a systems-based level (Usher et al., 2020). While still being influenced by the dynamic nature of this disease, learning has drastically changed in the past year to accommodate for the safety of all learners and community members (Minkos & Gelbar, 2021). Within a year, the educational sector has been dismantled and reconstructed, under conflicting and changing parameters of governmental advice. With more and more students opting for alternative online education for the substitution of formal in-class learning, the disconnect of learning has systemically changed the nature of modern education (Daniel, 2020).

With many families influenced and pre-cautious of COVID-19, the retention of engaged student learning as attenuated (Drane, 2020). Classes are class and/or collapsed due to the withdraw of students. More apathy is growing, with many students *falling through the cracks* as attendance attenuates (Irawan et al., 2020). In addition, less social connections have also further disengaged the synthetic nature of online learning. All these barriers and constraints places limitations into the capstone of this project (Table 5.; Page 6).

In addition to all these limitations, the recent outbreak of COVID-19 in the Prince Rupert Community has further spread the disconnect among our community, placing almost first among BC communities affected by COVID-19. Emergency order to vaccinate all adults (18+) has been scheduled for the entire general public which may alleviate complications in the future.

Table 5. General limitation trends acknowledged during the global COVID-19 pandemic.

Limitations	Descriptors
I	Students and families are *falling through the cracks*
II	Learning apathy is on the rise
III	Stress is systematically increasing
VI	Attendance is dropping
V	Online engagement remains low
VI	Indigenous and marginalized community member disproportionality affected by the global pandemic

To move forward, acknowledgements of trauma must be the primary mindset of healing for so many wounded learners. A trauma-informed practice must take place to heal the trust, scares, and trauma of all victims. As part of this social-emotional journey to spiritual healing, a holistic approach that connects the mind, body, and soul should be the primary framework of reference when it comes to authentic recovery (Table 6.; Page 6). A combinatory trifecta of methodological practices from the Medicine Wheel, Response Trauma intervention (RTI), and Maslow's Hierarchy of Needs will be used to sensitively approach true healing and learning Appendix 5-7; Page 25-27).

Table 6. General limitation trends acknowledged during the global COVID-19 pandemic.

Acknowledgements	Descriptors
I	Many of our marginalized learners are hurt – emotionally and physically
II	Learning cannot happen before healing
III	Healing requires time

With these limitations and various confounding variables unaccounted for, this will directly affect the survey data of this capstone project. Based on these influences, the following affects may be noticed in the survey process and interpretation – outlined in Table 7. (Page 6).

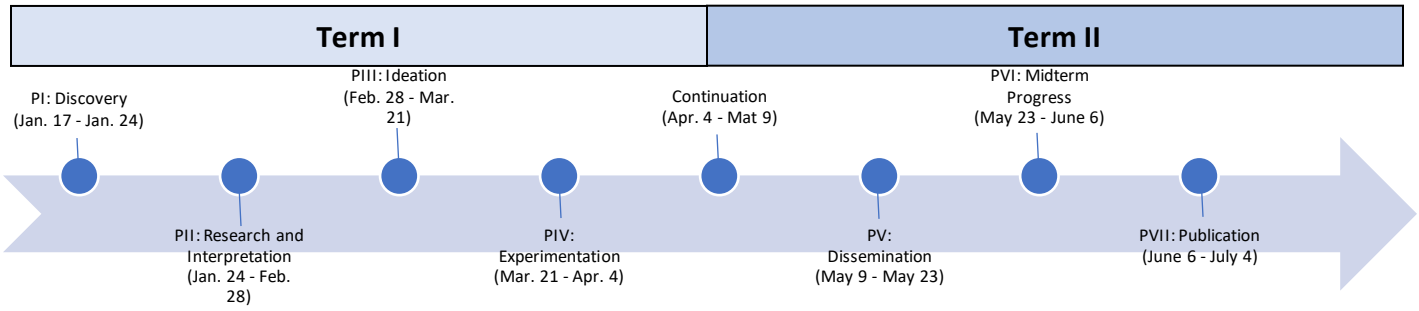
Table 7. Assumptive potential survey influences. PSIs = Potential Survey Influences

PSIs	Descriptors
I	An attenuation in survey participation
II	Skewed data representation of non-marginalized learners
III	Participant removal due to incompletion of survey process

Timeline Development

In Term I (January 2021 – May 2021), there are five phases: Phase I: Discovery, Phase II: Research and Interpretation, Phase III: Ideation and Phase IV: Experimentation; in Term II (May 2021-July 2021), there are three main consecutive phases: Phase V: Dissemination, Phase VI: Midterm Progress, and Phase VII: Publication (Figure 1., Page 7).

Figure 1. Infographic summary of capstone timeline, with time periods.



Since Phase I -III has already lapsed, a higher focus to mid and late phases will be summarizes in this proposal. During Phase IV: Experimentation, I will be interpreting the 33-questionnaire survey results. Statistical trends will be quantified using basic infographic displays to highlight correlations and outcomes. To comprehensively capture the findings, separate quantitative analyses of bar graphs and pie charts will be created to definitively identify trends. Due to the nature of this educational research, hard statistical testing that quantifies statistical significance will be omitted due to scope and complexity of this nature of standardized experimentation with the lack of control groups. Instead, preliminary trends will be reinforced and supplemented with anecdotal findings and meta-analysis comparison to literature review findings.

During PV: Dissemination period, the survey findings will be released. Anecdotal feedback will be collected from two levels of stakeholders: students, teachers, and parents. Anonymous pseduonames will be replaced to protect from digital identifies for anonymity. To ensure that there is no bias, participants that participated in the initial survey will not be eligible to participate in this process of the capstone project. Transcript responses will be recorded and organized based on theme.

During PVI: Midterm Progress, time will be taken to organize all findings into a comprehensive document that will lay the foundation for a science resource pack. An update of this progress will also be reported. This period will draft and finalize a complete an official report by the PVII: Publication phase.

Research Findings

Based on the literature review done by Yue (2021), the following conclusions were determined from *Paradigm Shift in Pedagogy: A Literature Review of Effective 21st Century Teaching Practices* (Figure 2.; Page 8) (Forthcoming; Page 8-9).

Figure 2. A transcript verbatim of conclusions derived from Yue's (2021) forthcoming release of *Paradigm Shift in Pedagogy: A Literature Review of Effective 21st Century Teaching Practices* (Page 8-9).

> "Research has [presented] many correlations that active learning reflects and scaffolds the learning needs, inclusion, and capabilities for a responsively dynamic and resilient opportunity of learning for learners *(modified by Phillips on March 12, 2021)*. Not only does this foster future societal innovation that is more attuned to system-based thinking to complex issues, students also gain the competencies of soft skill development that predicates mindful and critical change makers. This research indicates that traditional passive learning methodologies that are present within many school systems must adapt to a new paradigm of teaching to enhance, enrich, and transform the state of educational quality.
>
> The positive literature reviews of active learning methodology will help construct a new curricular framework for pedagogical practices in my personal and professional development of teaching resources to foster authentic learning experiences that resonates all learners. By selectively designing a universal framework that connects mind, body, and soul, student engagement, motivation, and inclusion will increase that extends beyond curricular learning. Through a holistic model that de-emphasizes standardization and individuality, students can be exposed to learning experience that intrinsically motivates oneself and others while strengthening soft-skill development and problem solving.

To scaffold my literature review findings, a holistic science unit plan will be created to accentuate methodological practices of Inquiry-based Learning, Eco-centric Learning, Traditional Ecological Knowledge and Practices, and Peer Learning. A combinatory approach will be integrated that intertwines each learner on a personal, social, cultural, and ecological scale, with an emphasis of local exploration and community stakeholder engagement. This resource will be attuned to the BC Ministry of Education guidelines of curricular framework and will a product summation of various stakeholders within my community."

References

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Marsh, T. N., Cote-Meek, S., Young, N. L., Najavits, L. M., & Toulouse, P. (2016). Indigenous healing and seeking safety: A blended implementation project for intergenerational trauma and substance use disorders. *International Indigenous Policy Journal*, *7*(2).

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Yue, M. (2021). Paradigm shift in pedagogy: A literature review of effective 21st century teaching practices. *Forthcoming Release.*

Appendix

Research Methodology

Appendix 1. A screen capture completion of Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2) from the Canadian Panel of Research Ethics (PRE). This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed.


PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Michael Yue

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: 1 March, 2020

Appendix 2. A screen capture Participant Consent Form (An Inquiry into the Educational Learning Needs of High School Students: Meta-Analysis of Students, Educators, and Community Members) from Michael Yue. This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed.

PARTICIPANT CONSENT FORM

AN INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS: META-ANALYSIS OF STUDENTS, EDUCATORS, AND COMMUNITY MEMBERS

RESEARCH OPPORTUNITY

As an emerging lifelong learner, opportunities of growth come in many forms – sometimes which could be hands-on learning, curricular instruction, problem solving, immersion, trial-and-error, etc. However, have you ever considered being an active research participant? In this unique opportunity, you can participate in Mr. Yue's research to provide insight into high school learning.

RESEARCH BACKGORND

In this research, Mr. Yue is curious about how student learn best. As a Master of Education (MEd) candidate in Sustainability, Creativity, and Innovation (SCI) from Cape Breton University (CBU) in the School of Education and Health, Mr. Yue's research proposal, *An Inquiry into the Educational Learning Needs of High School Students: Meta-analysis of Students, Educators, and Community Members* is a partial fulfillment for the ongoing graduate program. In this inquiry, Mr. Yue will be the primary researcher. To contact Mr. Yue, you can email michael.yue@sd52.bc.ca for an inquiry, if you have any questions about the study. My graduate supervisor at CBU for EDUC6800: Sustainability, Creativity, and Innovation Project is Dr. Christina Phillips, who may be contacted by email at Cristina_Phillips@cbu.ca.

PURPOSE AND OBJECTIVE

The purpose of this research project is to understand more about student learning at CHSS. The main goal of this study is to facilitate a survey as a reflection for your high school learning needs, styles, goals and success. Mr. Yue is interested if there is any relationship between the learning needs, styles, and pedagogy that influences the growth mindset of high school students. In this research, I will be using a non-invasive, non-intrusive, and anonymous questionnaire for statistically purposes, as a baseline for my inquiry. The findings from this preliminary survey will be used to create a sustainable, creative, and innovative science curriculum that is inclusive of the holistic needs of all learners.

PARTICIPANT CONSENT

Participation in this research project will be completely randomized to reduce outcome bias in this study. A public announcement (PA) will be stated at CHSS to inform the CHSS community about this research opportunity. This research is inclusive and does not discriminate against CHSS community member, and all participants are welcomed.

As a volunteer participant in this study, you may refuse to participate or withdraw your answers from the study at any time. If you do withdraw from the study, your survey data will be removed from the interview response data set and will be destroyed by overwriting the electronic file. I will record the points raised by each participant. Each participant will be anonymous by default to protect privacy. In addition to this, no identifiers will be released for publication other than age, sex, and status. Anonymous representatives will be assigned a number/pseudonym and will only be identified by that number/pseudonym in the transcripts of the focus group to ensure confidentiality.

RESEARCH BENEFITS

Education is about learning and transforming the quality of all life – whether it is laying vinyl flooring or understanding the economics of shipments on an international port – learning comes in many diverse and dynamic forms. Learning is ingrained in every aspect of all individuals. However, how can we truly determine if knowledge can be validated? Using the scientific method, research has played a crucial role into the inquiry of understanding more about our natural world. Participating in this research study may allow for academic, personal, and/or professional growth opportunities that reflects and aligns with the following learning outcomes:

1	Be part of a local research opportunity
2	Contribute in the collaborative educational literature of learning
3	Increase awareness, familiarity, and literacy of research design
4	Scaffold on learning from your local high school
5	Be able to have a student voice in teaching pedagogy

RESEARCH RISK

Participating in this research does not present any known or anticipated risks to any participants, as a voluntary survey is a non-invasive in nature. Survey questionnaires and interview responses will be protected through the use of pseudonyms. Commitment to participate in this study will be a minor limitation as there will be time allocation to participate in this research; however, the research methodology of this study designed that your participation will not be an onerous commitment (10 - 15 minutes).

RUMERATION

There is no remuneration for participating in this project.

ANONYMITY AND CONFIDENTIALITY

Protection of participant information will be respected on the highest academic and professional standard. To properly protect your all sensitive information, a multimodal approach will be in place to ensure minimal risk to all participants on a personal, social, and digital level. Anonymity of participation will be encrypted using pseudonyms. In addition, an oath of research confidentiality will be taken by Mr. Yue to ensure that all research data will not be discussed publicly to preventatively reduce impose risk to participants. All electronic documents will be privately encrypted with a password to block access, download and print sensitive data information; this information will permanently be deleted with no electronic traces, at the end of the inquiry. In addition, physical information will be shredded appropriately.

While the risk remains low with the imposed mitigation strategies and practices on anonymity and confidentiality, students may be able to recognize the familiarity of your writing style in short responses. Despite digitalizing the response process and removing calligraphy bias, some students may be able to recognize exemplar quotes/slang/statements in the final report.

SHARING RESULTS

When this study has fully adjourned, I will have the research report available on my website teachermryue.wixsite.com/mysite. In addition, a PA announcement will be available. Even though an exact date is not available for publication, the to be announced (TBA) month will be in late May of 2021.

CONSENT FOR INTERVIEW AND SURVEY QUESTIONNAIRES

If you are interested in participating in Mr. Yue's research, *An Inquiry into Educational Efficacy of Student Learning: Are Learning Styles Important at a High School Level?* physical documentation of participant verification will be required. By proceeding to the next section of this form, you will provide discrete intentions to participant, defer or abstain from the research process.

Your validated signature indicates that you fully understand and acknowledge the preconditions below:

No.	Question	Yes (Y) / No (N)	Initials
1	I have carefully read the information in this Participant Consent Form.		
2	Any inquiry/clarification questions were adequately addressed.		
3	I am aware I am fully autonomous of my actions and I can withdraw from this study at any time.		
4	I fully agree to participate in this research project		
5	I am conformable to complete a short face-to-face interview		
6	I have access to internet to complete the online survey questionnaires.		
7	I need accommodations to meet to needs of the interview and online survey questionnaires.		

No.	Question	Yes (Y) / No (N)	Initials
8	If accommodations are required, I have formally written my request in the space below:		
9	I would like to be contacted in the future by the researcher		
10	I am fully aware of confidentiality and anonymity of this research; the privacy of the research interview and questionnaires will be kept secretive from the public.		

I_____have validated that the above information is accurate and reflect my personal intentions.

PARTICIPANT

Name:_____ Date:_____

Email: _____ Signature: _____

SUPERVISOR

Name:_____ Date:_____

Email: _____ Signature: _____

ALL INFORMATION COLLECTED IN THIS PROCESS WILL BE **COMPLETELY ANONYMOUS** AND PUBLICATIONS WILL OF SURVEY DATA WILL **NOT USE PERSONAL IDENTIFIERS**. ONLY MR. YUE WILL BE ABLE SEE PRIMARY DATA.

Appendix 3. A screen capture completion of Cape Breton University's (CBU's) Confirmation of Support from Collaborating Organization from Michael Yue, Dr. Christina Phillips, and Carla Rourke. This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed.

Cape Breton University
School of Professional Studies

Cape Breton University
Department of Education
P.O. Box 5300
1250 Grand Lake Road
Sydney Nova Scotia, Canada
B1P6L2

Confirmation of Support from Collaborating Organization

Project Title	AN INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS: META-ANALYSIS OF STUDENTS, EDUCATORS, AND COMMUNITY MEMBERS
Project Lead (student name)	Michael Yue
Contact Information	michael.yue@sd52.bc.ca

Instructor	Dr. Christina Phillips
Course	EDUC6800: Education for Sustainability Project
Contact Information	1250 Grand Lake Rd., Cape Breton University, Sydney, NS. christina_phillips@cbu.ca

Supervisor/Head of Collaborating Organization	
Name	Carla Rourke
Position	Principal
Organization	School District #52
Contact email/phone	Carla.rourke@sd52.bc.ca

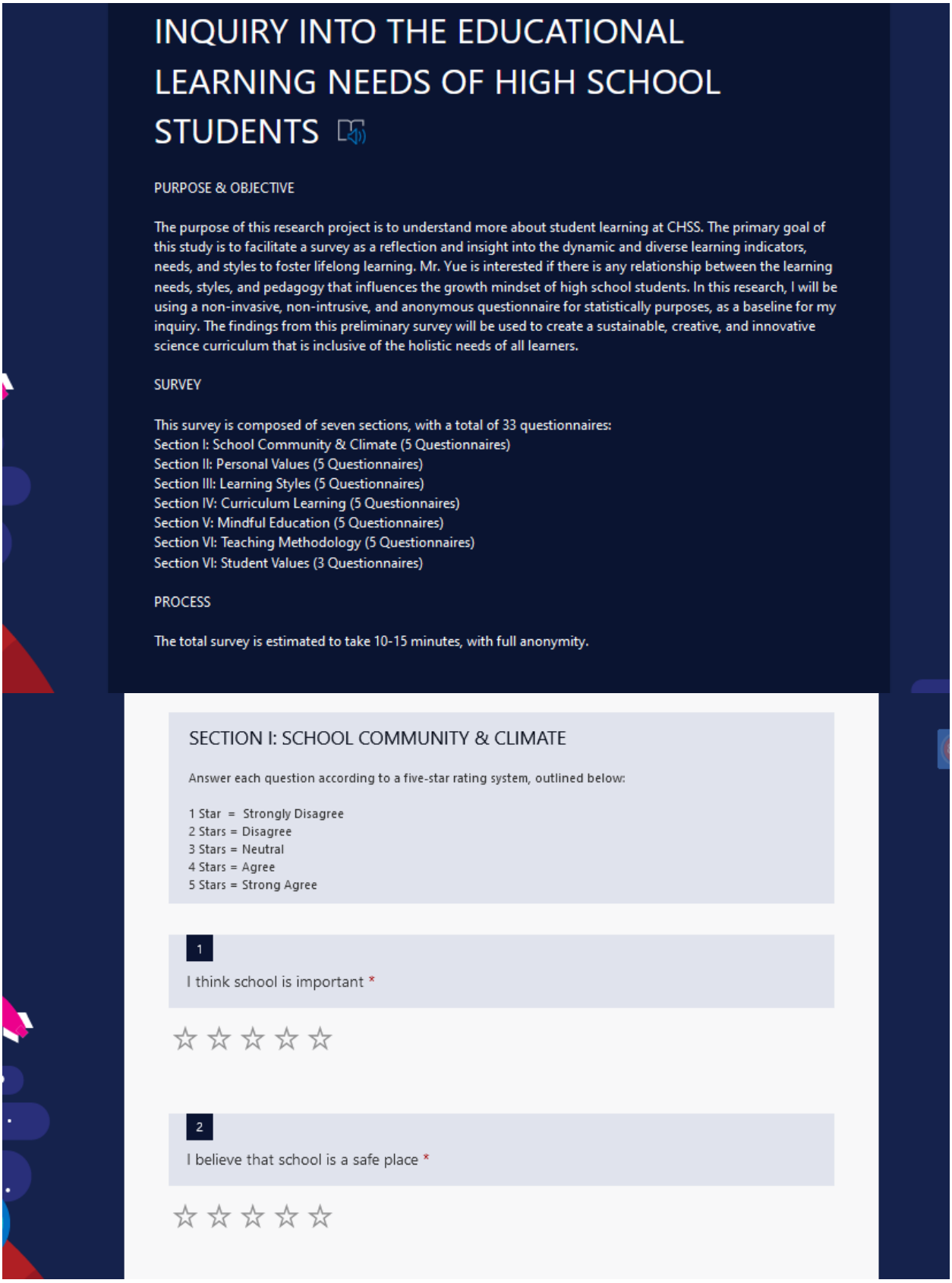
- I confirm that the school administration (or division head/management) is aware and fully supports the proposed applied research project.

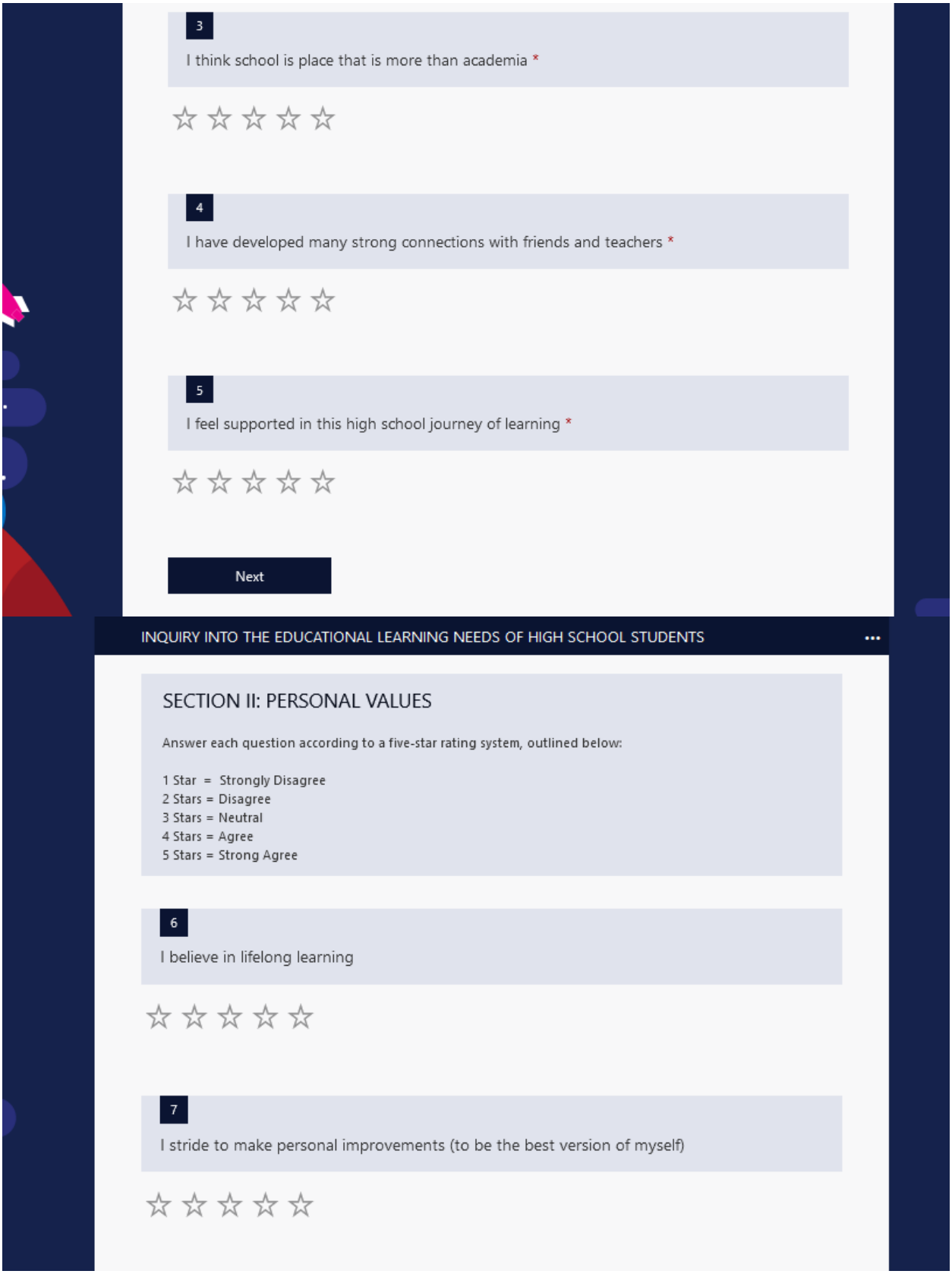
Name: Carla Rourke Position: Principal

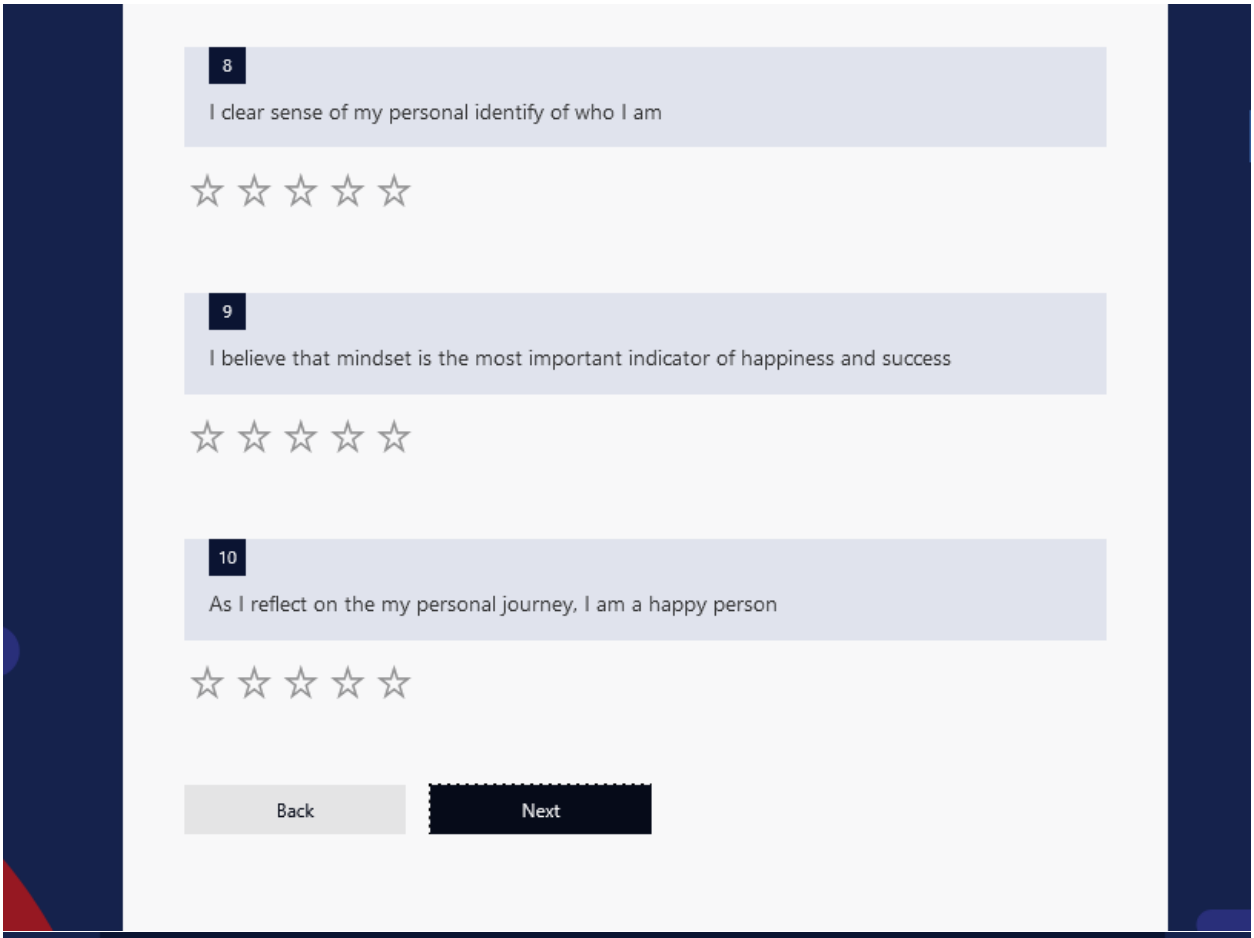
Signature Date: Mar. 14, 2021

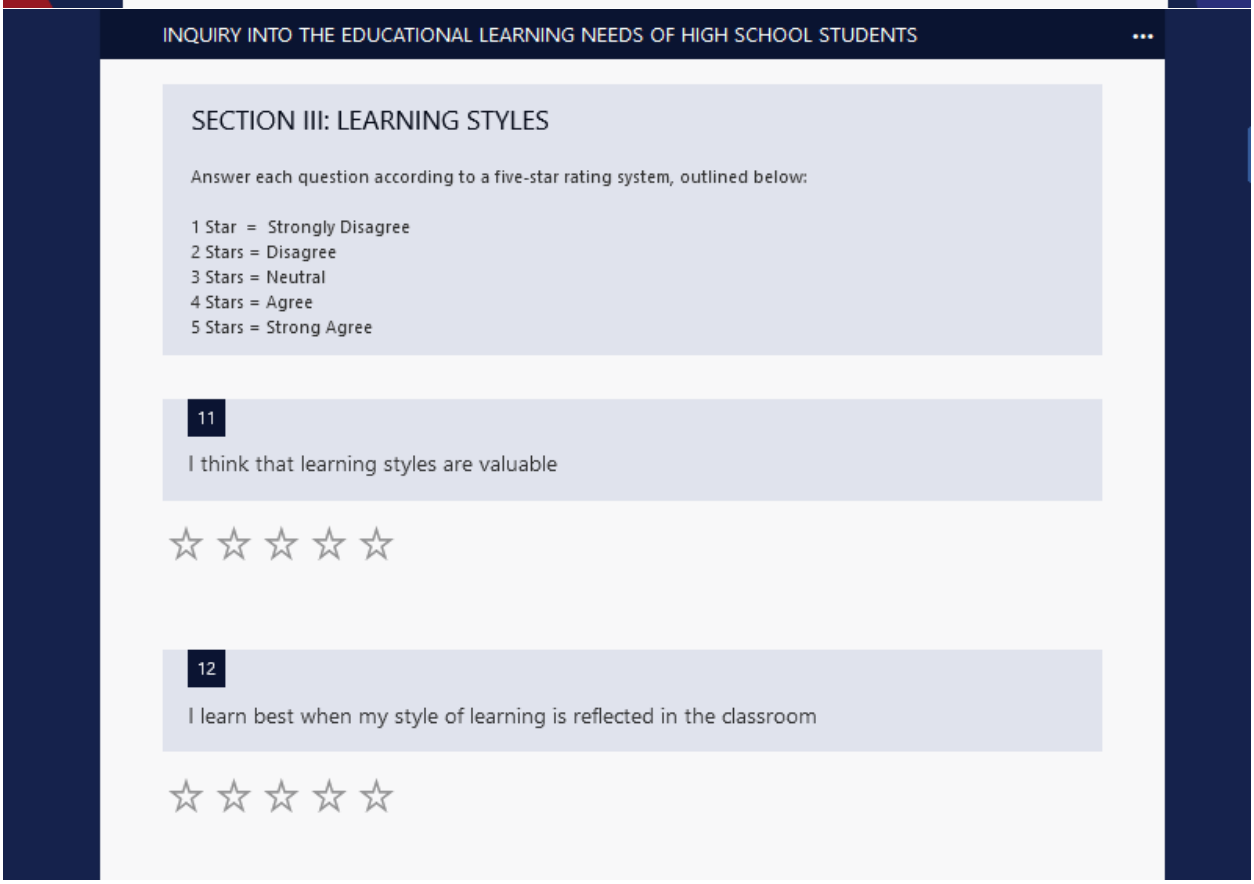
(Head Department/Division) *(year/month/day)*

Appendix 4. A screen capture of survey questionnaires designed by Michael Yue for capstone project (An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum). This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed.




3
I think school is place that is more than academia *
4
I have developed many strong connections with friends and teachers *
5
I feel supported in this high school journey of learning *
Next
INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS
SECTION II: PERSONAL VALUES
Answer each question according to a five-star rating system, outlined below:
1 Star = Strongly Disagree
2 Stars = Disagree
3 Stars = Neutral
4 Stars = Agree
5 Stars = Strong Agree
6
I believe in lifelong learning
7
I stride to make personal improvements (to be the best version of myself)


8
I clear sense of my personal identify of who I am
9
I believe that mindset is the most important indicator of happiness and success
10
As I reflect on the my personal journey, I am a happy person
Back
Next


INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS
SECTION III: LEARNING STYLES
Answer each question according to a five-star rating system, outlined below:
1 Star = Strongly Disagree
2 Stars = Disagree
3 Stars = Neutral
4 Stars = Agree
5 Stars = Strong Agree
11
I think that learning styles are valuable
12
I learn best when my style of learning is reflected in the classroom

13

If the teacher knew what type of learner I was, I think my education would be reflective of my understanding

☆ ☆ ☆ ☆ ☆

14

In a courses, my teachers will try to use different learning styles to teach material (visual, auditory, social, etc.)

☆ ☆ ☆ ☆ ☆

15

I believe that all students are able to succeed, regardless of their learning styles

☆ ☆ ☆ ☆ ☆

Back Next

INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS

SECTION IV: CURRICULUM LEARNING

Answer each question according to a five-star rating system, outlined below:

1 Star = Strongly Disagree
2 Stars = Disagree
3 Stars = Neutral
4 Stars = Agree
5 Stars = Strong Agree

Definitions:
Autonomy = Independence / Freedom
Soft Skills = Broad, practical skills
Hard Skills = Specific knowledge / ability
Standardized testing = Administered test taking

16

I wish there was more hands-on-learning opportunities

☆ ☆ ☆ ☆ ☆

17

I want more autonomy to be creative and innovative in my learning progress

☆ ☆ ☆ ☆ ☆

18

I believe that teaching should reflect the 21st century

★ ☆ ☆ ☆ ☆

19

I want to learn more soft skills rather than traditional hard skills taught in education

☆ ☆ ☆ ☆ ☆

20

I believe that a decrease in standardized testing will benefit a learners

☆ ☆ ☆ ☆ ☆

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INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS ...

SECTION V: MINDFUL EDUCATION

Answer each question according to a five-star rating system, outlined below:

1 Star = Strongly Disagree
2 Stars = Disagree
3 Stars = Neutral
4 Stars = Agree
5 Stars = Strong Agree

21

I feel like everyone would benefit from a combination approach that reflects different teaching styles

☆ ☆ ☆ ☆ ☆

22

I believe that frequent feedback is important for an effective learning process

☆ ☆ ☆ ☆ ☆

23

I enjoy activities which are low-risk

☆ ☆ ☆ ☆ ☆

24

I believe that students should have the capabilities to remaster concepts for grading

☆ ☆ ☆ ☆ ☆

25

I believe that classroom community and climate sets the tone for learning

☆ ☆ ☆ ☆ ☆

Back Next

INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS ...

SECTION VI: TEACHING METHODOLOGY

Answer each question according to a each choice-based questionnaire.

Definitions:
Experiential Learning = Learning through actions / experiences
Transformative Learning = Learning that resonates / influences the mind on a deep level
Holistic Learning = System-based learning that involves many aspects
Collaborative Learning = Learning through human interactions

26

I think the following are important (check all that applies):

- ○ Experiential Learning
- ○ Transformative Learning
- ○ Holistic Learning
- ○ Collaborative Learning
- ○ All of the above

27

I want a curriculum that is mindful and inclusive of

- Diversity
- Mental health
- Practical learning
- Learning needs
- All of the above

28

I wish learning was more

- Engaging
- Spontaneous
- Adventurous
- Reflective
- All of the above

29

I really enjoy

- Sharing my thoughts to the class community
- Listening to stories
- being exposed to different perspectives
- be included in the learning process
- All of the above

30

I worry the most about

- My grades
- My anxiety
- My social impressions
- My ability to fit in
- Other

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INQUIRY INTO THE EDUCATIONAL LEARNING NEEDS OF HIGH SCHOOL STUDENTS

SECTION VII: STUDENT VALUES

31

In one word, what does education mean to you?

Enter your answer

32

Associated with this questionnaire, there are four learning images displayed. Identify which picture resonates with you. Which of the following image represent what you hope education will look like.

Image I (Top Left)
Image II (Top Right)
Image III (Bottom Left)
Image IV (Bottom Right)

- ○ Image I
- ○ Image II
- ○ Image III
- ○ Image IV

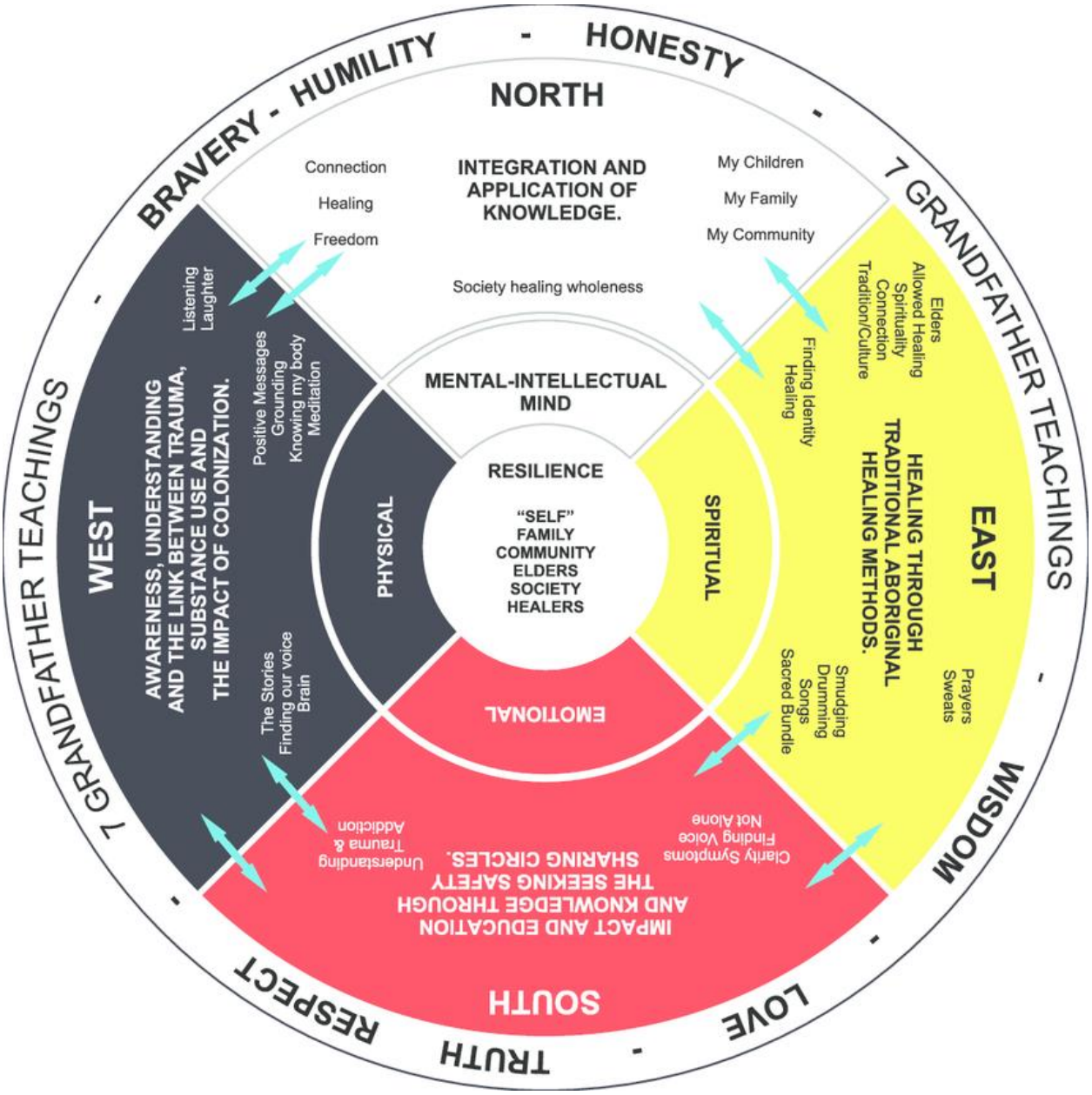
33

Continuing from Questionnaire 32 (above), why did you choose your option? Answer Questionnaire 33 in 1-2 sentences.

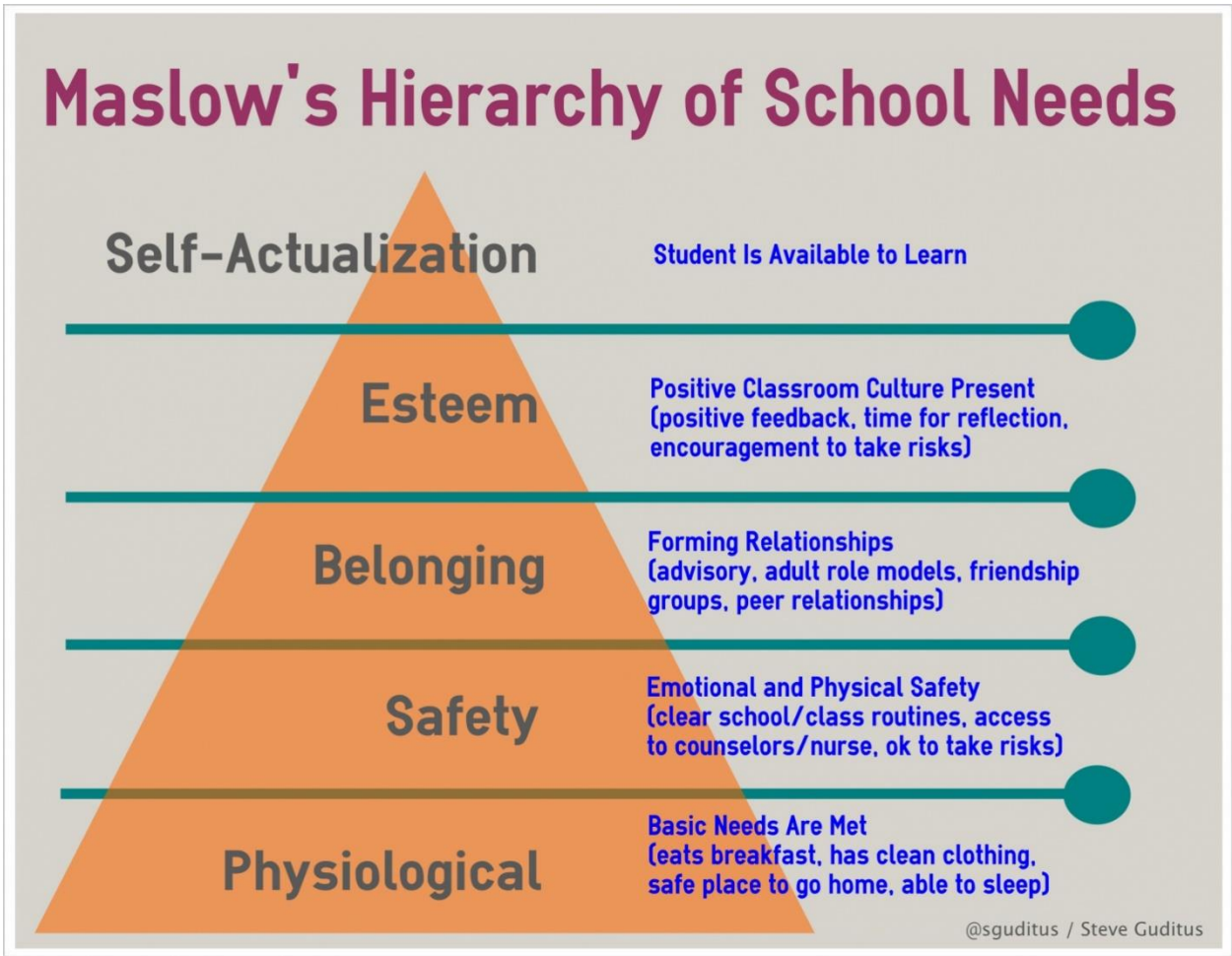
Enter your answer

Back Submit

Appendix 5. A screen capture of a Medicine Wheel Model for Healing by Marsh et al. (2016). This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed.



Appendix 6. A screen capture of Maslow's Hierarchy of School Needs by Guditus (2013). Retrieved from http://sguditus.blogspot.com/2013/02/maslows-hierarchy-of-school-needs-steve.html. This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed



Appendix 7. A screen capture of a Social and Emotional Learning model by CASEL (2020). Retrieved from https://casel.org/what-is-sel/. This digital screen capture is for educational purposes only and shall not be modified, copied, or distributed

PREMINILARY FINDINGS

As the project progress, a self reflection was conducted to evaluate and determine the relative assumptions of parameter metrics that were in place during this capstone project. A review of general acknowledgements and limitations have been provided a reflection of my anecdotal findings.

Table 1. Capstone goal summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science.* E = Emerging Progress Goal; A = Approaching Progress Goal; M = Meeting Progress Goal. [Revised May 21, 2021].

Goals	Descriptors	EPG	APG	MPG
Primary	To facilitate a survey as a reflection and insight into the dynamic and diverse learning indicators, needs, and styles to foster lifelong learning			X
Secondary	To be able to recognize the diverse spectrum of learners when creating a framework for learning			X
Tertiary	To analyze literature findings to preliminary survey data for interpretational purposes		X	
Quaternary	To apply theory-based findings to professional practice in the form of curriculum development and personal teaching	X		

Table 2. Capstone (indirect) objective summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science.* DOs = Direct Objectives. E = Emerging Progress Goal; A = Approaching Progress Goal; M = Meeting Progress Goal. [Revised May 21, 2021].

Dos	Descriptors	EPG	APG	MPG
I	Create stakeholder inclusion into the curricular and pedagogical development of teaching practices			X
II	Provide educators an insight into student perception of learning			X
II	Transform the state of educational practices with merit-based innovation	X		

Table 3. Capstone (indirect) objective summary for *An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science.* IOs = Indirect Objectives. E = Emerging Progress Goal; A = Approaching Progress Goal; M = Meeting Progress Goal. [Revised May 21, 2021].

IOs	Descriptors	EPG	APG	MPG
I	Demystify generalizations and stigmas of student learning			X
II	Paradigm shift of mechanistic root metaphors that are deterministic in nature		X	
II	Eliminate reductionistic assumption of high school learning			X

Table 4. General limitation trends acknowledged during the global COVID-19 pandemic. E = Emerging Progress Goal; A = Approaching Progress Goal; M = Meeting Progress Goal. [Revised May 21, 2021].

Limitations	Descriptors	EPG	APG	MPG
I	[Some] [s]tudents and families are *falling through the cracks*		X	
II	Learning apathy is on the rise			X
III	Stress is systematically increasing			X
VI	Attendance is dropping			X
V	Online engagement remains low			X
VI	Indigenous and marginalized community member disproportionality affected by the global pandemic			X

Table 5. General limitation trends acknowledged during the global COVID-19 pandemic. E = Emerging Progress Goal; A = Approaching Progress Goal; M = Meeting Progress Goal. [Revised May 21, 2021].

Acknowledgements	Descriptors	EPG	APG	MPG
I	Many of our marginalized learners are hurt – emotionally and physically			X
II	[Authentic] [l]earning cannot happen before healing	X		
III	Healing requires time			X

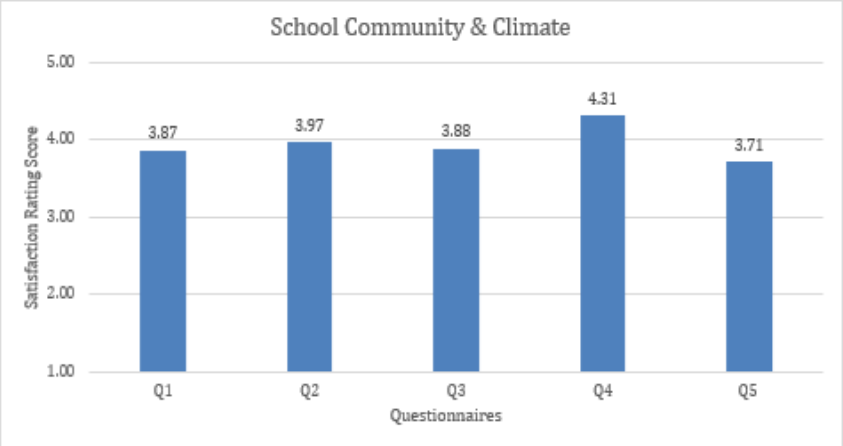
CONSTRAINTS & BARRIERS

Table 7. Summary chart of representational and logistical constraints and barriers.

REPRENSENTATIONAL	LOGISTICAL
▪ Collaboration timing and scheduling is very difficult due to the dynamic nature of all stakeholders (Meetings often have to be planned in a few weeks → standby time which challenges planning process and timeline) ▪ Rescheduling of stakeholders due to unexpected circumstances (Delay process and progress) ▪ Fluidity of stakeholder communication often conflicts with the rigidity of timeline structure established	▪ Very time consuming and I have underestimated the amount of work needed for resource gathering (behind of schedule); ▪ Working a full-time job, in addition to personal commitments makes it difficult to do have time to squeeze in work (stress) ▪ Working as a District Itinerant provides more inflexibility due to the nature of my work which de-structures my planning process (last two months I was teaching Physics 11 by scratch, with only one day notice → more prep time + stress → changes MEd plans and allocation)

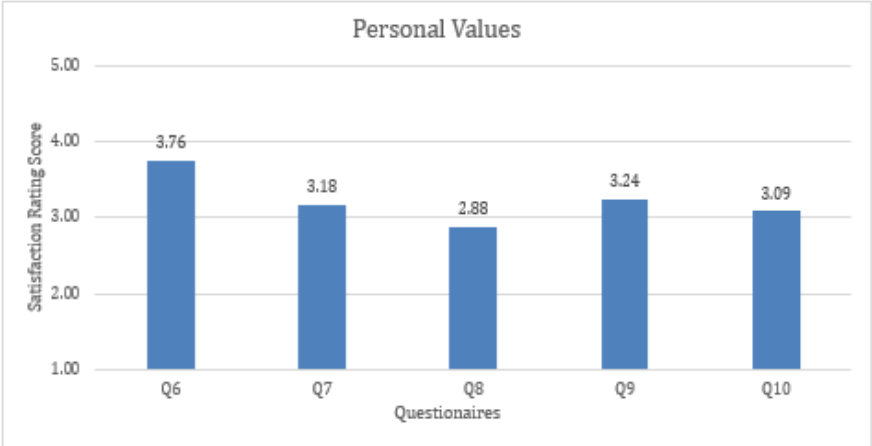
SURVEY FINDINGS

Preliminary Surveys have found a strong correlation between student aptitude and experiential learning. A sample size of 56 CHSS students were used for analytic purposes to create visual graphs of survey findings. Each partition of survey questionnaires were segmented to create more dynamic visuals that pertain to a specific parameter of learning.



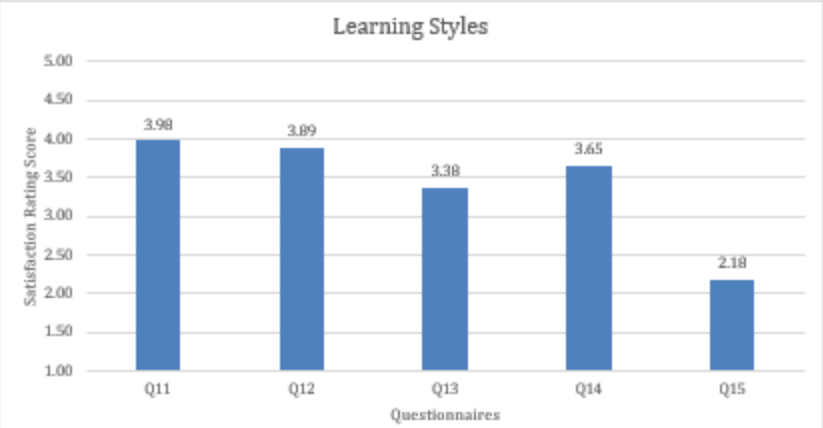
Questionnaire	Statement	SSR
Q1	I think school is important	3.87
Q2	I believe that school is a safe place	3.97
Q3	I think school is place that is more than academia	3.88
Q4	I have developed many strong connections with friends and teachers	4.31
Q5	I feel supported in this high school journey of learning	3.71

Figure 1. Preliminary survey data of "Section I: School Community & Climate" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). A Satisfaction Rating Score (SRS) from a scale of 1 to 5 is used in this survey, with 1 signifying strongly disagree, 2 signifying disagree, 3 signifying neutral, 4 signifying agree, and 5 signifying strongly agree. An average of SRS is displayed (N = 56).



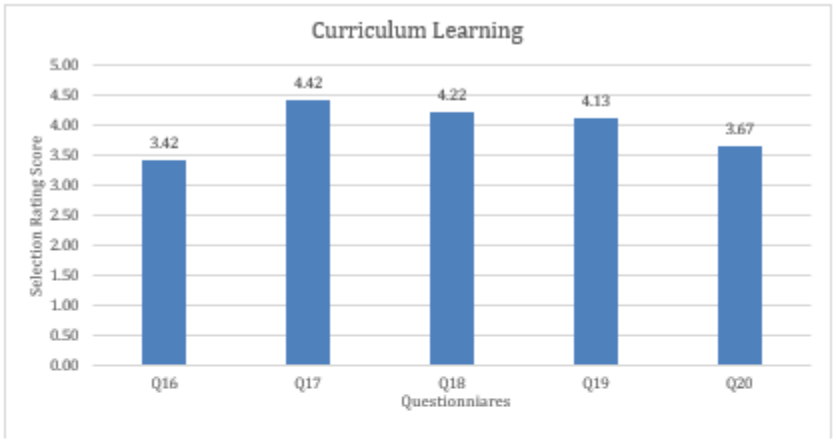
Questionnaire	Statement	SSR
Q6	I believe in lifelong learning	3.76
Q7	I stride to make personal improvements (to be the best version of myself)	3.18
Q8	I clear sense of my personal identify of who I am	2.88
Q9	I believe that mindset is the most important indicator of happiness and success	3.24
Q10	As I reflect on my personal journey, I am a happy person	3.09

Figure 2. Preliminary survey data of "Section II: Personal Values" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). A Satisfaction Rating Score (SRS) from a scale of 1 to 5 is used in this survey, with 1 signifying strongly disagree, 2 signifying disagree, 3 signifying neutral, 4 signifying agree, and 5 signifying strongly agree. An average of SRS is displayed (N = 56).



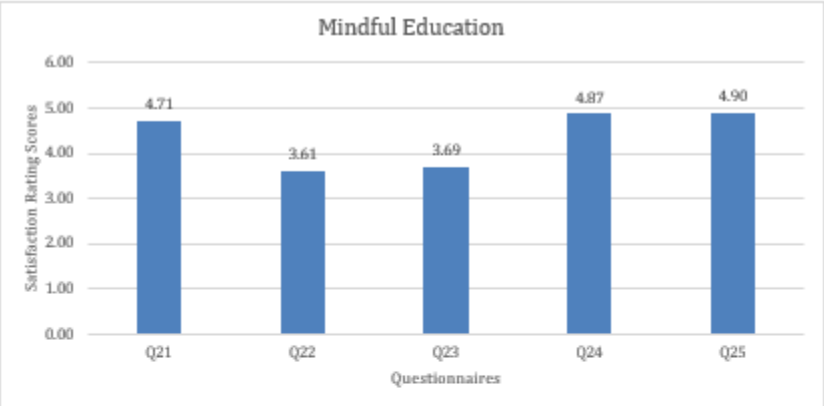
Questionnaire	Statement	SSR
Q11	I think that learning styles are valuable	3.98
Q12	I learn best when my style of learning is reflected in the classroom	3.89
Q13	If the teacher knew what type of learner I was, I think my education would be reflective of my understanding	2.38
Q14	In a course, my teachers will try to use different learning styles to teach material (visual, auditory, social, etc.)	3.65
Q15	As I reflect o I believe that all students are able to succeed, regardless of their learning styles in my personal journey	2.18

Figure 3. Preliminary survey data of "Section III: Learning Styles" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). A Satisfaction Rating Score (SRS) from a scale of 1 to 5 is used in this survey, with 1 signifying strongly disagree, 2 signifying disagree, 3 signifying neutral, 4 signifying agree, and 5 signifying strongly agree. An average of SRS is displayed (N = 56).



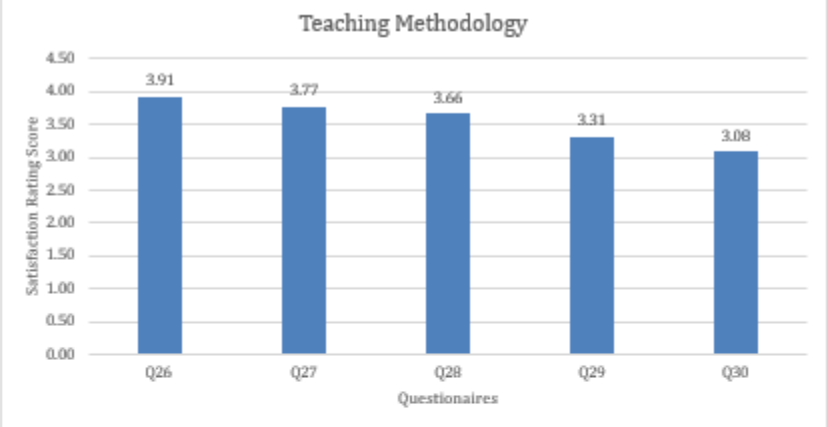
Questionnaire	Statement	SSR
Q16	I wish there was more hands-on-learning opportunities	3.42
Q17	I want more autonomy to be creative and innovative in my learning process	4.42
Q18	I believe that teaching should reflect the 21st century	4.22
Q19	I want to learn more soft skills rather than traditional hard skills taught in education	4.13
Q20	I believe that a decrease in standardized testing will benefit all learners	3.67

Figure 4. Preliminary survey data of "Section IV: Curriculum Learning" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). A Satisfaction Rating Score (SRS) from a scale of 1 to 5 is used in this survey, with 1 signifying strongly disagree, 2 signifying disagree, 3 signifying neutral, 4 signifying agree, and 5 signifying strongly agree. An average of SRS is displayed (N = 56).



Questionnaire	Statement	SSR
Q21	I feel like everyone would benefit from a combination approach that reflects different teaching styles	4.71
Q22	I believe that frequent feedback is important for an effective learning process	3.61
Q23	I enjoy activities which are low-risk	3.69
Q24	I believe that students should have the capabilities to remaster concepts for grading	4.87
Q25	I believe that classroom community and climate sets the tone for learning	4.90

Figure 5. Preliminary survey data of "Section V: Mindful Education" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). A Satisfaction Rating Score (SRS) from a scale of 1 to 5 is used in this survey, with 1 signifying strongly disagree, 2 signifying disagree, 3 signifying neutral, 4 signifying agree, and 5 signifying strongly agree. An average of SRS is displayed (N = 56).



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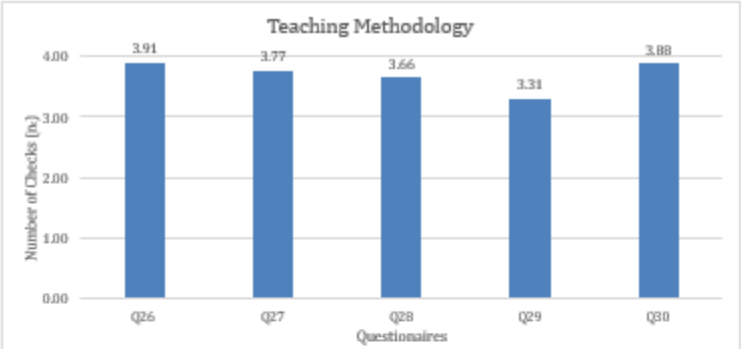

Questionnaire	Statement (Check all that applies)		SSR
Q26	I think the following are important:		3.91
	Experiential Learning	Transformative Learning	
	Holistic Learning	Collaborative Learning	
Q27	I want a curriculum that is mindful and inclusive of		3.77
	Diversity	Mental Health	
	Practical Learning	Learning Needs	
Q28	I wish learning was more		3.66
	Engaging	Spontaneous	
	Adventurous	Reflective	
Q29	I really enjoy		3.31
	Sharing my thoughts to the class community	Listening of stories	
	Being exposed to different perspectives	Be included in the learning process	
Q30	I worry the most about		3.88
	My grades	My Anxiety	
	My ability to fit in	Other	

Figure 6. Preliminary survey data of "Section VI: Teaching Methodology" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). Number Checks (n_c) are used as a quantified measure for student, with a range from 1 – 4. An average of n_c is displayed (N = 56).

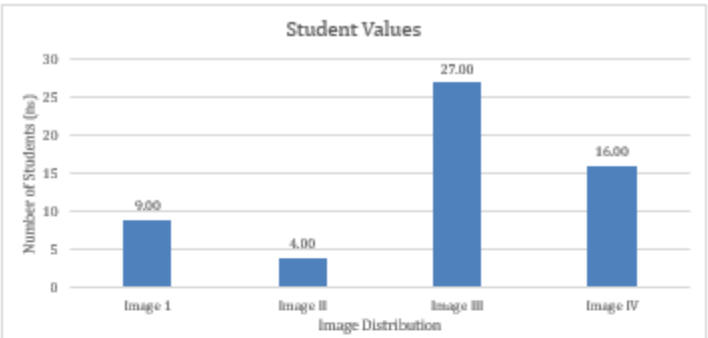

Image I	Image II	Image III	Image IV
			

Image	Number of students	Fraction Representative	Percent distribution (%)
I	9	9 / 56	16.07
II	4	4 / 56	7.14
III	27	27 / 56	48. 21
IV	16	16 / 56	28.57

Figure 7. Preliminary survey data of "Section VII: Student Values" from a CBU capstone project, "An Inquiry into the Educational Learning Needs of High School Students: Professional Development of a Reflexive, Reflective, and Transformative Science Curriculum" by Yue (forthcoming). Number Checks (n_c) are used as a quantified measure for student alignment for Q33. A cumulative total of n_s is displayed (N = 56).

LEARNING FROM ANECDOTES AND DATA

There are 20 principles which I learned from my findings:

Principle (P)	Descriptor
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
P05	Students require social emotional learning supports to foster a sense of self and belonging
P06	Learning should be interdisciplinary and interconnected
P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
P08	Diversity and background of all students should be represented and brought into the classroom ecosystem
P09	Response Trauma Intervention (RTI) is about healing and supporting the soul rather than victimizing and resurging traumatic triggers
P10	Indigenous learning is good for indigenous learnings and all learners
P11	*Adaawx* can teach us stories that embodies preservation, conservation, cultural traditional, and eco-over-ego modernity.
P12	Classrooms should be an extension of our surrounding ecosystem, not a microclimate that is isolated from the natural system
P13	Think global, act local to transform and re-connect youth to their land
P14	Soft skill development by doing can be more important than hard-skill mastery of theory-based concepts
P15	To foster creativity and innovation, collective collaboration is needed to exchange different perspectives of tackling a dynamic problem
P16	Mindful practices will foster mindful lifestyles
P17	Traditional Ecological Knowledge and Wisdom (TEKW) should be an essential dogma of sustainability
P18	Very moment, especially in nature, is a teachable moment that extends beyond a time and instance
P19	Trust is a process that intrinsically bears no judgment
P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

RESEARCH APPLICATIONS

My inquiry journey to student learning has re-invigorated, reclarified, and validated neo-pedagogical practices that are transformative in nature which phases from the traditional paradigm of knowledge-based learning. Based on the synthesized principles (from page 35), I have curated a resource catalog of activities which can be used for Environmental Science 11, specific to the BC curriculum. With plethora of personal dedication placed in the browsing, reading, analyzing, and sifting process, both physically and digitally, I have chosen the following pedagogical resources to highlight a holistic representation that I believe would resonate with my community of indigenous and non-indigenous learners.

RESOURCE CURATION I	
Activity Sequence	No. 1
Title	Community Organizing to Develop a Healthy Environment
Source	MSU. (n.d.) Community Organizing to Develop Healthy Environments: A Web of Connections Activity. *Mississippi State University Leadership and Health*. Retrieved from http://extension.msstate.edu/publications/community-organizing-develop-healthy-environments-web-connections-activity. Publication Number: P3093.
Page	37 - 40
Modification	Add subject/topic matter if needed – discrimination based on teacher

REPRESENTED PRINCPLES (YELLOW)	
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
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MISSISSIPPI STATE UNIVERSITY EXTENSION

Community Organizing to Develop Healthy Environments

A Web of Connections Activity

Introduction to the Web of Connections

This activity enables participants to recognize the interconnectedness of their professions and communities and the vital roles they each play in addressing key issues.

Groups and teams benefit from a variety of perspectives and insights. When each group member brings experiences and expertise to their group, the whole group or team emerges with a more complete and robust result or solution. This **multidisciplinary** approach helps groups solve problems in a more holistic and comprehensive way.

The Web of Connections exercise is designed to help participants better understand and visualize the relationships between their different areas of experience and expertise as it relates to their group or team's purpose. This Web of Connections activity, regardless of the issue being addressed or the nature of the group, is a great way to get the creative and innovative juices flowing! This activity is suitable for groups 12 years of age and older.

Materials Needed

- A ball of yarn
- Scissors
- Signs/objects that represent academic disciplines, professions, social issues, resources, parts of systems, etc. (See table on page 4.)
- Space for participants to sit or stand in a circle

Instructions

✓ The facilitator will explain to participants the focus of the activity. Participants should collaborate and think critically on how the components or roles relate to each other.

✓ Form a circle so participants are facing one another.

✓ Give each individual one of the signs or objects that symbolize the perspective or issue they are to represent in the activity. This activity is ideal for groups of 12 but can be adapted for smaller or larger groups. If the group size is larger than the number of roles, have participants work in groups; if it is smaller, eliminate roles or have individuals play more than one role.

✓ Any participant can begin making connections; however, the facilitator may want to start to demonstrate how the activity should work.

- ✓ The first person or group will start with the ball of yarn and explain to everyone the details of their assigned component/role (represented by the sign or object).
- ✓ While holding onto the string, the first person will pass the ball of yarn to another person or group with a sign or object.
- ✓ The next person or group then will explain the details of their topic, as well as how theirs is *connected* to the group before them. The first connection of the web is now made.
- ✓ Continue to pass the ball of yarn until everyone has presented their connection, and then cut the string.

  **Note that participants can mention how their topic relates to several of the previously presented ones. For instance, the fourth component/role can be connected with the third, second, or first.*

- ✓ Lastly, the audience may take the time to discuss the connection made during the activity. A few examples of discussion questions include:
  1. What other connections are possible that have not been made?
  2. What connections were the most obvious?
  3. What connections surprised you?
  4. How does this exercise influence your feelings about _____?
  5. Which additional roles or issues could be added to the web?
  6. Do you feel like more can be accomplished when groups/interdisciplinary teams are formed? Why or why not?
  7. How can the connections represented here today help solve problems? Could they complicate issues even further?
  8. How can you use what you learned during this activity?

2

Want to expand this activity and make it a multisession set of experiences?

If time permits, students can apply this activity to another specific topic area they are studying. Students may research components and/or professions within that area, and then lead their own Web of Connections activity. Another way to expand this activity is to host a follow-up discussion panel featuring professionals within the field. These additional activities can help students think more independently and gain a deeper perspective of the topic.

To help you facilitate your own Web of Connections activity, we have provided examples for the following topics:

- Community Organizing **(MSU Extension Publication 3093)**
- Global and Domestic Issues with Hunger **(MSU Extension Publication 3136)**
- Interprofessional Aspects of Healthcare **(MSU Extension Publication 3137)**

Each Web of Connections activity also includes an evaluation form for facilitators to obtain participants' feedback.

Community Organizing to Develop Healthy Environments

Various individual, environmental, and relational factors may impact the health of a community and its residents. Such factors are referred to as *social determinants of health.* Community organizing, a process of identifying community needs and securing resources necessary to address selected issues, offers community members an opportunity to create health-promoting environments toward witnessed improvements in health outcomes and quality of life for residents.

Community organizing consists of a multidisciplinary approach including participation from stakeholders, gatekeepers, doers, and influencers. Stakeholders are people who are impacted by the community issues of interest and will be affected by efforts to change the selected issues. Gatekeepers can determine access to stakeholders and make decisions about community activities. Examples may include but are not limited to teachers, principals, and superintendents (for access to students and their parents/families), and pastors and church leaders (for access to congregants). Doers are community members who are willing to actively engage in efforts to plan, implement, and sustain change efforts. Influencers may be less active in change efforts than doers but have social capital and can garner support of gatekeepers and other key leaders in the community. Note that these roles are overlapping, as people may serve various roles within a community.

For a sample scenario using different community roles to develop healthy environments, see page 4.

Web of Connections Evaluation Survey

Workshop: *Community Organizing to Develop Healthy Environments*

Facilitator: _____

Date: _____ County: _____

Group participating in the activity: _____

Please indicate your response to each item:

	Strongly Disagree (SD)	Disagree (D)	Neutral (N)	Agree (A)	Strongly Agree (SA)
This activity…					
a. related to my needs.					
b. was understandable.					
Participating in this activity was worth my time.					
I would recommend this activity to others.					
My knowledge increased about how people are connected, in general.					
My knowledge increased about how social determinants can impact the health of a community.					
My understanding of addressing the health of the community through organizing roles of stakeholders and gatekeepers has increased.					
I will tell others what I learned through this activity about the web of connections of community organizing.					

RESOURCE CURATION II	
Activity Sequence	No. 2
Title	Hug a Tree
Source	**AOC. (n.d.). Hug a tree. *Arete Outdoor Centre.* Retrieved from** https://www.aretecentre.co.uk/wp-content/uploads/2020/05/hug-a-tree-compressed.pdf.
Page	42
Modification	Add subject/topic matter if needed – discrimination based on teacher

REPRESENTED PRINCPLES (YELLOW)	
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
P05	Students require social emotional learning supports to foster a sense of self and belonging
P06	Learning should be interdisciplinary and interconnected
P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
P08	Diversity and background of all students should be represented and brought into the classroom ecosystem
P09	Response Trauma Intervention (RTI) is about healing and supporting the soul rather than victimizing and resurging traumatic triggers
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P12	Classrooms should be an extension of our surrounding ecosystem, not a microclimate that is isolated from the natural system
P13	Think global, act local to transform and re-connect youth to their land
P14	Soft skill development by doing can be more important than hard-skill mastery of theory-based concepts
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P18	Very moment, especially in nature, is a teachable moment that extends beyond a time and instance
P19	Trust is a process that intrinsically bears no judgment
P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

OUTDOOR ACTIVITIES

ARETE OUTDOOR CENTRE

Hug a Tree

Playing in the woods for all ages. Through trusting your partner it supports emotional wellbeing and empathy to guide carefully. Family interaction.

Health and Wellbeing

Understand link between physical and emotional well-being.

Time:
30 min plus

Space:
Park / Forest

Equipment:
Improvised Blindfold

Find an area where there is a good selection of trees close together. Maybe walk to a local park, there may even be somewhere on the way.

Activity:

1. One person is blindfolded, you can use a hat, scarf or hooded top back to front.
2. Their partner is to lead them towards a tree, unknown to them.
3. Upon meeting the tree the blindfolded participant needs to memorise size, shape, texture, location and any other features.
4. They are then returned to the starting point, still blindfolded.
5. The challenge is to relocate the tree they just met, and hugged.
6. Take turns to swap roles and hug other trees.

Notes:
Make it more challenging by taking a more convoluted route before arriving at the tree to hug.
Adapt to identify trees with bare feet, instead of hands.

Referenced from www.getoutwiththekids.co.uk

www.aretecentre.co.uk

Learning through adventure

RESOURCE CURATION III	
Activity Sequence	No. 3
Title	First Peoples' Principles of Learning
Source	FNESC. (n.d.). First People Principles of Learning. *First Nation Education Steering Committee*. Retrieved from http://www.fnesc.ca/wp/wp-content/uploads/2015/09/PUB-LFP-POSTER-Principles-of-Learning-First-Peoples-poster-11x17.pdf.
Page	44
Modification	Add subject/topic matter if needed – discrimination based on teacher

REPRESENTED PRINCPLES (YELLOW)	
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P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

FIRST PEOPLES

PRINCIPLES OF LEARNING

Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.

Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

Learning involves recognizing the consequences of one's actions.

Learning involves generational roles and responsibilities.

Learning recognizes the role of indigenous knowledge.

Learning is embedded in memory, history, and story.

Learning involves patience and time.

Learning requires exploration of one's identity.

Learning involves recognizing that some knowledge is sacred and only shared with permission and/or in certain situations.

For First Peoples classroom resources visit: www.fnesc.ca

fnesc

ENGLISH FIRST PEOPLES

RESOURCE CURATION III	
Activity Sequence	No. 4
Title	Territory Acknowledgement
Source	Quaker Service. (n.d.). Territory Acknowledgement. *Canadian Friend Service Committee*. Retrieved from https://quakerservice.ca/wp-content/uploads/2019/07/Land-Acknowledgment-Resource.pdf
Page	46 - 47
Modification	Add subject/topic matter if needed – discrimination based on teacher

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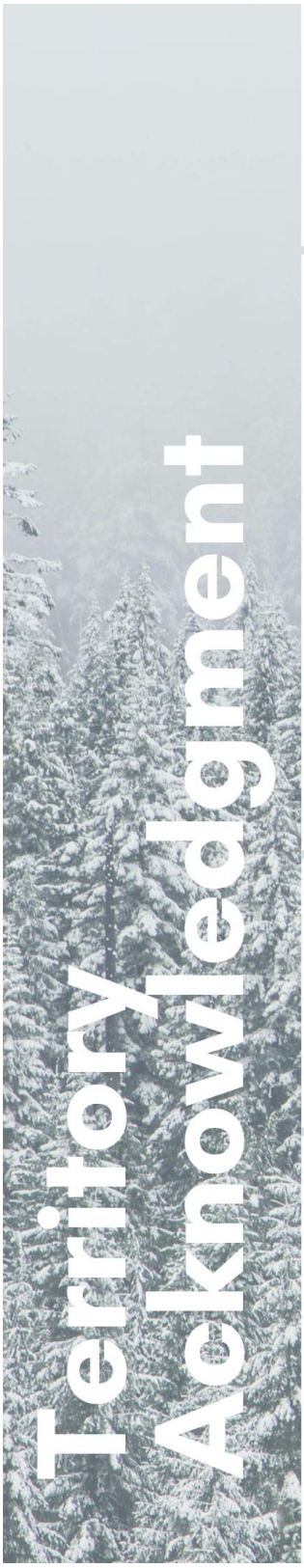


ac·knowl·edge

/əkˈnäləj/

to accept or admit the existence or truth of.

to remember

To properly acknowledge Indigenous territory, the speech must reflect intent, purpose, and a commitment to action, explicitly describe the historical and existing power dynamics between settlers and Indigenous people on this land, as well as the obligation of settlers to redress it. It must be personal to the speaker, and relevant to the organizers.

The speaker should also address how the land acknowledgement speaks to the event in question and how the organizer of the event intends to better serve — in concrete terms — the Indigenous people and the land that they acknowledge. [1]

Moving beyond territorial acknowledgments means asking hard questions about what needs to be done once we're 'aware of Indigenous presence'. It requires that we remain uncomfortable, and it means making concrete, disruptive change. How can you be in good relationship with Indigenous peoples, with non-human beings, with the land and water? [2]

to do

Use words like acknowledge, honour, traditional territory, land, treaty, First Nation name(s), commitment

To learn which traditional territory you are on, visit https://native-land.ca/

to avoid

Using words like gratitude, thanks, play, Canada, citizen, guest

Having/Asking Indigenous people to draft the acknowledgment

Doing it as a token.

Repeating it automatically.

Drafting a superficial/generic one without learning the history.

Repeating the same phrase across events, groups and time.

ask yourself

How can I make this land acknowledgment personal?
What will be my contribution to righting historical harms?
What commitment am I making?
What are my reasons for making this land acknowledgment?

examples

We acknowledge with respect the Lekwungen-speaking peoples on whose traditional territory the university stands and the Songhees, Esquimalt and WSÁNEĆ peoples whose historical relationships with the land continue to this day.

-University of Victoria

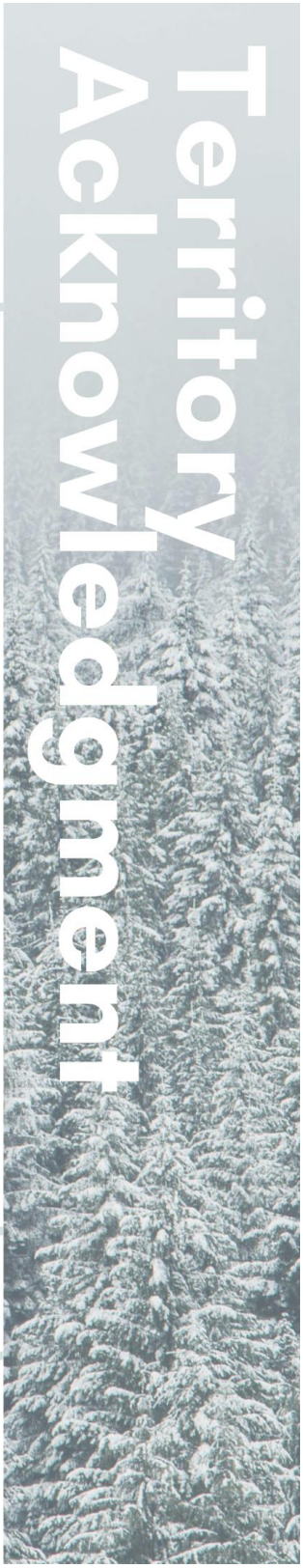
I want to begin my remarks by recognizing the traditional keepers of this land, the Kitigan Zibi Anishinabeg First Nation and Pikwakanagan First Nation, as we meet on their unceded territory.

- Senator Murray Sinclair in the Senate

We acknowledge that Camp NeeKauNis is situated on the ancestral lands of the Wendat and Anishnaabeg and, more recently, Haudenosaunee peoples, in Upper Canada treaties territory that has seen thousands of years of rich Indigenous history and is home to many Indigenous people from across Turtle Island today. We honour the covenants of the Dish with One Spoon and Two Row Wampum Belts. As we gather, we remind ourselves to respect and nurture our sacred relationship to this land as well as to its First Peoples both past and present.

-Camp NeeKauNis

[1] C. Vowel, 2016. Beyond territorial acknowledgments. https://apihtawikosisan.com/2016/09/beyond-territorial-acknowledgments/
[2] The Varsity Editorial Board, 2019. To properly acknowledge Indigenous territory, go off script. https://thevarsity.ca/2019/03/16/to-properly-acknowledge-indigenous-territory-go-off-script/



quakerservice.ca

Canadian Friends Service Committee
60 Lowther Ave.
Toronto, ON
info@quakerservice.ca

RESOURCE CURATION III	
Activity Sequence	No. 5
Title	Activity Preface
Source	Staniforth, S. (n.d.). Get Outdoors: An Educator's guide to outdoor classrooms in Parks, School grounds and other Special places. *WildBC*. Retrieved from http://www.metrovancouver.org/events/school-programs/K12publications/GetOutdoors.pdf
Page	48 - 52
Modification	Add subject/topic matter if needed – discrimination based on teacher

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"Passion does not arrive on videotape or on a CD; passion is personal. Passion is lifted from the earth itself by the muddy hands of the young; it travels along grass-stained sleeves to the heart."

RICHARD LOUV, LAST CHILD IN THE WOODS

Introduction to the Guide

Welcome to the Great Outdoor Classroom!

This resource has been developed for teachers and other educators to support and inspire them to take learning outdoors. Many experienced educators have helped to create this guide, endorsing "tried-and-true" activities and combining them with practical, realistic teaching strategies. Almost all the activities can be done outdoors on the school grounds or in a local park, in recognition of the challenges of taking classes on more extended field trips. The activities have been piloted with students from Kindergarten to Grade 12 across BC, and for use by non-formal educators such as park interpreters and youth group leaders. The activities underline the main themes in the BC Environmental Learning and Experience framework (ELE, Ministry of Education, 2007) – those of Complexity, Aesthetics, Responsibility, and Ethics (C.A.R.E.). Relevant learning outcome links are included, as well as a process that maps out "baby steps" for taking students outdoors.

"Come forth into the light of things. Let Nature be your teacher."

WILLIAM WORDSWORTH

Background Information on Parks and Protected Areas in British Columbia

This section answers some basic questions about protected areas including why we need them, and describes the regional, provincial and national parks systems in BC.

Section I: Simple Steps to Successful Outdoor Classrooms

Preparing Yourself and Your Students for the Joys and Challenges of Learning Outdoors

This section reviews current research on the benefits of outdoor exploration in the development of children's physical, mental and spiritual health.

Barriers to taking students outside are addressed, and the concept of the 100 Metre Field Trip is supported: you don't have to go far to have engaging and instructive experiences out-of-doors. The Teacher Tip Sheets and Checklists were developed from a range of examples provided by educators, and address how to plan successful outdoor excursions that keep students (and the environment!) safe, while encouraging curiosity and creativity, and helping students make connections to the natural world.

Section II: Get Out There! Easy Activities for Taking Groups Outside

This section highlights "classic best practices" – activities that provide easy, fun and powerful ways to explore an outdoor area, help raise awareness and develop relevant, personal connections to nature. These hands-on, sensory awareness activities require almost no materials and have been used successfully by environmental educators with groups of all ages. They are great "warm up" activities for any field trip, and great "wakeup" activities for quick daily breaks from classroom routines. Adaptations for older students are provided, as well as Critical Questions and Debriefing suggestions for discussion.

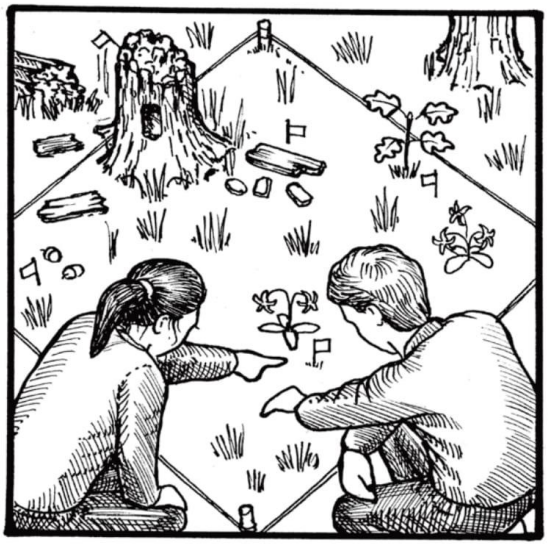
Section III: Valuing Special Places and Family Treasures

Protecting Natural and Cultural Treasures

This section engages students in exploring places that are meaningful to them, examines cultural connections to place and community and investigates values around protection and care. Four activities explore these concepts: listening to a guided imagery story about protecting things of importance, interviewing family members to explore cultural heritage, and writing and reading about personal experiences with special places. Worksheets support student-directed learning.

Section IV: Exploring and Mapping Special Places

These activities explore biodiversity, habitat, and mapping. Students discover BC's biogeoclimatic zones by creating postcards, engaging in hands-on exploration of local biodiversity and developing community mapping skills, including creating base maps, keys, scale, and transects. Activities support student-directed learning, and target Science and Social Studies learning outcomes for intermediate and secondary students.



The Appendices

Prescribed Learning Outcomes, by grade and subject level, additional resources, web links, further background material, along with detailed Park Planner Sheets for visiting provincial, regional and national parks across BC.

However you choose to use this guide, we wish you enjoyment and inspiration in your exploration of the great outdoors!

Conceptual Framework

This resource was developed based on the following "big ideas" or key concepts, which provide a framework for each section and activity. They can be used to plan teaching units, guide the integration of outdoor learning across several subjects, and help students monitor their own learning projects.

1 **CONCEPT 1: WE PROTECT THINGS THAT ARE VALUABLE TO US. OUR HERITAGE AND CULTURE INFLUENCE OUR VALUES.**

2 **CONCEPT 2: HUMANS NEED PROTECTED NATURAL AREAS FOR THEIR SPIRITUAL, PHYSICAL AND INTELLECTUAL HEALTH BENEFITS, AND THEIR SCIENTIFIC, CULTURAL, ECOLOGICAL AND ECONOMIC VALUES.**

3| **CONCEPT 3: THE DISCOVERY, EXPLORATION AND ENJOYMENT OF LOCAL NATURAL AND PROTECTED AREAS PROVIDE VALUABLE LEARNING EXPERIENCES FOR STUDENTS.**

4| **CONCEPT 4: DIRECT, PERSONAL EXPERIENCE AND INVOLVEMENT WITH PARKS AND NATURAL AREAS IN OUR COMMUNITIES HELP DEVELOP ONE'S SENSE OF PLACE.**

5| **CONCEPT 5: PLACE–BASED EDUCATION, WHERE LOCAL CULTURE AND NATURAL HERITAGE ARE EXPLORED, RE-INTEGRATES AND RESTORES THE ESSENTIAL LINK BETWEEN PEOPLE AND THEIR COMMUNITIES.**

6| **CONCEPT 6: ACTIVE STEWARDSHIP, OR CARING FOR WHAT WE DON'T OR CAN'T OWN, IS IMPORTANT TO CONSERVE, RESTORE AND SUSTAIN PARKS, NATURAL AREAS AND OTHER SPECIAL PLACES.**

These concepts are closely aligned with the Environmental Learning and Experience (ELE) learning principles, published by the BC Ministry of Education (2007). These principles include Complexity, Aesthetics, Responsibility and Ethics (CARE) as follows:

C A R E

C -a consideration of complexity and complex systems,

A- aesthetic appreciation,

R-responsible action and consequences of action, and

E-the practice of an environmental ethic.

The ELE's model of direct experience, critical reflection and negotiation are also supported and endorsed by the activities and teaching strategies within this guide.

www.bced.gov.bc.ca/environment_ed/

RESOURCE CURATION III	
Activity Sequence	No. 6
Title	Voices of the Salmon People
Source	Campbell, K. (1999.). Łuutigm Hoon (Honouring the Salmon): An Anthology Told in the Voices of the Tsimshian. *Tsimshian Nation and School District No. 52 (Prince Rupert).* Retrieved from Wap Sigatgyet (in person).
Page	54 - 59
Modification	Add subject/topic matter if needed – discrimination based on teacher

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Voices of the *Salmon People*

What remarkable creatures the Pacific salmon are. They begin life in fresh water. Then they leave the rivers to disappear into the vast ocean. Years later they return to their original river. Fighting the obstacles of rapids, waterfalls, nets and hooks, they reach the same spawning beds where they were hatched. They lay their eggs for the next generation of salmon in the gravel of the river bottom. Then they die.

There are more mysteries about the life of the salmon. There are five different species of salmon as well as seagoing trout which are their cousins. Together they make up the *Salmonid* family. Each species is physically different, from the small pink salmon to the sometimes gigantic spring salmon. They spend their growing years in different habitats. The sockeye must live in a lake, while the others are reared in river estuaries. They all spend different lengths of time in the ocean, two years for pinks and up to eight for springs, and they come back to fresh water at different times of the year.

For all their differences, however, there is one similarity besides their shiny silver skin. They all return to where they came from. Once they return, they must die, but only after they have spawned a new generation.

In times past, according to Tsimshian world view, humans understood that animals lived in societies just like people. They lived in longhouses gathered in villages, had chiefs and travelled in canoes. Only when they crossed into the human world did they take the animal forms that we know. In their own worlds they appeared as humans. Only people with special powers or training could enter their secret worlds.

And so it was with salmon. Each type of salmon had its own village, and its own chiefs. Greatest of all was the Chief of the Spring Salmon.

The salmon willingly gave themselves to people as food. However, they expected people to treat them with respect. Whatever happened to them in the human world was felt in the salmon world.

Tsimshian people have always believed in reincarnation; that is, they believe that after death a person is born again. In the same way, salmon were reborn into their secret world after they had been consumed as human food.

As long as humans respected this cycle of life, the salmon were plentiful. But if people mistreated the salmon or ignored the proper customs for consuming them, there would be famine—or worse, the salmon would become extinct.

These beliefs reflected the reality of life for the Tsimshian people. Salmon was their main source of food. It was plentiful and could be caught fairly easily in large quantities. Sometimes, however, the salmon did not return as expected. If the salmon did not come, people faced starvation.

Many Tsimshian *adawx* (historical narratives) warn people about famine. They instruct them in the correct ways of respecting the animal world. In some of the stories people are careless or disrespectful to an animal. The results are usually disastrous.

The narrative *Na Adawga Hoon ada Łguwaalksik,* The Adawx of the Salmon and the Prince, which you will read in this book, warns that if people do not take care of the salmon, the salmon will become extinct.

In modern times we have not always respected the salmon. Some species are dangerously close to extinction. Today we need to listen to the voices of the Salmon People just as much as the ancient people did.

I was taken by the salmon to their abode in the far distant country and there I saw and learned the law of the salmon as to how you must treat them after they have been caught. You must not keep them any longer than you must and when you eat of the salmon you must burn all the remnants, all the bones and make sure that everything is consumed. When you cut a salmon you must cut it lengthways, not in half. You must not feed the salmon to dogs as the bones will all be lost. You must not abuse the salmon in any way and when you catch salmon you will not leave any of it on the beach so that animals or birds may devour any and do not throw any salmon away, so that it may rot. All this you must remember and if you disregard it, then we shall have famine. These things I saw and heard at the country of the salmon.

From an *adawx* told by John Morrison, Gitando, 1947


NA ADAWGA HOON ADA ŁGUWAALKSIK
The Adawx of the Salmon and the Prince

'Na gup'l ga galtsapts'ap a Gits'alasak asda gyikoł *Git-xstexł* 'ni man gyepsat a galksa tsalasa ada *Gitlaxtsooks* a txalaxdiilt. Ada lp masm smgyigyeda meła k'üülda galts'ap. Ada sm helda na gyeda meła k'üülda galts'abm Gits'alasaga gwa'a.

Wai k'ap giidza txa'nii goomsm waalsga 'wii heldm gyet a giidza sgooksga hoon, awil smgal t'ooxłga waalt güültga gyetga hoon. Wai naga t'in habool hoon adat smgal łu'udikt, awil sm aliisga gant gapt. Kam łgu sap'awnt adat wündoot git.

Wai sm k'oolu łgułgm 'yuut gał k'oolda Smo'ogyit. Adat smgal si'ipntga na 'nagyetgit. Ada ałgat anooxł dm waalt a ligi goo at sga łuudikt. Ada sm lap gyeda łguwaalksik a goo dm waalt.

Years ago there were two villages of the Kitselas Canyon people, *The People of Shrubs,* which was on the high side of the canyon and *The People of the Bottom Boards of the Canoe,* opposite. And each one of these villages had their own chiefs. And each village had many people there.

Nearly every winter it happened that many of the people were short of salmon, as it was difficult for the people to gather salmon. Whoever had any quantity of salmon took very good care of it, hardly eating it, only taking off a small portion which they kept in their mouth.

Now a chief had an only son and the parents loved him very much. They would not allow him to do anything as they took such care of him and the Prince was free to do anything he wanted.

Told by Louis Starr and Mark Bolton at Port Essington, 1937. Recorded and translated by William Beynon. This narrative was transcribed into contemporary Sm'algyax orthography by Marjorie Brown and Theresa Lowther, 1998. Illustrations by Vernon Brown.

Working Together to Preserve Salmon

When the salmon is caught, everyone pitches in to help preserve it. All generations share the work, and children learn by watching and doing.

Some of the old methods of preserving are still used today, but modern techniques are also used.

Can you find all the ways of preparing and preserving salmon shown in this picture?

Some of the methods are:

- barbecuing
- canning
- jarring
- salting
- smoking
- sun drying

Illustration by Judy Hilgemann

RESOURCE CURATION III	
Activity Sequence	No. 7
Title	Ethnobotany
Source	FNESC & FSNA (2019). Ethnobotany. *First Nations Education Steering Committee and First Nations Schools Association.* Retrieved from http://www.fnesc.ca/wp/wp-content/uploads/2019/08/SSSFP-Final-for-web-Aug-14.pdf
Page	61 - 72
Modification	Add subject/topic matter if needed – discrimination based on teacher

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Unit 5
Place-Based Ethnobotany

Overview

In this unit students look at the relationships between plants and people through the lens of the field of ethnobotany. Particularly, they explore the idea of First Peoples' Traditional Ecological Knowledge about plants as it relates to place.

Traditional Ecological Knowledge about the diverse plants growing in their territories is key to the sense of place held by First Peoples. When First Peoples go out on the land to pick berries, to dig bitterroot, to gather stinging nettle, bark or grasses, it provides a connection with the land and with the ancestors.

As with other resources, traditional knowledge views plants holistically, as a complete living organism interconnected with the rest of the world. There are many dimensions to the wealth of plant resources, such as healing, spirituality, ceremony, nutrition, and technology.

Central to this unit are the ways in which the interconnections that First Peoples have with the land results in a sustainable use of the resources.

The unit builds on students' scientific inquiry which is both respectful of, and informed by, Indigenous perspectives. The focus is on place-based activities as much as possible, as place is the essence of Indigenous knowledge and science. Try to gather as rich a collection of learning materials about the local ecosystems, foods and First Peoples Traditional Knowledge as possible.

A major element of this unit is connecting with the local First Nations community to talk to a member who can present their knowledge about the plants.

First Peoples Traditional Knowledge and Intellectual Property Rights

First Peoples have a strong relationship with the land. Each community, and specific people within communities, have knowledge and understandings of plants discussed in this unit. While much general knowledge has been shared with ethnobotanists and others, in some cases this knowledge is private. Traditional Knowledge about plants is the cultural heritage of First Peoples and is considered part of a First Nation's intellectual property and should be treated with respect. While much of this knowledge is shared, remember that some understandings of plants and their uses are protected.

Alert: Caution When Using Local Plants

First Peoples have used plants for millennia, and have the knowledge of how and when to harvest, prepare and use the plants, especially powerful medicinal plants. Some of the plants the students may encounter can be toxic, carrying the danger of serious illness or death if used improperly. Others may be irritating or cause allergies to some people. Take care when handling plants and ensure that students respect the potential harm that could occur without the proper knowledge.

Guiding Questions

- How can humans interact with plants in a respectful and sustainable manner?
- How have First Peoples used knowledge of plants and their ecosystems to maintain their health and well-being?
- How do First Peoples' perspectives on interconnectedness and place reflect their understandings about plants and their habitats?
- How can Indigenous knowledge and understanding inform the scientific process?
- How do plants support all life?
- How does sustainability relate to ethnobotany and the environment?

Relevant BC Learning Standards for Senior Secondary Science

Course	Key Content Standards	Key Curricular Competencies
Science 10	• Diversity of life	Processing and analyzing data and information: • Experience and interpret the local environment; • Apply First Peoples perspectives and knowledge Questioning and predicting: • Make observation aimed at identifying their own questions, including increasingly abstract ones, about the natural world. Planning and conducting: • Collaboratively and individually plan, select and use appropriate investigation methods, including field work and lab experiments, to collect reliable data. Processing and analyzing data and information: • Experience and interpret the local environment; • Apply First Peoples perspectives and knowledge, other ways of knowing and local knowledge as sources of information Evaluating: • Consider social, ethical, and environmental implications of the findings from their own and others' investigations Applying and innovating: • Contribute to finding solutions to problems at a local and/or global level through inquiry Communicating: • Express and reflect on a variety of experiences, perspectives, and worldviews thorough place.
Life Sciences 11	• First Peoples understandings of interrelationships between organisms • First Peoples knowledge on classification	
Environmental Science 11	• Ecosystem complexity: roles; relationships; population dynamics • Energy flow through ecosystems • Matter cycles through and between living systems • Succession • First Peoples knowledge and other traditional ecological knowledge in sustaining biodiversity • Benefits of ecosystem services • Human actions and their impact on ecosystem integrity • First Peoples ways of knowing and doing • Resource stewardship • Restoration practices	
Environmental Science 12	• Soil characteristics and ecosystem services • Land use and degradation • Land management • Personal choices and sustainable living • Global environmental ethics, policies and law [*including First Peoples perspectives, philosophies and responsibilities*]	

Suggested Activities

Note: There are more activities here than most teachers will incorporate into their units. It is not expected that you will use all of the activities, or follow the sequence as it is described. These activities are intended to be adapted to fit the needs of your students and classroom, as well as inspire ways that you can respectfully include relevant Indigenous knowledge and perspectives in your course.

Activity 5.1
What is Living?

Students investigate two different perspectives on what is living.

a. Give students a collection of images that show a diversity of items from nature, and have them sort the pictures in as many different ways as they can.

Blackline Master 5-1, page 154, *Sorting Nature*

- Students can use the images on Blackline Master 5-1, page 154, *Sorting Nature*, or you could have the class collect images. They should include a variety of things found in natures, such as plants, animals, rocks, rivers, sun or moon, and natural phenomena like a rainbow.
  - The images shown on Blackline Master 5-1 are: Row 1: amoeba, chiton, snowflake; Row 2: rock, mosquito larva, fir cone; Row 3: water, sun, trees; Row 4: bear, berries, rainbow.
- Students can work in pairs or triads. Have students pick out common elements and group the images in any way that makes sense to them. Have them record the classification rules they use in each case. For example, they may make three groups: animal, plant, and other; or two groups: made of cells or not made of cells.
- As a class have each group report out about the groupings and common elements they found. Ask, "Does the way you sorted the pictures say anything about how you see or understand the world?"

b. Then ask students to identify what all of the items in the collection have in common. What elements or features do they all share?

- Ask the groups to brainstorm as many shared features as they can. (For example, all part of the natural world; all are made of molecules or atoms; all transform energy; all are affected by gravity.)

c. Discuss the perspective of many First Peoples that all things are living. Consider the phrase, 'We are all made of molecules.' Ask questions such as:

- What does "we are all made of molecules" mean to you?
- How might it be seen from an Indigenous perspective?

d. Read "The Creator and the Flea Lady." In this narrative, told by Ellen Rice White in *Legends and Teachings of Xeel's, the Creator*, everything is alive and has energy. See Unit 1, Activity 1.4 for a discussion of this story.

Cross-Curricular Connection
English Language Arts

Legends and Teachings of Xeel's, the Creator by Ellen Rice White.

Teach or review the terms biotic and abiotic. Next have groups organize the abiotic images into factors which are supportive of biotic processes and those which are not. Likewise have students break up the biotic pictures into plants and animals. Write on the whiteboard the following questions, or variations on them, for group discussion:

- What abiotic factors support the biotic process and which ones don't? What are the reasons for this?
- In what ways are plants and animals similar and different? How are they mutually supportive? Can either be detrimental to each other?

e. Ask students to reflect on the view that everything is alive or living. Ask questions such as:

- What impact might a perspective that all things are living have on how people interact with the environment?
- How do you personally feel about the view that everything is alive?

Unit Link
See Unit 1, Activity 1.6, Two Ways of Seeing the World for activities about "Two-Eyed Seeing."

Activity 5.2
Traditional Plant Knowledge

Students assess what they know about Traditional Ecological Knowledge, and the plants used by First Peoples in your region.

Foundations
Traditional Ecological Knowledge, page 13.

a. What is Traditional Ecological Knowledge?

- Review or introduce the concept of Traditional Ecological Knowledge. If you haven't done so yet, you may want to use ideas from Activity 1.1, Unit 1, page 38.

Unit Link
Traditional Ecological Knowledge, Activity 1.1, Unit 1, page 38

b. Plants as Indicators

- To begin thinking about Traditional Ecological Knowledge students can investigate the example of plants as indicators of significant events.
  - Plants are frequently used as indicators or signals of the timing of other events in First Peoples' seasonal rounds. When people notice a certain flower blooming in the spring, they can reliably predict that another important event is about to happen.
  - Understanding plants as indicators demonstrates First Peoples understandings of the interconnected relationships between plants and other organisms.
- Students can use Blackline Master 5-2, page 155, *Plants as Indicators*, to find some examples.

Blackline Master 5-2, page 155, *Plants as Indicators*

- Ethnobotanists call indicator species phenological indicators. Students could investigate what phenology means, and how this relates to TEK. (Phenology is the timing of events in the life cycles of plants.)
- With students, find out some examples of plants as indicators in the local region. Consult Elders and knowledge-keepers, as well as available print resources.
- Discuss with students the types of scientific knowledge and skills that are important when people use plants as indicators.
  - How does using plants as indicators demonstrate the idea of interconnectedness?
  - How do indicator plants help to create a "sense of place" for local First Nations communities?

b. Have a discussion about the plants that local First Peoples harvest and use. Depending on your class, some students may be very familiar with them and involved in the harvesting and processing of the plants. Others may be able to make predictions, while others may have little or no prior knowledge.

c. Display some pictures of different local plants that are important to local First Nations communities. You may be able to find pictures in books or online, or your school or district Aboriginal Education department may have resources you can borrow.
- Where possible, find the names of the plants in the local First Nations language before you show the pictures.
- As you show various pictures to students, ask them if they are familiar with their names or how they are used.

d. For further activities about local plant knowledge, see Traditional Plant Knowledge of the Tsimshian by Judy Thompson, 2003. http://www.ecoknow.ca/curriculum.html
- Ask students to find out what the most significant plants for First Peoples are in your region? What makes them significant? How does their use incorporate Traditional Ecological Knowledge?

Activity 5.3
Devil's Club Case Study

You can use the devil's club to model some aspects of an ethnobotanical study. It is one of the most significant plants for First Peoples in most of the province. It occurs almost everywhere except for the northern boreal forests.

a. Begin the lesson by showing a picture of Devil's Club, or if possible, bring a sample in.
- Students could view a short video which illustrates its features and

characteristics. See Devil's club - Oplopanax horridus. Identification and characteristics, UBC Forestry, 2018. 1.28 min. https://youtu.be/YR0xQKOh2Z4

- Students can discuss or list the most obvious physical features of the plant.
- Tell or have students find out the binomial scientific name for the plant. (*Oplopanax horridus*). Discuss how it might have received this name.
- Ask students why they think this plant received such foreboding names in English and Latin. Ask, "What does this tell us about the Western scientific perspective on the plant?"

b. Ask if any of the students have any experience with this plant. Students can volunteer to talk about stories or encounters they have had with it. For example, there could be some who have had allergic reactions or told to avoid it.

c. Present information you have gathered about local First Nations' knowledge and use of devil's club. This may include guest speakers, references to books, or going on a walk to observe a plant. Students whose families have had experiences with the plant could ask their families for information and stories.
   - Student should learn the name for devil's club in the language of the local First Nations. They may be able to find the name by consulting with the First Nations language teachers or dictionaries of the language.
     - They could also use the FirstVoices website (firstvoices.com) which has web-based dictionaries of a number of BC First Nations. They could either enter "devil's club" into the search field on the home page, to see the word in a number of languages, or they could go to the specific page for the local First Nations language, if it is there.

d. Have students research to find out different ways that BC First Nations use devil's club. They can focus on the local community's knowledge, but also include information from other cultural groups. Some sources of information include:
   - Ethnobotanical plant guides. Your library may have a number of books that have been published, covering both the whole province and specific cultural groups.
   - Ethnobotanical articles, such as:
     - Devil's Club (Oplopanax horridus): An Ethnobotanical Review by Trevor C. Lantz, Kristina Swerhun, Nancy J. Turner. HerbalGram. 2004; 62:33-48 American Botanical Council. Online at https://bit.ly/2ToUgUh.
   - Harvesting devil's club has special protocols in most First Nations communities. For example, only trained people can harvest it for medicine, and it is usually harvested in a remote place. For further examples see page 503 of Turner and Berkes, *Coming to Understanding: Developing Conservation through Incremental Learning in the Pacific Northwes*t. https://bit.ly/2H9U9FD.

- See also WorkSafeBC, "Toxic Plant Warning: Severe Eye Injuries from Devil's Club (Oplopanax horridus.)" Linked at https://tinyurl.com/fnesc63.
- Discuss with students what types of information could be gathered about devil's club. Together they should create a list of topics that can be researched. These could include:
  - habitat; ecosystems
  - life cycle, how it reproduces
  - interconnectedness with plants and animals
  - distribution, where in the province it grows
  - how it used by First Peoples
  - role played in First Peoples' belief systems
  - management techniques First Peoples used

e. After students have learned about the importance of the devil's club to First Peoples, have students compare the perspectives of Indigenous knowledge and Western science.
- Discuss the feelings that the English and scientific names evoke. (fear and danger; the name and understanding of the plant creates fear while the Indigenous understanding creates opportunity.)

f. Learning from a Scientific Paper
Students can learn about an ethnobotanical study involving devil's club by studying a recent scientific article. In this study scientists investigated how well devil's club recovered in an area that had been clearcut.
- Find the study report online at:
  - Carla M. Burton and Philip J. Burton. "Recovery of *Oplopanax horridus* (Sm.) Miq., an Important Ethnobotanical Resource, after Clearcut Logging in Northwestern British Columbia." *Ethnobotany Research and Applications*, Vol. 14, 2015. https://bit.ly/2tNiw48.
- Students could work individually, in groups or as a class, depending on how well they are able to analyze a scientific paper.
- Students should focus on the Objectives (p. 3), Discussion (p. 10) and Conclusions (p. 11) to help them understand the purpose of the study and what the results were.
- Ask students to summarize this study in their own words. Ask questions such as:
  - Why was there a need for this study?
  - What were the goals of the study?
  - What were the main conclusions?
  - How does this study benefit First Peoples?
  - How can the knowledge learned from this study be applied in the future?

Activity 5.4.
Bitterroot Case Study

This activity provides an example or model of a plant study that illustrates different types of Traditional Ecological Knowledge.

Blackline Master 5-3, page 156 *Bitterroot and Indigenous Knowledge*.

a. Introduce the important plant bitterroot using Blackline Master 5-3, page 156 *Bitterroot and Indigenous Knowledge*.

b. Ask students to create a graphic organizer or mind map to illustrate the many different types of knowledge First Peoples traditionally held about the bitterroot plant and its habitat.
- Sample responses: Some of the areas of knowledge featured in the article include: the names in the language; where, when and how to harvest the plant; how it is connected to both the cultural and physical aspects of life; how to prepare it; how to harvest sustainably and how to manage the landscape to maintain and increase the potential harvest.
- Ask students if they think there is any information missing. What further questions can they think of that could tell more about how the bitterroot fit into the lives of the Interior people in the past and the present?
  - For example, the article does not discuss traditional narratives that might talk about the importance of the bitterroot.
- Ask students to identify the parts of their graphic or map that relate to "place," that is to the local environment and the relationships the First Peoples have with it.

c. You may want to discuss ways that the First Peoples traditionally used the land in sustainable ways. How did their beliefs in the interconnectedness of all things affect the way they harvest these and other plants?
- You may want to make connections with Unit 4, Shaping the Land, to investigate ways First Peoples managed the landscape and harvested sustainably.

d. Compare nutritional value. Ask students to study the tables of nutritional values for the bitterroot and the carrot. Can they decide which plant is better for you?
- Students should note that the bitterroot values are for the dried plant, while the carrot values are for the raw plant. Also, they may question the validity of these single sources of information.
- Ask students to design a way to be able to more accurately compare the nutritional values in these two tables.

f. For an additional resource see *Shuswap and Okanagan First Nation Root Food Protocols*, an informative Masters' Thesis by a First Nations scholar, Nancy Bonneau. She studied the protocols and harvesting practices of two important plants, bitterroot and springbeauty. It contains excerpts of interviews with people who still harvest these plants today. http://ow.ly/m0If302O93Y.

Activity 5.6
Cultural Plant Use: An Ethnobotany Inquiry

Students conduct an inquiry into the relationship between local First Peoples and one or more plants and their habitats.

a. Introduce the Inquiry activity. You could read the following or create your own introduction which suits your local context and place:

Inquiry is about inspiring curiosity through the formulation of questions about something of interest. It is this curiosity which drove the costal First Nations of BC to build their fishing nets or develop uses for a potentially hazardous plant like Devil's Club. It is curiosity which pushed the Wayfinders and explores across treacherous oceans to new islands and lands. It is curiosity which created smart phones and computers and which drove humanity to land a rover named Curiosity on a planet named Mars.

- At this point students could view the short video of NASA's Mars Rover Curiosity: https://youtu.be/Txti0XLxOzI
- Continue with your introduction:

Curiosity is the start of inquiry. It lays the foundation. One of the reasons humanity is driven to explore Mars is a result of a fundamental, and culturally transcendent, inquiry question: Is there life beyond this fragile blue planet of ours? Yet this question is massive. So massive it creates a multitude of other inquiries which moves the inquirer into questions of early life forms. Some of the earliest life forms on earth were plants. Thus, the inquiry into ethnobotany can give us insights into what early life is like and how more complex life either benefits or is hurt by it. Now it is time for you to develop your own inquiry questions about your plant. Remember that inquiry itself is based on creating questions which drive curiosity forward.

b. Provide students an opportunity to explore possible topics by presenting a variety of resources to inspire their thoughts.
- Set up a centre or display area of pictures, books, and real life objects.
- Create a class list of local plants that are used by First Peoples, or were used in the past. This could be posted on a chart or other display.
- Ask students to classify the different ways that First Peoples traditionally use plants: for food, for technology, for beverages and for medicines.
- Visit a local museum or nature centre that has information about local First Nations' plant use.
- Invite a First People's artist or craftsperson who uses plant materials to display their work and speak about their craft. (E.g. carver, canoe builder, basket weaver)

c. Decide how your class will engage in the inquiry activity. Students could work in groups, or individually.
   - Decide on a way for students to select a plant to study, depending on you class makeup. Students could choose a plant that interests them, you could directly assign a plant or you could hold a lottery and pick the plants from a hat.

d. Discuss with students how to create good inquiry questions. Reference some of the inquiry questions from the Mars Curiosity Rover video. Ask, what are the characteristics of good inquiry questions?
   - Spend time discussing with students possible big ideas that could direct their inquiry. The class can hold a brainstorming session where students suggest a variety of questions. They can be posted on chart paper, or for older students, online at a class forum or wiki, if available.
   - Where appropriate, you can guide students to reformulate some questions. Help to connect student ideas and questions to the curriculum.
   - Ask students, or groups, to formulate an inquiry question that they will explore.

e. Use the 7Es model to help organize students' inquiries.
   - Adapt the learning processes about the 7Es, discussed in Foundations, 7E Model, page 31.
   - Use or adapt Blackline Master 5-4, page 158, *Inquiry Using the 7Es*.

Blackline Master 5-4, page 158, *Inquiry Using the 7Es*

f. Next students should outline three or more steps they could take to facilitate answering the inquiry question.
   - What sources could they use in their research?
   - Who are people of knowledge that the group could contact?
   - Where could they go to observe or interact with the plant?

g. Have students being their research to respond to their inquiry questions.
   - It is also possible to bring in a class set of botany books if access to the computer lab or library is not available; however, it is encouraged that students get time in both of these to conduct their research.
   - Depending on what you have already done with you class it might be helpful to discuss best practices within regards to research. A discussion of sources, documentation, plagiarism, etc. may be important at this stage. Assess where your class is and plan accordingly.
   - Remind students that it is imperative that they have good note taking and information gathering techniques so that they can utilize what they research in their final product.

h. Guide students' exploration of their questions.
   - Discuss different ways they could find answers to their questions, such as story, scientific inquiry, asking local First Peoples, online and print resources.

- Encourage students to "think outside of the box" as they investigate their plant. Here are some possible suggestions to investigate:
  - Research First Nations knowledge and usage of the plant
  - Consult historical accounts of the plant
  - Contact a local botanist/ethnobotanist at the university/college
  - Research academic journals and articles
  - Find botany books at library which will have technical identification procedures
  - Find pictures on the internet of the plant
  - Go out and take pictures and video of the plant.
  - Create a drawing of the plant.
  - How frequent is this plant in my community? Are there any "hot spots" and what is the distribution?
  - Ask parents, elders and community members where they might have seen this plant.
  - Use smartphone to take pictures with geo-tagging
  - Plot geo-tagged pictures onto Google Earth
  - Is climate change affecting this plant? If so how?
  - Talk to indigenous elders who have long memories about harvesting and yields which can be traced back to their grandparents.
  - Search for any climate change research on my plant.
  - Look for any harvest logs or historical data about size, frequency, etc.
  - Is development/industrialization affecting the plant?
  - Which animals use this plant and how?

i. Communicating Inquiry Findings. Students should decide on how to present the findings from their inquiry. Ask them to think about the best format for their content. For example, is it best told visually, with a video, digital presentation, or gallery? Or does it fit a narrative form, told in a story or graphic novel format. It may be best to present a lot of information clearly, using a poster or a pamphlet.

j. Hold a culminating activity where students can present their findings. It could be as a presentation to invited guests, such as members of the local First Nations community or another class.

RESOURCE CURATION III	
Activity Sequence	No. 8
Title	Ethnobotany of Local Plants
Source	Turner, N.J., and J.C. Thompson. (2006). Plants of the Gitga'at People: 'Nwana'a lax Yuup. Gitga'at Nation. *Coasts Under Stress Research Project and Cortex Consulting*. Retrieved from Wap Sigatgyet (in person).
Page	74 - 75
Modification	Add subject/topic matter if needed – discrimination based on teacher ➔ Preparation for nature walk next activity

REPRESENTED PRINCPLES (YELLOW)	
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
P05	Students require social emotional learning supports to foster a sense of self and belonging
P06	Learning should be interdisciplinary and interconnected
P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
P08	Diversity and background of all students should be represented and brought into the classroom ecosystem
P09	Response Trauma Intervention (RTI) is about healing and supporting the soul rather than victimizing and resurging traumatic triggers
P10	Indigenous learning is good for indigenous learnings and all learners
P11	*Adaawx* can teach us stories that embodies preservation, conservation, cultural traditional, and eco-over-ego modernity.
P12	Classrooms should be an extension of our surrounding ecosystem, not a microclimate that is isolated from the natural system
P13	Think global, act local to transform and re-connect youth to their land
P14	Soft skill development by doing can be more important than hard-skill mastery of theory-based concepts
P15	To foster creativity and innovation, collective collaboration is needed to exchange different perspectives of tackling a dynamic problem
P16	Mindful practices will foster mindful lifestyles
P17	Traditional Ecological Knowledge and Wisdom (TEKW) should be an essential dogma of sustainability
P18	Very moment, especially in nature, is a teachable moment that extends beyond a time and instance
P19	Trust is a process that intrinsically bears no judgment
P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

Salmonberry (*Rubus spectabilis*)

Different colour forms of salmonberry (*Rubus spectabilis*)

Salmonberry *(Rubus spectabilis)*

Berries: ***mak'ooxs*** (Sm'algyax Dictionary 2001, p. 255)
Shoots: ***ooył*** (Sm'algyax Dictionary 2001, p. 255)

This important shrub is common in moist sites around Gitga'at territory. The young shoots and berries were very important foods. The flowers are among the earliest to come out in the spring; hummingbirds really go after the salmonberry blossoms. The berries are said to be ripened by Swainson's thrush's (***sümiitüsk***: *Catharus ustulatus*) call. This thrush is sometimes called the salmonberry bird; its singing is frequently heard in Hartley Bay. However, Ernie Hill said that the singing of the Swainson's thrush makes all the berries ripen ("it sings while the berries are ripening") — it is not specific to salmonberry. Helen Clifton said the bird whose singing ripens the salmonberries is called ***smiik'ask*** ("sparrow" according to The Sm'algyax Dictionary [2001, p. 270]). Salmonberry sprouts are gathered early in the spring before they become woody, peeled, eaten raw or steamed, and sometimes dipped in oolichan grease and, more recently, sugar.

The Sm'algyax Dictionary (2001, p. 255) notes that salmonberry shoots "keep your body cool" and are "very tasty." The shoots are broken off, peeled, and dipped in sugar and grease. People used to get lots of it, but not too many people eat it anymore. Ernie Hill Jr. really likes these shoots and eats them frequently. When he was a boy, they used to bring them in by the armful; they add them to a salad if they get enough.

Clyde Ridley noted (and others agreed) that the salmonberry colour forms are named from the time they ripen: ***maa'y m djiiyuus*** = morning berry ("day berries"; golden ones, said to ripen during the day); and ***maa'y m hopel/hobel*** = night berry – ripens at night (for the dark coloured ones). Helen Clifton said that when they made a trip to Ketchikan, in June or early July, all the salmonberries were yellow, and she attributes this to 22 hours of daylight.

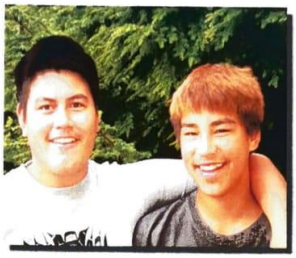
The Hills like to prepare the salmonberries with oolichan grease and sugar and eat it as a dessert. Lynne has tried preserving them in the traditional way; boiling and mashing up and drying on skunk cabbage leaves. When the sun is shining, people would move all the berries outside to dry. Ernie Hill Jr. said that if someone from Raven or Blackfish clan brings him the first salmonberry of the year, he has to pay them something, because he is the head Eagle Chief.

He used to pick up a gift at Prince Rupert for them, and now he tries to have something on hand — a cap or something like that, if it is a child.

Ernie Hill Sr. recalled a man at Old Town who was really sick. He used to go up the river by canoe and eat the salmonberries drooping over the river, pulling them into his mouth. After a few days of this, he recovered.

STUDENT REPORT

By Tristan Reece (grade 9) and
Frank Dundas (grade 11)



Sm'algyax name: **mak'ooxs** (plant)
maa'ym dziiws (yellow berries)
maa'ym atk (red berries)
Common name: **salmonberry**
Botanical name: ***Rubus spectabilis***

Salmonberry (*Rubus spectabilis*)

How is it used?

As a food: Salmonberries are used mainly as a dessert. They are sometimes used in jam, but it is not as successful as other berries. We sometimes used salmonberries at feasts as a dessert with oolichan grease.

How is it harvested?

When you go picking, you don't pile salmonberries too high because they will become squished and are hard to clean. It is best if you pick the berry with the flower part still attached to prevent too much squishing. Depending on what you are picking for will determine how long you stay out picking. If it's for a feed, maybe an hour; if it's for storing or feasting, three to four hours. You should wear long sleeves and proper shoes as you do get scratched up from bushes and it is usually muddy.

When is it harvested?

It takes two to three years for a branch to grow. Salmonberries start to ripen in the early summer months of June or July. The sprouts/stems are harvested in mid-May. You can go to different areas around Hartley Bay to pick at different times. Blossom Island usually ripens first, then McKay Reach, then Hartley Bay, and last Old Town where you can pick ripened berries in the middle of July to September.

How is it prepared?

If you want to freeze salmonberries, you clean the berries then squish them and mix them with sugar and water. Then you put them in a zip-lock bag or a container. If you want to eat the berries fresh, you can squish them and have them with water, oolichan grease (*smk'awtsii*) and sugar, or with milk and sugar. People also eat the sprouts (***ooyl***) with sugar. You have to peel the skin off and then dip the sprout in sugar. The shoots are eaten raw and sometimes steamed or are put in a salad.

RESOURCE CURATION III	
Activity Sequence	No. 8
Title	Nature Walk & Identification
(Supplemental) Source	Andrachuk et al. (2014). Forest and Nature School in Canada: A Head, Heart, Hands Approach to Outdoor Learning. Forest School Canada. Retrieved from https://childnature.ca/wp-content/uploads/2017/10/FSC-Guide-1.pdf
Page	77 - 80
Modification	Local elder-guided

REPRESENTED PRINCPLES (YELLOW)	
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P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
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P11	*Adaawx* can teach us stories that embodies preservation, conservation, cultural traditional, and eco-over-ego modernity.
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P15	To foster creativity and innovation, collective collaboration is needed to exchange different perspectives of tackling a dynamic problem
P16	Mindful practices will foster mindful lifestyles
P17	Traditional Ecological Knowledge and Wisdom (TEKW) should be an essential dogma of sustainability
P18	Very moment, especially in nature, is a teachable moment that extends beyond a time and instance
P19	Trust is a process that intrinsically bears no judgment
P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

Seeing the Forest for the Trees

> *There is more information of a higher order of sophistication and complexity stored in a few square yards of forest than there is in all the libraries of mankind.*
>
> *—G. Snyder, Turtle Island (1993, p.108)*

A forest is what you make of it – it may be the single tree in your schoolyard, the woodlot connected to your school ground, or even a local park or nearby natural space that may take a short journey to get to. It is defined as a Forest and Nature School because it is where Forest and Nature School rules apply (Knight, 2009; Knight, 2011). As Robert Michael Pyle explains, the places for deep nature connection do not need to be vast or grand: the ditches, ravines, and pockets of wildness even in urban landscapes "are places of initiation, where the borders between ourselves and other creatures break down, where the earth gets under our nails and a sense of place gets under our skin … [These places] teach us to care enough for all the land" (Pyle, 1993: xvii, xix).

Sustainability in Forest and Nature School

Sustainability in FNS refers to much more than the ecology of the natural environment and site where your FNS takes place. There is much to be learned from the field of sustainability education where "the emphasis is on such values as respect, trust, participation, community, ownership, justice, participative democracy, openness, sufficiency, conservation, critical reflection, emergence and a sense of meaning: an education which is sustaining of people, livelihoods and ecologies" (Sterling, 2008). From this systemic, holistic lens, we come to understand that the context of community, as well as how you engage your community, is as important to the development of your programs, as determining where your program will run.

In the context of FNS 'sustaining people and livelihoods' can mean many things. One consideration that falls under this area of sustainability is program accessibility, ensuring your program reflects, as well as supports physical, social, economic and cultural diversity.

In terms of the 'sustaining ecologies', it is vitally important that you ensure that the site has been chosen wisely and is used in a sustainable manner. This means working in relationship with your site, treating the forest area with respect and care, to ensure it will remain a valuable learning site for years and generations to come. It is important that everyone taking part in your program models an ethic of care and responsibility for the property and take pride in the local environment. Through modelling this ethic of care, we teach children to care as well!

A Forest and Nature School program constantly monitors its ecological and social impact. You may decide that you want to have a social and ecological impact form that is completed seasonally with your students. Having a better understanding of the larger picture of your FNS is an important part of your reflective practice and will support your students in building a relationship with the land, with the community at large, and with one another.

Site Selection

Selecting a site for your FNS, will be dependant on many factors, ranging on a continum from what is available to what is ideal. One of the most important factors in considering a site for your program is choosing a nearby, natural space that is easily accessible and will have meaning for you and the community you work with. Canada is vast and rich in landscape, natural resources, geographies, topographies, etc. Connecting to the land, and to place, will depend on the region you live in and the ecosystems that surround you.

The Forest and Nature School approach can be adapted to a variety of natural spaces, ranging from local forests, creeks meadows, prairie grasses, mountain, shorelines, tundra, natural playgrounds and outdoor classrooms. A key component to selecting a site is engaging children to be a part of this process and when possible, allowing them to choose and set up a site themselves. This is the first step for a child or youth to direct their learning experience,

to feel a sense of relationship and responsibility to place, and how we begin to empower them to become active, engaged and capable learners.

Things to consider:

- **Does the site already have a management plan?** Consider using this as a building block for determining activities and locations of these activities.
- **Who are your stakeholders and partners for FNS?** Engaging community partners is key to building a supportive framework and can enhance programming. We do this by identifying community stakeholders and partners even prior to launching programs, and by holding public forums or more informal coffee or fire-side chats. Additionally, valuing and incorporating feedback received, building long-term relationships with community members, giving back to your community, and incorporating local cultural and environmental context into your program are all important to fostering community.
- **How will you measure your impact?** A Forest and Nature School site will be used season after season, year after year. Therefore it is important to ensure that measures are in place to ensure that the site is used sustainably.
- **How often will you monitor & assess your impact?** Regular site monitoring and impact assessments should be part of daily risk assessment. Watch, in particular, for evidence of negative impact on the site. If possible, move sites periodically to avoid degradation and negative impacts.
- **Does the site come with unique concerns?** Some sites come with unique species and habitats that need special care. Research the site carefully before and throughout your use of it for a FNS program.

Potential concerns and negative impacts that FNS programs should watch out for are compaction, interference with local wildlife habitats, areas that being overused, natural elements (like twigs and plants) being removed, and human-made materials being left behind.

Potential contributions you can make to give back to the site include planting trees and native wild plants, building habitat (bird or butterfly boxes), discussing site maintenance with the children on a daily basis. Groups can also create a photo diary of the Forest and Nature School to show its transition through time—this is also a great way to see your impact on the site.

The risk/benefit assessment process in FNS should be based on the following considerations:

- **What are the hazards?**
- **What are the risks?**
- **What are the benefits of the experience and/or activity?**
- **Who might be affected by them?**
- **What safety measures need to be in place to reduce risks to an acceptable level?**
- **Can the educator and/or children (where appropriate) put the safety measures in place?**
- **What steps will be taken in an emergency?**

In risk management, hazards are the source of "potential" harm, and a risk is the measure of likelihood and severity of harm.

Example:

POSSIBLE HAZARD- A stick poking out on a trail at eye level

RISK- High given it is likely that children would walk into it because we take that path daily, and the severity of injury could result in losing or scratching an eye.

BENEFITS OF ACTIVITY- We need to take that trail to continue explorations where we left off last session, and there is no other path to get there. Benefits also to learning and development in the experience that is on the other side of this hazard.

SAFETY MEASURE- Prune that tree branch with loppers (can be implemented by the educator, with any interested children accompanying them).

RESOURCE CURATION III	
Activity Sequence	No. 8
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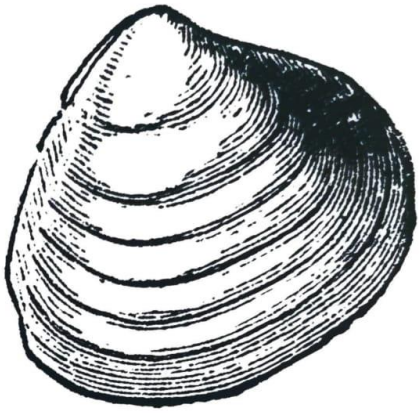
Blackline Master 1-2

Clam Gardens

One of the food sources that helped coastal First Nations survive in the past was the clam. If you go to an ancient village site along the British Columbia coast, you will find it is built on deep layers of white shells from clams and other shellfish, like cockles and mussels.

Clams are very nutritious. They are rich in protein, and also nutrients such as iron, Vitamin C and Vitamin D.

There are four main species of clams along the BC coast: butter clam, littleneck, horse clam, and cockles.



Harvesting clams

Clams and cockles are easy to harvest by all members of the family. They live below the surface of beaches in the intertidal zone. They sometimes give themselves away by squirting water through holes.

In the past, clams and cockles were a dependable food source. People could almost always find a good feed of shellfish, summer or winter.

The best time of year to gather clams is in the winter. In warmer months people knew that they might not be safe to eat. They could be polluted by what we call "red tide."

As well as observing the water to see a change in colour, people would watch the animals like seagulls and otters. If they were eating the clams, then people knew they were safe to dig.

Preserving clams

First Nations families harvested large amounts of clams in the past. Some were eaten fresh, but most were preserved to be eaten later.

The shellfish were steamed open and the meat was threaded onto sticks to be roasted or smoked over a fire. Some people put them between mats and stomped on them to make them more tender.

The dried clams could be stored for a long time, or they could be traded with other First Nations.

The clams made a good snack. Sometimes people strung them on strings which they wore around their neck. If they got hungry while going about their work, they could pull off a clam to eat.

Clam gardens

We know clams were an important food source in the past because First Peoples built large clam gardens to improve the quality and quantity of the clams.

To do this, people long ago built walls along a sloping beach, and filled it in with sand to make level ground.

All along the Pacific coast, First Nations people built thousands of these beach terraces. In one bay alone on Quadra Island there are at least 49 separate gardens.

It took a great deal of knowledge to build and maintain these gardens. First, the builders had to understand the currents and tides to know the best places to build them.

The clam gardeners must have had a detailed understanding of the intertidal ecosystem to create such successful technology to manage their shellfish harvest.

The walls were as much as two meters high. They were created by rolling boulders down to the lowest of the low tide levels.

The rock walls were built at just the right height so the sandy terrace behind it would create the best growing habitat for the clams.

They waves washing over it would bring in nutrients. As people harvested the clams and cockles, using their digging sticks, they kept the sand loose enough for the shellfish to move about.

Certain people in the community were stewards of the clam gardens. They would observe the condition of the gardens. They would make sure there was no overharvesting. If the quality or number of clams got too low, they would leave the area untouched for a period of time.

Sometimes they would take small clams from another clam beach and "plant" them on a struggling beach.

Scientists have done some tests in clam gardens and found that more clams grow on beaches with walls than regular beaches. As well, clams grow faster and are more likely to survive in clam gardens.

The vast system of clams gardens wasn't built quickly. They were built over many generations. Families passed on the knowledge and skills involved so that the gardens could be continue to be cared for.

The use of the clam gardens was part of First Nations political and social organization. In some communities certain families or hereditary groups had the use of certain gardens, which were passed down. As well as the rights to use the gardens went the responsibility to care for them.

Sea Garden

The rock walls did more than hold back the sand for the clam gardens. They also created a reef ecosystem where other sea creatures could live, such as octopus, sea cucumbers and chitons. These are all seafood delicacies, and no doubt were an added benefit to the clam gardeners.

Blackline Master 1-3

Plant Resource Management

Indigenous people have lived in harmony with the environment for thousands of years. The environment has sustained them. Methods of respectful harvest of these plants and animals were a way of life for thousands of years and reflect Traditional Ecological practices since time immemorial.

Over time, traditional names have reflected the use and the season of the plant. The numerous names for berries, for example provide a vast explanation for the people. A full understanding of one's environment was essential, seasons, weather and moons dictated travel, harvest and ceremonial events.

Indigenous people are known to travel great distances traversing long distances over mountains and valleys gathering food. Ecological indicators revealed when it was time to move on into neighbouring areas, and which areas to move onto next.

Harvesting techniques reflect an immense respect and reciprocity. Thanks were given to the Creator both before and after taking anything from Mother Earth. Spirituality was a key to the sustenance way of life and this unique relationship with the land.

When things were taken, nothing was wasted and all was shared. All plant parts were used following the harvest, as were all the animal parts following a hunt.

First Peoples' survival depended on using the resources in what we would call today a sustainable manner.

Here are a variety of harvesting techniques practiced by First Peoples throughout the province.

Soil Aeration

During the harvest of some plants, the soil was aerated as people used root digging sticks during the harvest. Children would help. This process was gentle and would serve to aerate the soil without damaging it.

Crop Rotation

Today we call it crop rotation. In the past each site would be rested for a necessary period of time before revisiting.

People would never harvest the same area intensively year after year. They would go back only once the area was renewed and ready for harvest. That is why it could take such a massive area to sustain a large group of people

Selective Harvesting

People would never harvest all of the plants from one area simply because they needed the food. They would harvest discriminatingly, putting back the immature or smaller bulbs or roots to produce in following years

Replanting

Replanting of smaller roots as well as seeds would occur which would promise a future crop in years ahead.

Pruning
Branches could be broken off and brought back to harvest berries off some berry plants. This would produce natural pruning without harming the bush. Some berry bushes were cut right back to the ground since the new suckers were the ones to produce the berries.

Women as Managers
Women possessed vast amounts of knowledge and passed this on to children. They were recognized as very important figures in holding and passing on the knowledge.

Landscape Burning
Controlled burning of an area was an important way of managing and improving some traditional territories. People understood that the soil needed to be renewed. Burning accomplished this.

Burning had other purposes. It could clear land for important plants to grow, such as berries, camas, grasses, and medicianal plants.

Sometimes it was used to fireproof areas around certain medicinal plants.

Baptiste Ritchie, Mount Currie Elder, 1969:

When there were a lot of bushes then the ripe berries disappear at the roots like potatoes, tiger lily and spring beauty disappear, when it gets too bushy. Then they burned. ... We realize already, it seems the things that were eaten by our forefathers have disappeared from the places where they burned.

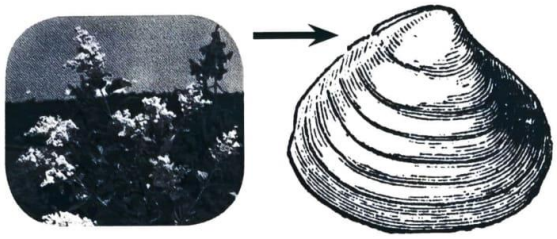
Annie York, Nlaka'pmx Elder, 1991:

I've seen it, when the old people used to do it. I was just a little girl. I'd go up the mountain with granny. After we'd pick berries, my uncle would say, "It's going to rain pretty soon; time to burn." He stays up after we finished. Then, we go back the next year, it's all burned. Now, it turns into bush. That's why we don't get many berries any more. We're not allowed to burn.

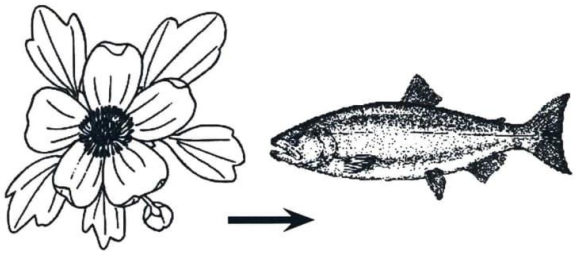
Source: Nancy J. Turner, "Not One Single Berry"

Blackline Master 1-4

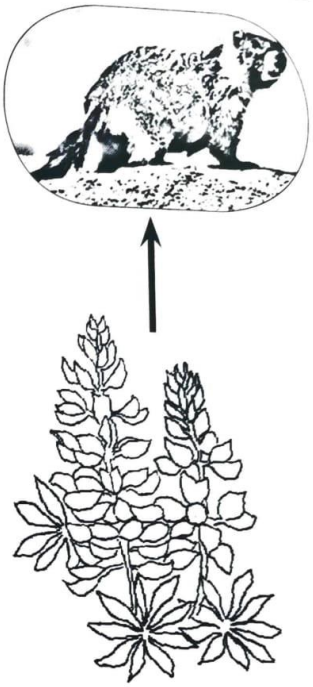
Understanding Nature's Signals



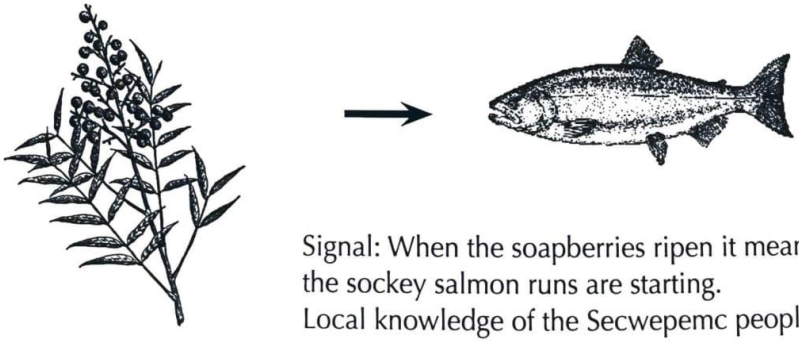
Signal: When the oceanspray plant blooms, the butter clams are ready to harvest.
Local knowledge of the Comox people.



Signal: When the sagebrush buttercup (called spring salmon eye) blooms, it means the first spring salmon are coming up the Fraser River.
Local knowledge of the Stl'atl'imx people.



Signal: When the lupine blooms, it is time to hunt marmots.
Local knowledge of the Okanagan people.



Signal: When the soapberries ripen it means that the sockey salmon runs are starting.
Local knowledge of the Secwepemc people.

Blackline Master 1-5

Research Using the 7Es

Research Question:

Environment
Have you gone out to the environment, if possible, and explored your question?

Engage
What do you already know? What do you want to know about the question?

Explore
Find out more details about the question.

Elder
Are there traditional stories related to your topic? What words are there in the local First Nations language?

Explain
Record you observations and research findings. Plan how you are going to present the answer to your question.

Elaborate
What other questions come out of your research? Complete your project.

Evaluation
How did you do? Were you satisfied with the answer to your question?

Blackline Master 1-6

Traditional Ecological Knowledge Research

Research Question:

Knowledge About Plant, Animal or Material	Harvesting and Processing Skills
Beliefs and Spiritual Connections	Learning and Teaching Knowledge and Skills

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Schoolyard Quadrats

Sampling & Biodiversity

Timeframe

1 Fifty minute class period

Target Audience

Middle School (6-8) Life Science but easily adapted to Grades 4-12

Materials

- 2 sets of cards labeled 1-10
- Small whiteboard
- Dry Erase Marker

Each Group Needs:

- Measuring tape (10 meters long) - can be subsituted for string marked in standardized units (feet/meters)
- One quadrat - can be made out of four plastic straws and yarn, or substituted for hula-hoops, or any other frame, but must be a standardized size

Each Student Needs:

- Student Worksheet
- Blank sheet of paper
- Clipboard

Contact:
SMILE Program
smileprogram@oregonstate.edu
http://smile.oregonstate.edu/

Description

In this activity, students practice the technique of measuring population density in quadrats by sampling the plant species that live in the lawn of the school. Students will gain an understanding of biodiversity, different sampling techniques (transect vs. random), and factors that impact population density.

Objectives

- Students will be able to define biodiversity, identify local plant species and calculate species abundance
- Students will utilize and compare common surveying techniques (random vs. transect sampling)

Teacher Background

Scientific methods taught in the classroom take on new meaning when students see (and experience) how "real science" is done by biologists who monitor the environment. Monitoring the environment means taking repeated samples in the same way at the same locations over time. To track changes over time, it is important to be able to quantify changes in abundance. Long-term monitoring increases sample number and allows scientists to detect change over time.

One common monitoring unit that is used in intertidal ecosystem studies (as well as other ecological/biodiversity studies) is the quadrat. Quadrats are square/rectangular frames within which species are counted and environmental qualities are measured. Scientists can place quadrats randomly in an area or quadrats may be placed at intervals along a transect line. Quadrats

are used because it is impossible to count every living and non-living thing in an ecosystem.

Preparation

Check out the lawn at your school to find an ideal place to set up a sampling experiment. Ideally, the area will be at least 10 m by 10 m, and have a lot of biodiversity. You may want to choose 4 species for your students to focus on. Additionally, note if there is a variety of soil and grass types that students could record on their datasheet.

Make sure the attached datasheet will match your needs/observations for the lesson

A list of common Oregon State lawn weed species is provided here: *http://horticulture.oregonstate.edu/content/welcome-pnw-weed-identification-module*

Activity Introduction

1. Explain how species are monitored using transects and quadrats – using Guiding questions. Introduce the activity:

   "Today we will apply methods that scientists use to monitor the biodiversity of an area to our own schoolyard. We will work in groups of 3-4 to make observations and count plant species using quadrats (or hula hoops)"
2. Divide students into groups of three or four. Each group will need a quadrat (or substitute). Each student needs a worksheet, sheet of paper, pencil, clipboard
3. Lead students out to the area of the school lawn you have designated.
4. Stand in the area to be surveyed. Each student should make a simple plan drawing of key features on the blank sheet of paper, including the direction of north, any nearby buildings, large plants (trees and shrubs), gravel or paths across the area. Explain that scientists always record detailed observations of their surroundings and characteristics of the day so they ensure the accuracy of their notes.
5. Lay one quadrat down on the ground. Ask students to look closely at the plants and observe how many different plants they can see. Collect samples of the most common plants (other than grass). Write their names on the whiteboard and attach a sample of each,

Key Vocabulary

Quadrat: Typically a square frame placed directly on top of vegetation used to survey biodiversity

Biodiversity: Measure of the number and variety of different plant and animal species that live in an ecosystem

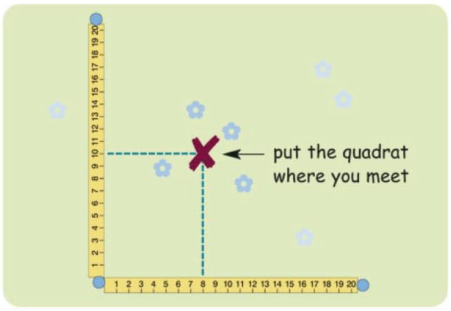
Population Density: Amount of a given species within a unit of area

Guiding Questions: Activity Introduction

- How do you think scientists monitor biodiversity in the field?
- Do you think it's practical to try to count every single organism in an area? Why not?
- Why do you think scientists need a standardized method of sampling?

or describe 1-2 identifying characteristics.

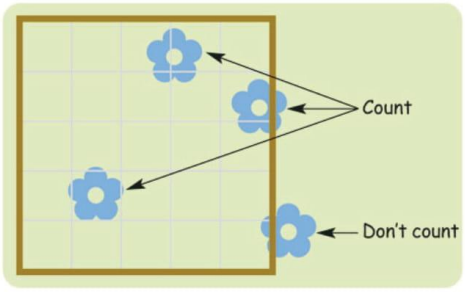
Activity Part One: Random Sampling



1. Lay out the tape measures or marked string at right angles along two edges of the area to survey. Lay the two bags of numbers near the point where the tapes meet.
2. As a group, have students pick one number from each bag. The students should walk to that number on each line. The place where the lines meet in the survey area with where they should place the quadrat. Numbers can get reused, but not the same combination.
3. On the worksheet (Figure 1), students draw any large features that happen to fall in the quadrat like trees, rocks, pavement, etc. Maybe divide quadrat into four equal areas (or quadrants) Figure 1 is 10 cm by 10 cm square - students can calculate the scaled ratio *(e.g. if quadrat is 1 square meter, it is a 1:10 scale to the quadrat)*

4. Using Figure 2 of common weed plant species found in Oregon, ask students to count the number of each plant species in their quadrat and record data in Table 1. *Note: If center of species/plant is outside of quadrat/frame, do not include in measurements.*

   Extension: Adapt worksheet to include percent of area covered, health of plants, ground coverage by gravel and/or dirt, soil types, etc. If working with younger students, presence or absence may be enough of an observation.
5. Using symbols shown alongside the plat diagrams (Figure 2), also plot the approximate location of the plants on your quadrat drawing in Figure 1.
6. Optional: If time allows, have each group repeat Steps 2-5 for a different part of the survey area. Another option for the second quadrat is to have students gently toss it over their shoulder instead of drawing numbers.



Activity Part Two: Transect Sampling

1. Each group needs a measuring tape. Have groups space evenly across sample area. Tell students that every meter/every

foot, they record what they find beneath the measuring tape. **OR** if more time, place quadrat every meter and record table measurements in Figure 3.

Activity Wrap Up:

1. Back in classroom, copy the class data into Table 2,. Total each column to get the class totals for the lawn. Instruct students to calculate average population density in count/ meter^2 (consider each quadrat's area and divide by total number of groups).
2. **Possible Extensions:**

- Produce bar graphs or other plots of the data collected
- Calculate the percentage of quadrats each species appears in

Wrap Up Discussion Questions:

1. What did you discover? How many different species of plants did you identify?
2. Comparison questions: **eg.** Are there more daisies in mown or unmown grass?
3. Which plant had the highest had the highest population density? The lowest?
4. What is the distribution of plants across the landscape? Did you notice clumps of a single species or were they mostly evenly distributed (heterogeneous vs. homogenous)?
5. How were results different between the two sampling methods?
6. How does the class average compare to measurements from an individual group? Which method is a better measure of population density than the other? Why?
7. What does the term Biodiversity mean? Why is biodiversity important?
8. What could change the types of species living in each area?
9. What would happen if one of the species disappeared?
10. What changes would humans need to make to increase the biodiversity here?

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Activity 5: Aquatic Food Chains

OBJECTIVES: For youth to:

- Identify at least one aquatic food chain and indicate which members are producers, consumers, or decomposers, and why.
- Identify one predator and one prey species and the importance of that predator to the dynamic balance of the community.
- Describe how energy flows through the system indicating the ultimate energy source and energy utilization by the various organisms.
- Correctly identify at least two invertebrates that were collected in the pond. Youth may use a guide such as Pond Life, a golden guide , the National Audubon Society Nature Guides, Atlantic and Gulf Coasts or Wetlands or the activity sheets in from Lesson 3 Activity 5. See the reference list for a complete citation on these publications.
- Demonstrate a knowledge of proper collecting and release methods while using the equipment provided for this activity.
- Provide several examples of interrelationships existing within the aquatic community observed.

LIFE SKILLS

- Acquiring, analyzing, and using information.

SUNSHINE STATE STANDARDS:

SC.4.L.17.2: Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

SC.4.L.17.3: Trace the flow of energy from the sun as it is transferred along the food chain through the producers to the consumers.

TIME: 60 minutes

Leader Information

This activity can be adapted for use in any aquatic ecosystem. It can be used in conjunction with the food web activities in Lessons 2-5. If the site is an estuary, for example, review the activity "Web of Life" in Lesson 4. This activity will provide additional information on the species found in coastal ecosystems. NOTE: If youth are cannot go to a location and collect the specimens, the educator should collect the specimens beforehand and have youth look at them in tubs for this activity.

This activity is designed to give youth a better idea of the food relationships that exist within an aquatic ecosystem. Many people see the game fish that a pond produces but few take a closer look at the many organisms making up the complex food webs that support the fish populations.

The energy source for all the organisms in the pond is the sun. Various types of green plants utilize sunlight to produce their own food. These green plants or producers can fall into a number of different categories: Submerged plants are rooted in the bottom and do not extend above the water surface. Examples are hydrilla and pond weed. Emergent plants are rooted in the bottom and extend out of the water. Examples are cattail and bullrush. Free floating plants have roots in the water that are not attached to the bottom. Examples are water hyacinth and duckweed. Phytoplankton are microscopic free floating plants found in the water column.

Animals that feed on the producers are called primary (or first order) consumers. Secondary (or second order) consumers feed on the primary consumers. Tertiary and fourth order consumers may also exist within the pond. These organisms form predator/prey relationships. Decomposers form the last major category which consists mostly of bacteria and fungi. These organisms break down dead organic matter or detritus into basic nutrients which may then be recycled by the producers or in some cases by consumers.

SETTING: Any pond that contains vertebrate and invertebrate population.

Materials:
Instructor:

- One large dip net and seine
- One sieve
- Two light colored pans
- 6 to 8 glass jars
- FOOD ENERGY PYRAMID
- AQUATIC FOOD WEB PICTURES

Youth (for each team of two)

- One dip net
- One magnifying glass
- One medium size plastic container (such as a milk jug with the top cut off)
- One set of tweezers
- One pencil
- One data sheet
- One clipboard
- Field guides to identify species
- DATA SHEET (1 for each youth)

ADVANCE PREPARATION: Read background basics. Gather all equipment together before beginning the activity. Make sure the youth have been properly instructed in the use of equipment and field guides. If possible, sample the area ahead of time and identify all unknown species. Make sure all equipment is available and in functional condition. Be prepared to show youth how to use the equipment. Make copies of DATA SHEET (1 for each youth)

The flow of energy from the sun to primary producers to consumers is known as a food chain. A common food chain found in ponds in Florida is: Sun ➔algae ➔snail ➔ ➔shell cracker (red ear sunfish) ➔large mouth bass.

A food web is the interconnected pattern of all separate food chains in a community. Each successive level of producers and consumers in a food chain is called a trophic level. With each transfer of energy (or with each successive trophic level), energy in the form of heat is lost to the environment. This concept of energy loss occurring at each trophic level can be illustrated by an energy pyramid.

INTRODUCTION

We can observe plant and animal life in many different ecosystems. Our observations help us to understand how all living things work together to make up an ecosystem. Oceans, swamps, or rivers may all contain very different living organisms, but they all need energy to live. Energy from the sun is transformed into food energy by plants. Plants are the producers. They need water, air, chlorophyll and energy from the sun to grow the leaves and fruits that are consumed by animals. Animals that eat plants are called primary consumers. Some animals, called secondary and tertiary consumers, eat other animals for food. Within an ecosystem, decomposers might be called the recyclers. These organisms, such as bacteria and fungi, breakdown organic matter into basic nutrients that may be reused by other living things. This flow of energy from one living thing to another is called a food chain. Today, we will visit a pond ecosystem and see how many food chains we can find!

Do

- Take youth to the area to be studied. Ask them to identify the source of energy needed to support the ecosystem. Also, ask them about other factors that might influence plant growth, fish populations, water temperatures, fertility, etc. (such as water clarity, predator/prey numbers, vegetation).
- Use the food chain and food web charts to point out the various organisms that exist within the pond or lake. Explain some of the food relationships that exist among these creatures and emphasize the fact that millions of smaller organisms support a small number of fish because of the loss of energy between trophic levels (e.g., by respiration, movement and waste products). Show youth the FOOD ENERGY PYRAMID Chart so that they can get a better idea of the energy flow and the numbers of smaller organisms required to support a few larger organisms in the higher trophic levels.
- Explain to youth that they are to observe or capture, identify and release organism (plants and animals) that are part of the food chain in the area. Emphasize that the creatures should be place unharmed in the plastic containers so that they can be returned alive at the end of the activity.
- Divide youth into teams of two. Explain that they are working in a "buddy" system and that each youth must assume responsibility for a teammate! Pictures of some possible aquatic animals they may find are provided on the following pages (see Bug Groups).
- Distribute the guides, equipment, data sheets, pencils and clipboards. Demonstrate how to use the collecting equipment (dip nets, seines, tweezers) and how to handle the organisms after capture. Show proper handling of a dip net by gently dragging it slowly through the water. Youth should not try to aggressively attack their specimens with the net. Explain how to use the guide and data sheet to identify -and record all organisms.
- Each team is now prepared to find and identify at least two organisms. Tell the teams to disperse, remain in view of each other, and use caution as they explore. Move from team to team to assist in collecting and identification. Help teams identify producers, consumers. Ask them to note such things as size, color, mouth parts, any special appendages and means of locomotion. Encourage them to determine what function each organism serves. If they find it difficult to identify producers or consumers, refer to the field guide which will give them some help. Make sure the teams are handling specimens and equipment correctly. Do not let them "over collect." One example of each organism will be sufficient.

- Call everyone together after about 30 minutes. Ask several of them to pour the contents of their jars into a light-colored pan. Have youth gather in a circle for a closer examination of the specimens.
- Ask youth to identify some of the specimens in the pans using identification guides. Also have them classify each organism in terms of its position in a food chain (producer, consumer). After the students have identified all specimens they know, look at the FOOD WEB Chart to see what members are missing from the collection (possible algae, zooplankton, and fish). Try to point out these missing organisms. Try to find out why they were not collected.
- Review the concept of the food chain and the energy flow within the chain, pointing out the energy source, producers, primary and secondary consumers.
- Explain the differences between a food chain and a food web. Emphasize the fact that most aquatic systems are actually many interconnecting food relationships that form a dynamically balanced community represented by a food web.

REFLECT

- **For each identified specimen: Where does this organism fit in the food chain? Is it a producer or consumer? If it is a consumer, what does it eat? Is it eaten by any other organisms?**
- **What is the energy source for a producer?**

  The sun.
- **What other components are needed for producers to survive?**

  Water, nutrients, air, and chlorophyll.
- **What is the difference between primary and secondary consumers?**

  Primary consumers eat plants, secondary consumers eat the animals who eat the plants.
- **What are decomposers? What do they do?**

  Bacteria and fungi are decomposers. They feed on organic matter and break it down into basic nutrients.
- **Which organisms were most abundant? Producers, primary consumers, secondary consumers or tertiary consumers? What could be a possible explanation?**
- **How does energy flow through the food chain?**

  Sun ~ producer ~ primary consumer ~ secondary consumer. Decomposers may act as the nutrient and energy cyclers when a plant or animal dies at any level of the food chain.

- **What predator/prey relationships can we find among the collected organisms?**
- **How many examples of a food chain can we list using these specimens? Can we connect some of these chains together? How would you describe a food web?**
- **Why was it important to handle the specimens with care and return them to the place from which they were collected?**

When the discussion session has ended or the specimens are no longer needed, have youth release all creatures, preferably in the same areas from which they were taken. Gather all equipment and return to a central location.

APPLY

- Draw pictures of the collected organisms while at the site or later back inside a room. Use the data sheets to label the drawings. Arrange the drawings in a group on a large bulletin board or hang them on the wall. Show the relationships between each organism by using string to connect all possible elements of the food web.
- Write a short essay about your field trip and the things you discovered. If you could be one of the organisms you observed in this environment, would you be a producer, consumer, or a decomposer? Why?

RESOURCE CURATION III	
Activity Sequence	No. 8
Title	Clam Gardens
(Supplemental) Source	Great Bear Sea. (2016). Exploring the Great Bear Sea Environmental Science Grades 11 & 12. *Green Fire Productions*. Retrieved from http://greatbearsea.net/wp-content/uploads/2017/12/Exploring-the-Great-Bear-Sea-Secondary-Environmental-Science-2017.pdf
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REPRESENTED PRINCPLES (YELLOW)	
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
P05	Students require social emotional learning supports to foster a sense of self and belonging
P06	Learning should be interdisciplinary and interconnected
P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
P08	Diversity and background of all students should be represented and brought into the classroom ecosystem
P09	Response Trauma Intervention (RTI) is about healing and supporting the soul rather than victimizing and resurging traumatic triggers
P10	Indigenous learning is good for indigenous learnings and all learners
P11	*Adaawx* can teach us stories that embodies preservation, conservation, cultural traditional, and eco-over-ego modernity.
P12	Classrooms should be an extension of our surrounding ecosystem, not a microclimate that is isolated from the natural system
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P19	Trust is a process that intrinsically bears no judgment
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Noble Academy

Scientist Guide

The "Key" to Leaf Identification

Introduction

Classification is an important and specific way of organizing information so that it can be used to understand the natural world. There are almost 9 million species on earth today; classification of these living things helps us see the similarities and differences in the living things around us.

The field of biology that identifies and classifies organisms into categories is called *taxonomy*. Scientists, or taxonomists, have classified millions of living species based on their physical characteristics and have given a unique name to each unique species. The scientists who classify living things record their classifications so that later, others who encounter a certain species will be able to identify it in the same way. Making sure that two scientists are referring to the same thing when using a certain name is important for clear communication.

A *dichotomous key* is a guide for classifying and identifying something by asking a series of questions to which there are only two possible answers that help guide scientists toward the correct identification or name of the item. Dichotomous means "divided into two parts." Many parts of the natural world that have been classified, categorized and grouped can be identified using a dichotomous key.

Activity Overview

In this activity, you will use a *dichotomous key* to identify 13 unknown leaf samples.

Materials

- 13 unknown leaf samples
- Leaf dichotomous key
- Leaf identification worksheet

Safety Precautions

- Please do not eat or drink in the laboratory.

Procedure

- Using the dichotomous key at each station, identify each unknown leaf.
- Always begin with step 1 of the *dichotomous key*.

(Continued on the next page)

This lesson was modified from Flinn Scientific Inc. Leaf Identification Kit, catalog no. FB0940, publication no. 1067.

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Procedure (continued)

- When looking at the key, there are two options for each step. For example:
  1a. Leaves are scalelike or needlelike 2
  1b. Leaves are not scalelike or needlelike.....3

  Choose the option that best describes the leaf in front of you and continue to the indicated step (in the example above you would either continue to step 2 or 3).

- As you work your way through the key, your choices will eventually lead you to the name of the leaf in front of you.
- Record the identity of the leaf on your "Leaf Identification Worksheet."
- Move to the next station and repeat, always beginning with step 1 of the *dichotomous key*.
- Continue classifying until all of the unknown samples have been identified.

Leaf Anatomy

Understanding the meaning of the anatomical terms used in the dichotomous key is necessary to successfully identify each leaf. If you are not sure of the meaning of a term, use the definitions and leaf figures below to help you. Never guess, as this could lead to the wrong classification term.

Definitions

Leaf **veins** are the vascular tissue of a leaf that carry water and nutrients, and support the blade, much as the metal ribs support the fabric of an open umbrella.

The **main vein** is the main or central vein that runs from the leaf stem to the tip of the leaf or to the tips of the leaf lobes (in this case, the leaf will have more than one main vein). Secondary or lateral leaf veins may branch off of the main vein.

A leaf **lobe** is a distinct protrusion that may be either rounded or pointed.

A **compound** leaf is a leaf that is composed of two or more leaflets on a common leaf stem.

A **scalelike** leaf is a leaf that has leaves that look like scales.

A **needlelike** leaf is a leaf that has long, thin leaves that look like needles.

A **serrated** leaf is a leaf that has a margin that is notched like a saw with teeth pointing toward the tip of the leaf.

The leaf **margin** is the edge of the leaf.

(Continued on the next page)

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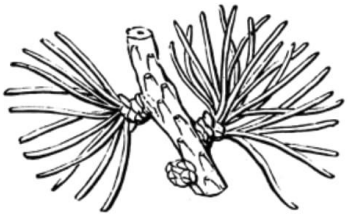
Leaf Anatomy (continued)

Figures

Use the definitions provided to label the different parts of the leaves below.



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Student Worksheet

Leaf Identification Worksheet

Name _____

Unknown Leaf #	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

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Scientist Guide

Leaf Dichotomous Key

1a. Leaves are scalelike or needlelike 2
1b. Leaves are not scalelike or needlelike 3

2a. Leaves are ½" long or shorter and have a narrow base ..... Eastern Hemlock
2b. Leaves are long and narrow, and needles are united at base to form bundles ..... Scotch Pine

3a. Leaves are finely serrated 4
3b. Leaves are not finely serrated 6

4a. Leaf has a single main vein with smaller side veins 5
4b. Leaf has main veins radiating from one point, base is not symmetrical..... Little Leaf Linden

5a. Leaf has a wide main vein ..... Eastern Cottonwood
5b. Leaf has straight, parallel, seldom branched veins..... Siberian Elm

6a. Leaves are lobed 7
6b. Leaves are not lobed 10

7a. Leaf has one main vein ..... Northern Red Oak
7b. Leaf has three to seven main veins radiating from one point at or near the base.....8

8a. Leaf has three distinct main veins..... American Sycamore
8b. Leaf has more than three distinct main veins 9

9a. Notches between lobes are deep and the under-surface is white downy .....Silver Maple
9b. Leaf is usually wider than long and base of leaf is not curved ..... Norway Maple

10a. Compound leaflets are present ..... Honey Locust
10b. Compound leaflets are not present 11

11a. Leaf is fan-shaped..... Ginkgo
11b. Leaf is not fan-shaped 12

12a. Leaf is heart-shaped with veins branching from the base..... Eastern Redbud
12b. Leaf is not heart-shaped ..... Osage Orange

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Observing, Describing, and Identifying Clouds

Purpose

To enable students to observe clouds, describe them in a common vocabulary, and compare their descriptions with the official cloud names

Overview

Students observe and sketch clouds, describing their forms. They will initially generate descriptions of a personal nature and then move toward building a more scientific vocabulary. They correlate their descriptions with the standard classifications using the ten cloud types identified for GLOBE. Each student develops a personal cloud booklet to be used in conjunction with the GLOBE Cloud Chart.

Student Outcomes

Students will be able to identify cloud types using standard cloud classification names.

Science Concepts

Earth and Space Science

- Weather can be described by qualitative observations.
- Weather changes from day to day and over the seasons.
- Clouds form by condensation of water vapor in the atmosphere.

Geography

- The nature and extent of cloud cover affects the characteristics of the physical geographic system.

Atmosphere Enrichment

- Clouds are identified by their shape, altitude, composition, and precipitation characteristics.
- Clouds help us to understand and predict the weather.

Scientific Inquiry Abilities

- Identify answerable questions.
- Use a Cloud Chart to classify cloud types.
- Develop descriptions using evidence.
- Communicate procedures, descriptions, and predictions.

Time

Two class periods. May be repeated on days when different kinds of clouds are present

Level

All

Materials and Tools

- GLOBE Cloud Chart
- *Observing Cloud Type Sheets* (in the Appendix)
- GLOBE Science Log
- Reference books containing cloud images
- Still or video camera to photograph clouds (optional)

Preparation

Obtain cloud reference books and mark the appropriate pages.

Prerequisites

None

Background

Accurate weather forecasting starts with careful and consistent observations. The human eye represents one of the best (and least expensive) weather instruments. Much of what we know about the weather is a result of direct human observation conducted over thousands of years. Although being able to identify clouds is useful in itself, observing clouds on a regular basis and keeping track of the weather associated with certain kinds of clouds will show students the connection between cloud types and weather. Recognizing cloud types can help you predict the kind of weather to expect in the near future. We do not describe those connections here, but there are numerous weather books that can help you and your students make them. Inviting a local meteorologist to visit your class and to talk with the students is a sure way to stimulate interest in the relationship between clouds and weather patterns.

In this activity, we ask students to look carefully at clouds, sketch them, and describe them in their own words *before* using the official names. The activity can be repeated on different days when different kinds of clouds are present. In fact, if you can be spontaneous, it would be nice to take a break and do some outdoor "cloud work" whenever a new kind of cloud appears in the sky. Over time, students can build up a considerable familiarity with cloud types. If you cannot always take the students outside when interesting clouds appear, perhaps you can observe them through a window.

Students Develop a Personal Cloud Booklet

Students should develop, either in their GLOBE Science Logs or in separate cloud booklets, an individual, personal set of notes on clouds and cloud types. They should devote one page of their GLOBE Science Logs to each individual cloud type they identify. They can include not only their own observations and descriptions but also photographs of clouds that they take or that they clip from other sources. On any given day students may observe several kinds of clouds in the sky at the same time. If several types of clouds are present, they should record each of the types on a separate page of their GLOBE Science Logs.

Identifying and Classifying Clouds

The GLOBE protocol asks you to identify ten common types of clouds. The names used for the clouds are based on three factors: their *shape,* the *altitude* at which they occur, and whether they are *producing precipitation.*

1. Clouds come in three basic shapes:
   cumulus clouds (heaped and puffy)
   stratus clouds (layered)
   cirrus clouds (wispy)
2. Clouds occur in three altitude ranges (specifically, the altitude of the cloud base):
   High clouds (above 6,000 m), designated by "cirrus or cirro-"
   - Cirrus
   - Cirrocumulus
   - Cirrostratus

   Middle clouds (2,000 - 6,000 m), designated by "alto-"
   - Altocumulus
   - Altostratus

   Low clouds (below 2,000 m), no prefix
   - Stratus
   - Nimbostratus
   - Cumulus
   - Stratocumulus
   - Cumulonimbus

Note: While both cumulus and cumulonimbus clouds may have their bases starting below 2,000 m, they often grow thick enough to extend into the middle or even high range. Thus, they are often referred to as "clouds of vertical development." Only high clouds are wispy and so the term cirrus has become synonymous with wispy as well as referring to high clouds.

3. Clouds whose names incorporate the word "nimbus" or the prefix "nimbo-" are clouds from which precipitation is falling.
4. Contrails are linear clouds formed around small particles in jet aircraft exhaust.

These are indeed clouds, caused directly by human activity, and are of great interest to researchers. We distinguish three subtypes:

1. *Short-lived contrails:* obvious tail behind a plane; Do not remain after plane passes;
2. *Persistent, non-spreading contrails:* obvious contrails (linear, narrow features) that do not appear to dissipate significantly, or to show signs of spreading, and that remain long after the airplanes that created them have left the area; Each contrail subtends a narrow angle in the sky;
3. *Persistent, spreading contrails:* obvious linear cirrus-type clouds with a diffuse appearance; Each contrail subtends a wider angle in the sky.

Cloud Identification Tips

Several things are useful to know in identifying and naming clouds according to the official classifications:

Clouds that are wispy and high in the sky are always cirrus of one type or another. If the cirrus clouds contain waves or puffs, then they are cirrocumulus. If they form continuous layers that seem to cover the sky high up, they are cirrostratus. Contrails occur at high levels too, and are very linear cloud features.

Clouds at middle altitudes are designated by the prefix "alto-." If in layers, they are altostratus; if in heaps and puffy, they are altocumulus.

Clouds that form at low altitudes (below 2,000 m) are either of the cumulus or stratus family. Clouds in the cumulus family are puffy and heaped. Clouds in the stratus family form in layers or sheets that cover broad expanses of sky.

Low clouds that are dark, threatening and *actually producing rain* receive the designation "nimbus." Nimbostratus clouds cover the entire sky with broad sheets and produce steady rain. Nimbostratus clouds are larger horizontally than vertically. The rainfall associated with nimbostratus typically is low to moderate in intensity, but falls over a large area for an extended period of time. Cumulonimbus have dark bases and puffy tops, often anvil-shaped, and are sometimes called "thunderheads." They tend to produce heavy precipitation, typically accompanied by lightning and thunder.

Using Photography

It should not be hard to find photographs of clouds in books, charts, and magazines. However, the students will enjoy taking their own photographs of clouds. Introduce this as an activity after they have sketched and described clouds in their own words. Video photography of clouds in motion also presents a new perspective on cloud formation and behavior, particularly if you can use a tripod and time-lapse photography.

Part 1: Describing Clouds In Your Own Words

What To Do and How To Do It

1. Organize the students into two-person teams. Send them outside with their GLOBE Science Logs to an open location to observe the clouds. Each student should draw a detailed sketch of the clouds in the sky. If there are several different kinds of clouds present, they should sketch each specific kind on a separate page of their notebooks.
2. Each student should record the date and time of day and describe the appearance of the clouds next to the sketch. They should use as many words as necessary to describe the appearance of the clouds. Emphasize that there are no right or wrong answers and that they should use whatever words seem appropriate to them. Some possible student responses:
   Size: small, large, heavy, light, dense, thick
   Shape: fluffy, stringy, cottony, lumpy, torn, smooth, patchy, sheets, ragged, looks like a...
   Color: gray, black, white, silvery, milky
   Description: thunderclouds, menacing, threatening, gloomy, enveloping, beautiful, streaked, foggy, bubbly, scattered, moving, swirling
3. Upon returning to the class, pairs should join together to share descriptions. Ask each group of four to compile a "group list" of all the words they used to describe each cloud type they observed. They should select the words they think are the best ones for describing the clouds they saw.
4. Using the GLOBE Cloud Chart, students should match their sketches with one of the photographs and record the scientific name of the cloud type next to their sketch.

Part 2: Comparing Your Descriptions to the Official Descriptions

What To Do and How To Do It

1. (You may choose to postpone this discussion until the class has accumulated descriptions of several different kinds of clouds.)
   Initiate a class discussion. Ask one four-person group to draw a cloud sketch on the board and record the words their group used to describe the cloud. If several different clouds have been observed, have a different group do each type. Ask other groups to contribute additional words they used to describe these clouds.
   Ask the students to group the words they used into clusters that seem to go together. Ask them to name the specific features of the clouds (such as size, shape, color, altitude, or other features) to which these clusters refer. Do these clusters represent the main cloud features to which they think an observer should pay attention? Are there any cloud features that have not been included? What would they say is the basis of their system, that is, what features of clouds does it pay attention to?
2. Ask the students to indicate the "official" names for the clouds pictured on the board. Explain that the official system used to classify clouds relies upon three features of clouds: shape, altitude, and precipitation. Compare the official system to the classification system they developed on their own. What cloud features does each include and omit?
   Ask students which of their words they would use to describe each of these cloud families:
   stratus clouds
   cumulus clouds
   cirrus clouds
   nimbus clouds

3. Repeat the observation, sketching, and description of different cloud types on subsequent days as new clouds appear in your sky. Have students develop a separate page of their GLOBE Science Logs for each new cloud type they observe. Have them record both the official name of the cloud and their own preferred descriptions of it. Continue to discuss the basis for the official classification system.

Adaptations for Younger and Older Students

Younger students can describe clouds in terms of their basic family type: cirrus, cumulus, and stratus. They can also describe the height of the clouds: low, medium, or high; their shape: large or small; and their color: white, gray, or black.

Older students can correlate cloud types with the appearance of certain types of weather. See the *Cloud Watch Learning Activity.* Students also can pay attention to the sequence of cloud types over the course of several days and can investigate the factors that cause clouds to form.

This activity can present interesting possibilities for collaboration with an art teacher or a literature teacher, each of whom can contribute a different, perhaps nonscientific, perspective on the description of clouds.

Further Investigations

Examine the correlation between wind and clouds. Chart the wind direction and speed for each observable cloud type.

Explain the connection between the hydrologic cycle and atmospheric conditions.

Satellite and shuttle photos allow observations of the dynamics of our atmosphere and the examination of large-scale phenomena that are not possible from land. Use space-based imagery to predict weather or to track storms. Consider the merits and disadvantages of space images versus local meteorological information and data.

Track storms and clouds from a distance to aid in understanding local weather conditions. Use binoculars to study clouds and their formations from a distance. Use local maps to help identify the distance of landmarks and the speed at which clouds are moving.

Create cloud games to practice identification skills and concepts:

Cloud Game #1: Have each student create a set of 3" x 5" index cards that includes names of the ten cloud types. A second set of cards includes illustrations of each of the ten types. Pairs of students combine cards, turning them face down. Partners alternate turning over two cards at a time, attempting to locate a match. A successful match results in another turn. Play continues until all cards have been matched. The winner is the partner with the most matched pairs.

Cloud Game #2: Groups of students can generate questions about clouds: appearance, shape, altitude, and percentage of dominant cover. On a 3" x 5" index card write the statement as an answer. For example: "Scattered Clouds" is the answer to the question, "What is the cloud cover when between a tenth and a half of the sky is covered with clouds?" Divide the class into teams to play. Players respond to the answer cards in the form of a question (see above).

RESOURCE CURATION III	
Activity Sequence	No. 8
Title	Clam Gardens
(Supplemental) Source	Great Bear Sea. (2016). Exploring the Great Bear Sea Environmental Science Grades 11 & 12. *Green Fire Productions*. Retrieved from http://greatbearsea.net/wp-content/uploads/2017/12/Exploring-the-Great-Bear-Sea-Secondary-Environmental-Science-2017.pdf
Page	90 - 89
Modification	Local elder-guided

REPRESENTED PRINCPLES (YELLOW)	
P01	Authentic learning is holistic, reflective, reflexive, and transformative
P02	Students have an intrinsic drive to learn given student autonomy and passion
P03	Students are important stakeholders when it comes to effective learning in the classroom ecosystem
P04	Student-led and faciliatory-orientated practices fosters inquiry
P05	Students require social emotional learning supports to foster a sense of self and belonging
P06	Learning should be interdisciplinary and interconnected
P07	Experiential learning connects every individual on a different personal and spiritual level given past experiences
P08	Diversity and background of all students should be represented and brought into the classroom ecosystem
P09	Response Trauma Intervention (RTI) is about healing and supporting the soul rather than victimizing and resurging traumatic triggers
P10	Indigenous learning is good for indigenous learnings and all learners
P11	*Adaawx* can teach us stories that embodies preservation, conservation, cultural traditional, and eco-over-ego modernity.
P12	Classrooms should be an extension of our surrounding ecosystem, not a microclimate that is isolated from the natural system
P13	Think global, act local to transform and re-connect youth to their land
P14	Soft skill development by doing can be more important than hard-skill mastery of theory-based concepts
P15	To foster creativity and innovation, collective collaboration is needed to exchange different perspectives of tackling a dynamic problem
P16	Mindful practices will foster mindful lifestyles
P17	Traditional Ecological Knowledge and Wisdom (TEKW) should be an essential dogma of sustainability
P18	Very moment, especially in nature, is a teachable moment that extends beyond a time and instance
P19	Trust is a process that intrinsically bears no judgment
P20	Students are constantly taking personal risks in their lives that we have not introspectively recognize

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JWAC Lesson Plan
U.N. Sustainable Development Goals

By: David Janise, September 2017

Warm-Up Question: *If you were to create a new sustainable development agenda to end poverty, protect the planet and ensure prosperity for all by the year 2030, what would your specific goals and targets for implementing this type of a plan be? Why?*

Discussion: On September 25, 2015, the 193 Member States of the United Nations spearheaded a set of 17 'Global Goals' with 169 targets to transform the world by the year 2030. The idea for putting forth the "SDGs" was informed in large part by the perspective on Ban Ki-moon, the former United Nations Secretary-General, who has said "we don't have a plan B because there is no planet B." Thus, a new sustainable development agenda was deemed necessary.

Implementation of the 17 SDGs is no easy task, however, as in each country the governments must translate the goals into legislation, develop a plan of action, allocate a budget, be open to and search for partners, etc. Coordination at the international level is crucial for the development of impoverished countries.

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Activity: *Have the students take a moment to read through the list of the 17 Sustainable Development Goals and targets to better understand what each is looking to achieve (distribute attached pages). Have the students individually make a list of the goals and rank the goals in order of importance. After, ask the students to share their list and encourage them to explain the reasoning behind their selections.*

Recap: *How has this exercise increased your awareness, knowledge, and understanding of the steps that are being taken by the United Nations to improve the planet? Do you think this is the appropriate and best approach to solving issues of sustainability? Is 2030 an appropriate timeline for achieving these goals?*

Discuss cross-cutting issues. For example, despite a stand-alone goal on gender equality, there is widespread consensus that progress on any and all of the SDGs will be stalled if women's empowerment and gender equality is not prioritized. *What are some other cross-cutting issues that could perhaps be foreseeable?*

Call to Action: *Take out a sheet of paper and brainstorm ideas for policies that could be put into place in order to help specifically address three of the SDGs. After 5 minutes, discuss and exchange ideas.*

- The United Nations website also has put together a list of actions that you can take in your everyday life to contribute to a sustainable future. The list, called "The Lazy Person's Guide to Saving the World," conveniently includes things you can do from your couch, things you can do at home, and things you can do from outside of your house. This can be found here: http://www.un.org/sustainabledevelopment/takeaction/
- To track the progress of the SDGs, the official Twitter account can be found at: https://www.twitter.com/GlobalGoalsUN

Attachment Material Source:

"United Nations Development Programme." *UNDP*, www.undp.org/.