Environmental Apps for Place-Based Learning

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Place-based learning is now an integral part of the British Columbia curriculum, and is an important link to the Canadian Indigenous Principles of Learning. Place-based learning can be loosely defined as an educational philosophy that helps students form a 'sense of place', or a connection to the part of the world that they live and learn in. This includes the history (both natural and cultural), landscape, communities, and biodiversity of a place. Place-based learning can be fostered by students making connections to the community, speaking with local Indigenous knowledge holders, investigating the geological, anthropological, and natural history of their town/region, or getting to know the flora and fauna that they coexist with. It is often linked to experiential learning - that is, not taking place in teacher-centered classrooms but driven by student curiosity and inquiry, often taking place outside of traditional 'school' settings.

We set out to investigate whether technology could be used to facilitate place-based learning about the biodiversity and landscape of a place. Among our group, we represent several diverse teachable areas, including arts, sciences, languages, and social studies. Our goal was to find easy, cost-effective ways to get students engaged in learning about their local biodiversity, regardless of the subject area. The first step, of course, is to get students outside and noticing the world around them in thoughtful ways. The right kind of intentional observation can lead to inspiration and curiosity, which leads to deeper and more meaningful learning and making.

To facilitate intentional observation and encourage students to get outdoors, we decided to focus on ways that students could learn more about the biodiversity of plants and animals in their area without having to buy and carry heavy, jargon-filled field guides. We found and investigated several mobile applications (apps) for finding, identifying, and learning about plants and animals. These apps utilize technology that students already have in their pockets, and allow them to take the 'experts' with them on a walk, hike, ride, or paddle. We took it upon ourselves to field test these apps, and provide a review for each one outlining its purpose and its potential uses for place-based learning, as well as a list of pros and cons to help our fellow teacher candidates decide which of these apps they would like to try for themselves.

1. Smart Plant

What is the app/website about?	● The purpose of the app help individuals provide care to their house plants. ● Individuals can take a picture and send it to experts to be identified. ● Once a plant is identified, the app will provide care instructions and send notifications-such as when to water plants or how much sunlight is required
Pros	● Experts identify plant images submitted by individuals ● Can ask experts questions about plants ● A reminder will notify an individual when to water plants and how much water they require
Cons	● Would not be an ideal app to use for place-based learning experiences as the purpose of the app is the care of house plants ● The premium version of the app costs $52 a year
How could you use the app/website in the classroom?	● May be useful if there were plants in the classroom. Only one app would be required to remind the class of when the plants need care and what kind of care they need (water, food, etc.). ● Perhaps having interesting plants for students to interact with inside a class may ignite a curiosity about different flora outside of the classroom

2. Picture This

What is the app/website about?	● A plant identification app ● Ability to upload images and the app will give suggestions for identifications ● There is a community component to the app where an individual can post images, comments or ask questions ● Can create a personalized collection of plant images ● Articles with information about how to grow different flowers or vegetables, and suggestions for enhancing the longevity of plants are provided ● Explore mapped areas where different plants have been located (local). Click on a picture of a plant and Details, Care, Uses and Gallery tabs provide detailed information
Pros	● In-depth information about various plants (description, interesting facts, symbolism, characteristics, scientific classification, condition requirement, care guide (planting difficulty, planting time, water, propagation, pruning, fertilizer, pests and diseases) and uses) ● Simple interface that is easy to use ● Interactive way to engage in plant identification and learn about plant diversity ● Collaborative component as images can be sent to friends ● Encourages observational and classifying skills
Cons	● Only available for IOS devices ● Free one week trial and then costs $3.99 a month ● The plant images are reviewed by artificial intelligence not by human experts

How could you use the app/website in the classroom?	● Students can: ● Learn about biodiversity in regard to local flora ● Explore the school grounds by identifying different plants. Examine and identify what is an invasive or endemic species ● Create their own species of plant and present to the class. The project would include detailed information as it would be displayed in the app ● Investigate the plants located in their backyard or nearby green spaces ● Challenge other students to find plants by creating scavenger hunts for each other ● This app would be ideal for use on a field trip (for example, Goldstream) or nature walk close to the school. Students could be given a list with descriptions (for example, find a plant that needs full sunlight and has a plant height of 4-16cm) and they need to snap different plants to see if that specific one matches the criteria

3. Lifescanner

What is the app/website about?	● Works with the Barcode of Life Database (BOLD Systems), which uses DNA sequencing to ID species ● Includes a database of all specimens collected all over the planet ● Can buy kits to send in your own specimens.
Pros	● App is free with no ads ● Gets students outside exploring their environment ● Interactive way to learn about genetic technology ● Students can actively contribute to a body of scientific knowledge ● Fun way to learn about the diversity of local species ● Teaches practical skills of observation, photography, search terms in databases
Cons	● Currently only available on Apple devices ● Collection kits are expensive ($50 for 4 collection kits) ● Database comprises mostly invertebrate species (*i.e.* great for bugs or tidepooling, but not birding) ● To collect whole animals, they have to be sacrificed. This is a moral dilemma that should be discussed as a class, and students should not be required to collect specimens.
How could you use the app/website in the classroom?	● Identify species, look up animals in your area, learn about local biodiversity. ● Learn about DNA sequencing and what it can be used to discover ● A field trip to a park/beach could

	include the app: make and check off a list of commonly found animals ● Students could photograph as many animals as they can find, then check with the app to see which ones they got ● ELL/second-language students could pick an animal, research it, and give a presentation of what they found, expanding their vocabulary. ● Using the kits, students participate in citizen science by contributing their specimens to the worldwide BOLD database ● Students could also be asked to investigate food fraud by collecting samples of meat or seafood

4. eBird

What is the app/website about?	eBird is a citizen science bird-reporting app that is produced and curated by the Cornell Lab of Ornithology (CLO), and is supported by Merlin Bird ID. It is free to download on all platforms (supported by a browser edition), can be used offline, and comes in over 30 languages. It has a built-in bird identification interface that links to Merlin, which can be used offline. It's a way for birdwatchers to keep track of their birding finds, with metrics available to help you track your sightings compared to previous years and months. Once the phone enters WiFi reception again, all these sightings are sent directly to a database monitored by CLO, which anybody can access.
Pros	● App is free, ad-free, and available on all platforms ● Easy and intuitive to use ● Number and length of birding expeditions can be curated by the teacher by following student accounts ● Can be used with Merlin to identify birds from a photo
Cons	● Merlin Bird ID must also be installed to use identification service ● Bird lists (eBird) and ID packages (Merlin) must be downloaded in WiFi range before heading into the field ● A baseline level of bird knowledge is required by the teacher to check students' work
How could you use the app/website in the classroom?	Students can: ● Engage with their environment and have an excuse to take their phone on a walk ● Participate in friendly competition among students for the most birds/rarest birds/most excursions ● Contribute in a real way to a body of

	knowledge that is used by scientists and birders all over the world ● Be introduced to the biological and mathematical ideas of point-counts, population ecology, statistical likelihood, survey methods, and identification. ● Get outside with friends and learn more about what is special about their backyards!

5. Merlin Bird ID

What is the app/website about?	● Developed by the Cornell Lab of Ornithology in 2014, it is an app designed for everyone from beginning to intermediate bird watchers ● Drawing it's data from eBird, a birding site also developed by the Cornell Lab (see above), the app hosts over 3000 species of birds based on millions of views worldwide ● Once you discover your own bird based on the app's help, the data is added to the app for future birders and more accuracy ● Bird Identification app based on picture ID and related questions with no need for wifi ● Contains a sound library for identification references for many birds ● Contains bird "packs" for five different continents of bird species
Pros	● App is free to download, free of adds and available on IOS and Android ● Does not need Wifi to connect to bird library or use photo identification ● Clean interface, intuitive to use, and very visual ● Sound library of different bird call is a great addition when trying to identify a bird you cannot see well ● Bird packs allow for selective downloading based on your region to save data from downloading the entire collection
Cons	● Requires a fair amount of data to download the photo ID capabilities and even one or two bird packs ● No certain way to know if the guessed identification is indeed correct without the bird still being present to compare
How could you use the app/website in the classroom?	Students can: ● Engage with their local environment

	and have an excuse to take their phones with them ● Participate in friendly competition among students for the most birds identified in a region ● Contribute in a real way to a body of knowledge that is used by scientists and birders all over the world ● Learn to explore and see in depth what is around them and think critically about the space they are in based on discoveries or lack thereof ● Get outside with friends and learn more about what is special about their backyards! ● Learn to observe detail for sketching en plein air for art or science observation ● Learn to really listen and feel a sense of place with adaptations available due to sound library for visually impaired students

6. Google Maps

What is the app/website about?	● Web mapping app or website designed by Google ● Offers many viewing pers such as, aerial photography, street maps, satellite imagery and, 360 degree views of streets
Pros	● Free to download, available for IOS or Android ● Engaging interface that is simple to use ● It is possible to explore maps offline when previously downloaded but not all the features are available ● Allows students to visualize locations from a different perspective
Cons	● Not every student may have access to a cell phone. However, creating groups could help to solve this issue ● Requires data and not all students may have a data plan. Placing students in groups with a student who does have data on their phone may circumvent this issue.
How could you use the app/website in the classroom?	● Students can: ● Explore the school grounds by conducting a longitude and latitude coordinate scavenger hunt. These coordinates might refer to a specific species of tree or a plant that they would then have to draw/learn about or it could be a landscape feature (hill, forest, glacial evidence, etc.). Students can also survey the school grounds themselves and create scavenger hunts for each other ● Learn about alternative modes of transportation by exploring various routes and travel times. Students could map out their favourite places in the city and discover what methods of transportation are the most environmentally friendly while also being convenient and realistic

	● This app could enhance a lesson or a unit on urban planning and policy. A project could create their own city, incorporating green transportation methods. For example, what is the city council process to establish bike lanes in the city? What are the benefits? What are the challenges? Have students become critically aware of the different methods of transportation (with pros and cons in mind) in the city as they navigate from place to place in their daily lives

7. SkySafari

What is the app/website about?	● SkySafari is a free app that uses augmented reality and a massive historical and knowledge database. ● Using Compass, the phone's screen turns into a planetarium, with an overlay of stars and other astral bodies that updates as you turn 360 degrees or change the angle of your phone up toward the sky or down toward the ground. ● At any time of day or night, the user can select any star in the sky that is shown on the app, and not only learn its name and what constellation it's in, but using the Selection tool will open an information page with everything known about that astral body and its history. ● The International Space Station, all the planets in our solar system, Pluto, the Sun, and the Moon are also included and have a ton of info available. ● Using the Time tool, the user can see what was happening in the cosmos at any time over the last several decades.
Pros	● Free (although there are pop-ups advertising in-app purchases, these are easily dismissed) ● Cross-platform (Available on Play Store for Android and App Store on Apple devices) ● Versatile, with many tools for students to explore ● Works day and night, any time of year ● Contains seemingly limitless extra information on every visible object in the night sky ● Can go 'back in time' using the Time function to understand planet/star movements ● Unlike some stargazing apps, it has the outer planets and Pluto

Cons	● Uses WiFi, but would require data if outside or out of WiFi range ● Does not contain every star in the sky (but has most of the easily-visible ones) ● The download is big, and will take up precious space on students' devices ● Some pre-knowledge of where to find things will help, but is not really necessary once you start exploring!
How could you use the app/website in the classroom?	● A cool lesson with this app could be using paper cut-outs and string to represent the movement of certain stars or planets over a year. ● This could apply to art, science, or even English (explaining the principles of astronomy to make sense of Shakespeare's "star-crossed lovers" maybe?)! ● In Social Studies, try a 'day at the planetarium' by dimming the lights and using the app to mark the constellations on the wall to link them to Greek and Roman mythology, other cultures' constellations, or Indigenous stories about the stars (with permission).

8. Picture Mushroom

What is the app/website about?	● Mushroom identification from photos with unlimited access to mushroom library and mushroom encyclopedia to learn more about each species after identifying them ● Similar to Merlin Bird without the connection to a scientific database
Pros	● Tons of information about each mushroom ● Explains time of year, where they're easily found and what they make come in handy for ● Clean interface, easy to use ● Keeps your personal library of identified mushrooms
Cons	● Free seven day trial but then it is 25.99 per year ● Information is drawn and connected to Wikipedia rather than a database linked to proffesionals ● Limit on IDs to make, without subscribing to the premium version ● Some of the mushrooms do not have much data on them if they aren't well known
How could you use the app/website in the classroom?	● I had fun seeking out different mushrooms on my hike and I could see students enjoying the act of discovery as well ● There are so many types of mushrooms in our own backyard that it would be an easy scavenger hunt, or competition in science to see who could find the most species of mushrooms and then choose their favourite to do a report on ● In outdoor Ed it would be helpful to learn about mushrooms and whether or not they are edible or useful for other tasks ● For an art class, I was blown away at the variety of colours there are in fungi and it would be a neat lesson to get

	students outside and learning about the variety of colour pallets in nature, and the significance of colour relationships in nature and in art