

Lesson in a Backpack

Includes:

Final Report

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Georgian Bay Biosphere's Lessons in a Backpack

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Community Based Research Final Report

As humans continue to seek ways to better our natural environment, we frequently overlook those who will carry this burden as we age out of the movement. The Georgian Bay Biosphere's Lessons in a Backpack program works to address this by educating youth on urgent environmental issues, such as how to adapt to and mitigate the effects of climate change. The Georgian Bay Biosphere's goal is to promote human-nature harmony in the Georgian Bay region. The lessons in a backpack program includes a variety of lessons that begin in Grade 1 and can now be extended all the way up to Grade 10. The program's three main goals are to connect youth with environmental science and promote ecological literacy, educate youth about their impact on the environment and beyond, and provide interactive environmental science opportunities both inside and outside of the classroom.

This project coincides with the release of the 2023 State of the Bay report, which gives an overview of the environmental health in the Georgian Bay region. One of our project objectives was to be able to bring an important concept from this report into our lessons to help tie them to the new report that will be published later this year. Climate change was one of the key concepts I chose to investigate, particularly how we can use solar energy as an adaptation and mitigation technique in the fight against it. The lesson was created after reviewing the State of the Bay report and conducting a literature review, which helped in the process of understanding various techniques that could be used to actively involve students and ensure there are enough hands-on activity. Following the review of the literature, the researcher's developed and evaluated a preliminary lesson. After the initial review stage, there was an in-class pilot of the lesson, which enabled students, teachers, and the host organization to provide useful feedback. The in-class lesson presentation provided an opportunity for students' views to be incorporated into the lesson; this feedback was extremely valuable because many different situations occurred, allowing for notes and changes to the lesson that would not have been made otherwise. Following the in-class pilot of the instruction, reviews were completed until early April.

Various research questions were developed for this project, and are listed as the following:

1. What are the key messages from the 2023 State of the Bay Report for a Grade 10 audience?
2. What strategies would enable those key messages to be most effectively communicated and understood to that audience?
3. How can we measure students' understanding, participation, and impact?
4. How can traditional knowledge/two-eye seeing approaches be incorporated into the learning?
5. How can teachers be best supported to provide this information to students?
6. How can the Biosphere ensure this lesson will receive uptake in the short and long terms?

These research questions served as a foundation for my research, which ranged from selecting a subject to deciding which methods to integrate into my lesson plan. The literature review revealed that incorporating engagement activities throughout the lesson plan, as well as the use of videos, provides for appropriate attention retention among students. It was discovered that we can measure students' understanding by evaluating their baseline knowledge, as well as incorporating different activities that demonstrate how knowledge progresses through the lesson and final activities that get students to reflect on what was learned. There was no incorporation of two-eyed seeing in this lesson; however, if the lesson is further developed, there is an opportunity to incorporate a case study that could showcase an Indigenous community in Ontario or another area in Canada that has been able to incorporate solar panels within their community. Teachers are best supported when they are given a thorough plan that includes a variety of lessons from which they can choose what is best for their class. By providing speaker notes, teachers can correctly prepare their lesson ahead of time and feel confident in their lesson delivery. Teachers can also be helped by Georgian Bay staff, who are available to deliver these lessons in class for the teacher, requiring no additional preparation on their part. The biosphere, as an organization, can ensure that the lesson is understood by engaging with local schools, which are the intended audience, as well as reaching out to schools just outside the typical area, where the information still applies. There are edits that can be made to the lesson in the long run, such as the incorporation of new updates on the mentioned local faster project, as well as

working with more classes, such as an environmental science class, if this is added as a course in the area. Extensions to the lessons could also be created so that they can be given at the Grade 11 or Grade 12. Should a project of this nature be undertaken again, I would suggest a secondary pilot of the lessons within the classroom to allow student researchers to determine whether changes made in the first round were helpful and to remove any remaining gaps.

The final lesson which has been developed has many different components. One of the first components which has been developed is the in class PowerPoint presentation. The PowerPoint presentation is a visual aid which can be used by the teacher to help explain topics in relation to solar energy which is covered within the lesson. The presentation also covers an explanation to one of the in-class activities which utilizes an online software, this allows students to compare and contrast photovoltaic potential across multiple locations in the country and create a hypothesis as to which location of their chosen group is the best. To accompany the PowerPoint presentation is a slides note document which explains topics for each slide for the teacher to explain to students in more depth so that their own primary research is not necessary to be conducted. Thirdly, there is an in-class worksheet which can be printed to be used throughout the presentation. This worksheet includes the brainstorming question which is within the PowerPoint presentation and provides a space for students to write down their thoughts to share with the class. Located next on the page is a fill in the blanks section for students to fill in while they are learning about the fundamental steps of solar energy. Last on the worksheet is the GIS solar activity which presents students with the opportunity to choose various locations across the country and allow them to compare which locations present the most optimal photovoltaic measurements. There are two extra activities which can be conducted with the class. One of which is entitled the solar inquiry activity which gets students exploring the Georgian Bay Biosphere website as well as the Sustainable Severn Sound website and then proceeding to answer some questions as to what they have learnt from looking at these sources. The last activity is the outdoor activity which is an activity which is conducted as a class. This activity provides the class with a solar power meter which will be utilized twice. Two separate measurements will be taken on two separate days and as a class they will use the meter to measure how much solar energy is capable of being utilized in that moment. Each student will be prompted to record this measurement as well as other notes which may help them to compare the environmental conditions on each of these days. Following the two measurements being taken,

students can then proceed to write a reflection on what they have found through this activity and why one day would have been optimal over another for solar energy. All of these activities can be used to support the original lesson or removed should the teacher not want to use them, making this lesson very versatile as a multi or single day introduction to this topic.

This lesson has great value in terms of expanding the knowledge of many students and tying in with the 2023 State of the Bay report. This lesson has been created over the course of two semesters with the assistance of many people, including my research partner, Mitchell Montero, who developed an invasive species lesson in a backpack. Together, we have been able to broaden the range of lessons accessible to students in the hopes of continuing the conversation about the state of the Georgian Bay region. Furthermore, recognizing the assistance provided by Aliena Hoskins and Katrina Krievins from the Georgian Bay Biosphere were critical to the project's success. They were able to provide insight into the region as well as valuable information and feedback along the process, which aided in the development of the lessons that are now being presented. Finally, many thanks are extended to Matthew Walmsley, Dr. Brendan Hickie, and Dr. Stephen Hill, who mentored and supervised this effort and helped guide it to its conclusion. The importance of educating youth on environmental conditions in their immediate region is an important topic that is often not covered within the high school curriculum. Being able to create this lesson not only makes this available for students to learn about, but also provides an opportunity for inquiry into a new topic that would not have been sparked otherwise. Renewable energy is becoming the future as we know it, and by getting students to think about it before making major life choices, they may reconsider investing in nonrenewable energy sources. The development of this project has revealed that there is a curious aspect within students surrounding renewable energy, and being able to integrate technology into the lesson allows for higher engagement than other activities. The lessons in a backpack program have a bright future ahead of it, and I am thankful to have been able to contribute to it and look forward to seeing what else is in store.