Increasing education and awareness on grassland ecosystems through the development of curriculum

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Abstract

Temperate grasslands are among the most endangered ecosystems globally, a situation mirrored in Canada, where significant portions have been lost. In British Columbia (BC), temperate grasslands cover less than 1% of the province but are crucial for over 30% of its species at risk. Despite their importance, there is limited awareness and education about grassland ecosystems and their services. Many teachers hesitate to focus on grasslands due to a lack of understanding and an absence of developed lesson plans that align with curriculum requirements. A project aimed at developing and piloting an elementary school curriculum on BC's temperate grasslands was therefore undertaken. The goal was to educate students and teachers about this endangered ecosystem in their region, foster local involvement, and gather support for grassland stewardship. The interdisciplinary curriculum meets the learning outcomes required for BC's public elementary schools, including embedding First Peoples Principles of Learning. Each of the three units contains ten independent lessons, which will all be available online. This will allow teachers to use the entire curriculum or select individual lessons to study. Portions of the first unit, "Grasslands: Grounding in Place," were piloted in grade 4 classes in fall 2023, complemented by field trips with elementary students. Feedback was positive, leading to a full-scale pilot in fall 2024. An outcome of this initiative was a partnership with the creators of BC Tomorrow, a free simulation tool that enables students to explore resource use and consider social, economic, and environmental factors. BC Tomorrow now includes a learning module about grassland ecosystems, which is available nationwide. This work is vital for raising awareness about grassland ecosystems and promoting further stewardship. Educating students and teachers about the significance and conservation of temperate grasslands will help ensure that these critical habitats are preserved for future generations.

Introduction

British Columbia’s temperate grasslands are endangered and cover less than 1% of the province’s land area, yet they provide many ecological goods and services (Iverson 2004). These include diverse habitats for plants and wildlife, flora for pollinators, nutrient cycling, carbon sequestration, and opportunities for recreation and outdoor education (Iverson 2004, Gayton 2013). However, there is a lack of awareness of the importance and function of grassland ecosystems in BC, especially within the public school system.

Many educators are hesitant to focus on grasslands due to a lack of understanding and the absence of developed lesson plans that align with curriculum requirements. Furthermore, recent updates to the BC Curriculum (PoBC 2024) have prioritized flexible learning environments and inquiry-based learning. The BC curriculum redesign has therefore heightened educators' existing interests in experiential and place-based learning and their desire

to take students outdoors (Asfeldt 2021, Gruno and Gibbons 2022). Additionally, this curriculum redesign may allow for increased collaboration between teachers and community groups or organizations whose priorities include education.

Flexible learning environments may also include the use of virtual, interactive resources. BC Tomorrow is a non-profit society that has developed a peer-reviewed simulation tool, which allows students to explore the impact of land uses on environmental, social, and economic variables (BCTS 2024). Their mission is to "help students and teachers explore sustainability when considering land use decisions in BC," (BCTS 2024). In addition to the simulator, there are opportunities to extend student learning with 'quests' that encourage students to explore the outdoors and create and upload personal field observations. The BC Tomorrow simulator features watersheds and a variety of ecosystem types, however, it lacks a grassland learning module.

To acknowledge the demand for outdoor education resources and address resource gaps, a collaborative pilot project aimed to develop and deliver an elementary school curriculum about BC's temperate grasslands. The objectives of the pilot project were to create an interdisciplinary elementary-level curriculum and complementary outdoor learning opportunities that aligned with BC's curriculum and embedded First Peoples Learning Principles throughout. A secondary objective was to collaborate with BC Tomorrow to develop a grassland module to complement the elementary-level curriculum lessons.

Methods

The curriculum was developed as part of an arts-based Master's in Environmental Education and Communications thesis (Rokosh 2024). A literature review of existing grassland-themed education resources was initially conducted by undergraduate students at Thompson Rivers University in Kamloops, BC. Semi-structured interviews were then conducted with local environmental non-profit organizations to address grasslands specific to the Thompson Okanagan. This literature review, coupled with the overview of the BC curriculum, helped identify gaps that could be addressed in the interdisciplinary grassland-themed curriculum.

Classroom planning involved preparing an 'Introduction to Grasslands' presentation and various interactive grassland-themed activities. First, a sensory 'smell box' (Annnenberg Learner 2020) contained fresh sprigs of big sagebrush (*Artemesia tridentata*), a shrub native to BC's grasslands, for students to experience. Next, we modified an outdoor colour scavenger hunt (Staten 2024) by completing the activity indoors and asking students to relate the colours to their local grassland area. Lastly, students were provided with various pressed grassland plant samples to showcase growth forms and colours, then asked to identify one similarity and two differences. Following the station-based activities, students completed a 'Know, Wonder, Learn' (KWL) activity (TLA 2024).

Field trip reconnaissance took place in September 2023 and locations were selected based on bus accessibility, trail difficulty, the grassland plant community, and outhouse access. Juniper Park, located in Kamloops, BC is a community park with a playground and a network of marked grassland trails and was selected for field trips in 2023. The 2023 field activities included a grassland-themed bingo game, a colour-chip scavenger hunt, and a nature journalling session (John Muir Laws 2017). In 2024, field trips were in Lac du Bois Grasslands Protected Area (Lac du Bois). Lac du Bois is located north of the Kamloops city center and is a Provincial Protected Area that captures 15,712 hectares of grassland, forest, and riparian ecosystems (BC Parks 2023). Lac du Bois field activities included exploring land uses, a 'create a creature' journalling exercise (ASTCSWS 2024), and a grassland eye-spy game.

Results

Unit 1 of the "Explore and Understand the Grasslands!" curriculum is titled "Grounding in Place" and includes ten interdisciplinary lessons (Table 1). Each lesson captures at least two learning objectives that align with BC curriculum and has First Peoples Learning Principles embedded throughout (Table 1).

In 2023 the curriculum was piloted in four classrooms at South Sahali Elementary School on September 29th and October 11th. Complimentary follow-up field trips were held on October 18-19th where 45 grade 3-5 students participated each day. In 2024, Marion Schilling Elementary School and South Sahali Elementary school grades 3-5 participated in the in-classroom presentation and field trip sessions to Lac du Bois. Four classrooms were visited on October 4, 2024, with field sessions occurring on October 11th and 18th.

Table 1. The lesson plan and learning objectives for the "Explore and Understand the Grasslands!" elementary-level curriculum Unit 1 - Grounding in Place.

Lesson #	Lesson Title	Learning Objectives
Lesson 1	What is a biome?	1) Students will identify the seven major biomes of the world. 2) Students start to explore interconnectedness within biomes i.e., food webs and cycles)
Lesson 2	An Introduction to Grasslands	1) Students will learn the location and broad features of grasslands both globally and locally 2) Students will reflect on what they wondered and what they now know
Lesson 3	Grasslands and Tk'emlúps Place Names	1) Students will listen to stories of the area to gain a deeper understanding of the history and feeling of the place. 2) Students will practice expressing a story (either their favorite story, or a version of a place-name creation story)
Lesson 4	Introduction to Journaling	1) Students will start to create their own field journals and gain understanding of the many purposes of journals 2) Students will make observations, ask questions, make connections, and learn about something that piques their interest.
Lesson 5	Observing our Landscapes and Outdoor "Mapping"	1) Students will spend time outside with their journals and record observations of their local landscapes 2) Students will create a map of their surroundings 3) Students will learn/explore elements of maps (orienteering, scale, legends, etc.)
Lesson 6	Indoor Mapping Activity	1) Students will see how their local area has changed over time and what it could look like when they get older. 2) Students see that human activities on the land impact water.
Lesson 7	Watersheds Part 1: What are those?	1) Students locate their watershed on a map using satellite imagery. 2) Students identify key places or significant features that exist in their watershed.
Lesson 8	Watersheds Part 2: What will this watershed look like in the future?	1) Students see how their local area has changed over time and what it could look like when they get older. 2) Students see that human activities on the land impact water.
Lesson 9	Introduction to Adaptations, Relationships and Interconnectedness	1) Students explore how grassland soils, plants, animals and climate/weather are connected. 2) Students observe how grassland plants and animals are adapted to their
Lesson 10	Field Trip to the Grasslands	1) Enhance students' understanding of grassland ecosystems by exploring them in person 2) Students learn and practice how to be a responsible land user while exploring the grasslands or any outdoor space

The KWL activity demonstrated that some students 'knew' that grasslands are hot and dry and knew about grassland plants (i.e., drawings of flowers, grasses, with few trees) and the variety of animals that live in grasslands. Other students 'wondered' what animals and plants live in grasslands and how living things survive and grow there. Following the grassland in-class presentation, students 'learned' that grasslands are endangered, how plants and animals adapt to living in hot and dry environments, and how we can help take care of our grasslands through stewardship efforts (i.e., walking on trails and cleaning up garbage).

The BC Tomorrow Society collaboration resulted in a 7.38-minute-long video that details the role of grasslands in supporting biodiversity and sustaining local communities that will be used to complement the grassland curriculum lesson plans.

Discussion [Conclusions/Implications]

The objective of this pilot project was to develop an elementary-level curriculum to help educate students and teachers about grasslands in their region. A secondary objective was to collaborate with BC Tomorrow to develop grassland-focused learning modules to supplement the curriculum. This project highlights the

importance of providing outdoor learning opportunities for elementary-level students. Students were highly engaged in the grassland curriculum and clearly expressed an admiration of their surroundings when exploring in Juniper Park and Lac du Bois. Studies have found that outdoor learning can increase a students' appreciation for nature, amongst other benefits such as improved self-confidence, physical and social skill development, and enhanced creativity (Boileau and Dabaja 2020). We also observed that grade 3-5 students are resilient to variable weather and maintain an overall positive attitude while exploring and learning in the outdoors.

The next steps in this project are to develop a diverse steering committee composed of educators and First Nations community representatives to help review and provide feedback on the curriculum. Furthermore, follow-up classroom visits will occur that will involve the BC Tomorrow grassland video and learning modules using the virtual simulator. Lastly, educators involved in the project will also continue expanding dissemination of curriculum through conference opportunities.

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