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Accessible and Enriched Community-Engaged Learning: A Botanical Virtual Classroom Field Trip

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Abstract

The Bloedel Conservatory, located on the unceded traditional territories of the xʷməθkʷəy̓əm (Musqueam), Sḵwx̱wú7mesh (Squamish), and səlilwətaɬ (Tsleil-Waututh) Nations in Vancouver, Canada, serves as an educational resource for the province's schools. The peak of the COVID-19 pandemic posed challenges for schools, teachers, and educators to access the Conservatory. In response, a collaborative effort with the educational group at the conservatory led to the creation of a curricular-aligned virtual classroom field-trip online teaching resource. This community-connected learning initiative features pre-recorded storytelling and semi-immersive videos showcasing the Conservatory's unique plant species, accompanied by curriculum-aligned lesson plans. Using the ArcGIS Story Map platform, the project maps the global origins of plants, integrating video, audio, and 360-degree content for an engaging virtual experience accessible through Wi-Fi-enabled devices. The project aims to achieve three objectives: 1) overcoming accessibility challenges for province-wide student and teacher access, 2) fostering deeper connections between individuals and plants (especially non-native species), and 3) engaging in community-based research and collaboration to promote scientific and environmental literacy. The experiences include a general virtual tour, an activity booklet, a virtual hibiscus-focused encounter and banana-themed exploration, and a blended/hybrid virtual learning lesson. These experiences weave together science, storytelling, singing, and dancing, contributing to an appreciation of biocultural diversity Coined by Luisa Maffi, biocultural diversity recognizes the interconnectedness of biodiversity and cultural diversity, emphasizing the integral relationship between nature and culture. This approach underscores the significance of understanding and preserving the multifaceted tapestry of life on Earth, encompassing biological, cultural, linguistic, and ecological dimensions. By transcending geographical boundaries, the project invites exploration and learning about the rich biodiversity within the Conservatory's dome, fostering a deeper understanding of the intricate relationship between biology, culture, and language.

Keywords: *biocultural diversity, science education, scientific literacy, environmental literacy, virtual classroom, Indigenous science,*

1.0 Introduction

Biocultural diversity represents a multidimensional framework that intertwines biological diversity with cultural diversity, emphasizing the interconnectedness between nature and culture. Originating from the interface of diverse ecosystems and evolving human societies, biocultural diversity reflects the dynamic relationships between biodiversity and the diverse cultures shaped by their environments. This concept transcends the traditional boundaries of conservation and anthropology, providing a holistic understanding of life's intricate tapestry.

Scholars have critically examined the historical development and paradigms framing biocultural diversity, exploring its conceptual evolution and implications [1][3][4]. Researchers have delved into the novel applications of biocultural diversity, such as its assessment in urban environments and its relevance in educational frameworks [2][5][6].

As we navigate the complexities of the twenty-first century, understanding and preserving biocultural diversity emerge as imperatives for sustainable development and conservation efforts. This paper aims to contribute to ongoing research by further exploring the nuances, challenges, and opportunities embedded in the dynamic interplay between biological and cultural diversity through collaborations with community and an urban garden located within a conservatory, specifically by exploring the learning affordances in K-7 classrooms using ArcGIS's Story Map platform.

2.0 ArcGIS Story Maps

ArcGIS Story Maps is a platform for creating interactive and engaging stories by combining digital maps (i.e. Google Earth), text, images, and multimedia content for a powerful impact through digital storytelling. Maps can be incorporated into stories to provide context, highlight locations, and connect readers relationally through place-based geographical learning. Additionally, the platform encourages students to explore and understand their world through virtual settings that they would not be able to access otherwise. ArcGIS Story Maps also allows educators a means to teach scientific content that go beyond traditional methods by fostering technical skills such as multimedia proficiency, digital storytelling, and topography [7]. In collaboration with the Vancouver Botanical Gardens Association's (VBGA), education team, four curriculum-aligned virtual classroom visits were created for Kindergarten to Grade 5 classes to learn about tropical plants in VBGA's Bloedel Conservatory.

3.0 Bloedel Conservatory: Virtual Classroom Experiences

The Bloedel Conservatory is located on the traditional territories of the xʷməθkʷəy̓əm Musqueam people, situated on top of Little Mountain, Vancouver's highest point in Queen Elizabeth Park. It is a glass dome-shaped structure and designated as a historic place. This botanical garden is home to a spectrum of flora and fauna with a variety of free-flying avian species and diverse exotic plants. The conservatory serves as a living laboratory, facilitating in-person field trips that enable students to engage with its diverse micro-ecological environment. Moreover, the conservatory became a place where students learned about biocultural diversity through stories shared by educators and the virtual visits. Specifically, the four virtual experiences were created by aligning with teachers' curriculum and classroom teaching approaches, where stories were shared from community members, students, scientists, artists, and educators to help connect science and culture and non-native plants to local plants.

The first virtual classroom visit offers a general overview and tour of the conservatory, introducing participants to specific plants under the dome: banana, hibiscus, spiral ginger, turmeric, and cinnamon. This experience gives students and teachers an immersive virtual experience akin to visiting the conservatory in real-time. The second virtual experience focuses on the hibiscus plant, accompanied by cultural stories from Hawai'i and Malaysia and Hawaiian hula dance. It includes curriculum aligned lesson plans and extensions for elementary students and teaching notes and prompts for the teacher (Figure 1, Figure 2).

Fig. 1. Screenshot of the virtual classroom experience with a focus on hibiscus in ArcGIS Story Maps.

Fig. 2. Screenshot of the hibiscus virtual experience on ArcGIS Story Map capturing a video snippet of the art of storytelling through hula dance.

Similarly, the third experience centers around the banana plant with classroom activities, and stories from Indonesia and Malaysia. These virtual experiences collectively aim to enhance engagement, learning, and appreciation for the plants in the Bloedel Conservatory (Figure 3, Figure 4).

Fig. 3 Screenshot of a virtual classroom visit focused on the story, science and economics of bananas.

Fig. 4 Screenshot of a section of the teaching notes for the virtual classroom experience.

The fourth virtual experience combines elements from previous experiences and includes a downloadable activity booklet to guide a blended experience to Bloedel Conservatory. The blended

experience contains curriculum-aligned lesson plans and provides suggestions and guidance for activities before, during and after the experience (Figure 5).

Fig. 5 Example pages from the activity booklet designed with curriculum aligned activities.

4.0 The Hibiscus

Connections to plants highlighted in the virtual tours are shared through science, stories, singing, and dancing. Stemming from an understanding of biocultural diversity – "the diversity of life in all its manifestations: biological, cultural, and linguistic — which are interrelated (and possibly coevolved) within a complex socio-ecological adaptive system" [8] the virtual experience of Bloedel intends to bring visitors closer to experiencing the plants and animals under the dome. Through a biocultural diversity lens, non-formal educational spaces become reflexive where students acknowledge, engage, and immerse in the cultural diversity of plants through stories. This project was designed to weave Indigenous science and western science together where science becomes contextualized so that, scientific knowledge becomes relational and relevant.

For example, in the hibiscus virtual classroom visit, the meaning of the hibiscus moved from being a symbol of the author's heritage and hula dance to all the possibilities for how science can be shared inside and outside the classroom. With this project, the hibiscus, represents much more than a tropical flower with its striking colors and delicate petals; it is a living testament to the marvels of adaptation, diversity, and the intricate web of life that educators have the privilege of sharing with their students as science educators. Educators learned that the hibiscus plant thrives in tropical, sub-tropical and temperate environments worldwide, exhibiting its ability to adapt to different climates and conditions. This ability to adapt to different environments through genetic diversity reflects biodiversity we find in ecosystems and ourselves. In addition, the hibiscus's cultural significance from Malaysia to Hawaii emphasizes the intertwining of nature and human culture. This intertwining underlines the importance of relationships with the natural world towards shaping one's beliefs about teaching science and connecting to the world. Through the hibiscus, a deep connection formed to the natural world. The virtual classroom experience helped enriched an educator's approach to teaching and deepened an appreciation for life's interconnectedness.

5.0 Conclusion

In conclusion, the concept of biocultural diversity serves as a multidimensional framework that interweaves biological and cultural diversity, emphasizing an interconnectedness between nature and culture. Collaboration with community, educators, students, and artist in the conservatory by using ArcGIS's Story Map as a platform, enriched the stories by connecting them culturally and geographically. The platform allowed digital storytelling to come from a place-based approach and together with curriculum-aligned activities and lesson plans, help educators bring their students closer to plants by deepening their relationships through stories. These experiences, focusing on specific plants like banana, hibiscus, spiral ginger, turmeric, and cinnamon found in the conservatory, are examples of how plants contribute to the creation of cultural significance. More importantly, these experiences move students away from hegemonic ways of teaching science by encouraging students to explore, understand and appreciate their relationship with nature, culture and the ecosystem.

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