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Bridging the Gap: Using School Campuses for Scientific Exploration and Language Acquisition

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Abstract

In recent years, education has emphasized the need for hands-on and active learning within the classroom, but this learning environment should be expanded to include innovative teaching practices that include the entire school campus. Learning outdoors has the potential to excite and reinvigorate learners while capturing a broader spectrum of our student body including those who are language learners or students who respond more to physical learning by doing. Participating in fieldwork, "provides a place to contextualize learning in real-world settings, acquire and develop technical and life skills and as a place to enjoy" [1]. As noted by Cooper and Wischemann [2], these outdoor spaces are valuable places for life learning and deserve much more attention for their capacity to serve our campus communities' need for study, relaxation, and aesthetic enjoyment. By emphasizing existing outdoor spaces for learning, we can call attention to the value and need for the protection of outdoor spaces that are often overlooked and underappreciated. These experiences will equip all students with the knowledge and skills required for a STEM-driven (Science, Technology, Engineering and Math) future and enhance science lessons to support multilingual students' engagement. We will provide examples from the campuses of Boise State University and Georgia Gwinnett College of innovative ways to use campus grounds and resources for extending learning opportunities beyond the traditional classroom environment.

Keywords: *Outdoor learning, scientific exploration, multilingual learners*

1. Introduction

Application is at the heart of obtaining new knowledge and skills. Whether we are trying to teach students a new language or kindle a conceptual understanding of the way the world works, experiential learning tools promote a personal investment of the learner in the subject material. In this paper, we discuss the idea of revisiting the traditional school campus and suggest a transformation that meets the wide range of our students' needs by considering both the exterior and interior spaces as valuable contributing parts of the whole learning environment. This revision is expected to translate into a broader reach, increased retention, and improved knowledge acquisition for students desiring an educational environment that fosters diversity and inclusivity. By building a structure beyond the institutional bar, we can cultivate experiences for students that facilitate the establishment of stronger communal links and the opportunity to learn by practice.

2. Designing a Complete School Campus

The existing model of using places of education as empty containers that facilitate auditory and visual information is uninspired. Exterior spaces when included, are discarded as casts of supporting characters with generic, token treatments. By dismissing the majority of our spaces as unused or undesirable, we are missing a major opportunity to connect and educate a much larger part of our student population. To promote investigation, creativity, and innovation, it is time to reimagine our institutionalized learning environments in a holistic way that cultivates both the exterior and interior landscape of our educational campuses.

We need to overcome the restrictive and compartmentalized approach to education [3]. With an increasing dependence on the artificial built or virtual environment, we place too much emphasis on lecture-format delivery that requires students to be passive bystanders in their education. We are also losing touch with our connection to the natural world and our human nature. Edward Wilson, one of the most acclaimed ecologists of our time, coined the term Biophilia, to describe the idea that we are

genetically hardwired to maintain a connection with nature to promote and provision for our survival [4]. In this virtual age, when we become farther and farther removed from that connection with each passing generation, we are seeing profound impacts to human psychological well-being. Scientific research shows that people need to interact with nature for physical and psychological health [4-8]. This connection can also improve mental health and reduce stress [9-10]. It has also been connected to improving social cohesion [11] and reducing depression and aggression [12-13]. Beyond the implications to our health, the development of a complete learning environment can invite students to proactively engage in their education and enjoy the benefits of culture, place, and environment.

By crafting a space to host a framework for transdisciplinary, collaborative learning experiences, we can promote the implementation of a multidisciplinary approach in diverse contexts. This space needs to have an identity rooted in place so that cultural and natural history will translate across the learning environment. This is not a new idea. Humans have been learning from the landscape for 20,000 years. In 1938, Dewey proposed his experiential learning theory which emphasizes the importance of learning through direct experiences [14]. Students are much more likely to remember and apply what they have learned in the future if knowledge acquisition comes through experiential learning [14-15]. We need to create environments where learning has the potential to occur through exploration and reflection [16].

3. **Implications for STEM**

Tools like inquiry-based learning, problem-solving, experiential learning, or experimentation are all ways to promote a personal investment of the learner into the subject material. Efforts have been made to extend access into STEM (Science, Technology, Engineering, and Mathematics) educational fields to a broader range of participants. By creating a renewed sense of place that offers an environment for students to practice, play, and explore, we will extend that invitation to a wider audience and create a more level playing field for communication and participation. An unfamiliar and unpredictable environment can challenge previous beliefs and awaken cognition, leading to adaptive learning [17]. The theory of transformative learning acknowledges that putting an individual outside their comfort zone can stimulate new patterns of learning and encourage social interaction, self-reflection, and self-confidence [18-21].

When school gardens were incorporated into campus landscapes and curriculums, research showed improved performance in science, math, and language arts as measurable outcomes and personal growth in social development was noted as an indirect benefit [22]. Outdoor education has been shown to benefit group work and the cooperative and social environment within higher education [23]. With the careful, collaborative, and intentional design of outdoor learning environments, embodied learning facilitates new ways of thinking about the natural world. Students develop new ways of engaging, seeing, and connecting, developing a curiosity that is integral to scientific investigation and discovery. Public landscapes creatively designed in partnerships among educators, scientists, designers, and the public have the potential to amplify science learning for all" [24].

When teaching STEM disciplines, it is important to provide students with opportunities to actively participate. We use best practices in labs to enable exploration through practice and research so that students can ask questions and define problems, use models, plan and carry out investigations, analyze and interpret results, use mathematics and computational thinking, construct explanations and design solutions, engage in arguments based in evidence, and obtain, evaluate, and communicate information [25]. However, these practices can become a trap if they remain locked in simulations, case studies, or scenarios that aren't applied to the real world. There is a balance between using these training wheels to stimulate scientific investigation, and the need to give our learners a chance to respond actively.

Science can also serve as an important entry point for students from diverse communities, including students from different social and linguistic traditions, particularly language learners [26]. By engaging in the process of scientific discourse in a practice-oriented environment, it promotes meaningful language use in contexts where students are required to communicate about science and levels the playing field for all participants, encouraging social interactions that would not come about in the traditional classroom setting.

4. **Implications for Language Learning and Acquisition**

In the United States, more than half of the school-age population is made up of racial and ethnic minorities [27]. Twenty-one percent of students speak other languages at home, and many of these students do not have their language needs met at school [28]. Research findings show that incorporating outdoor education increases students' confidence and motivation for language use [29].

We know that language acquisition is a process. Research has shown that students acquire language more easily and efficiently in an "engaging, low-stress environment that encourages them to communicate" [30]. It is important to set the stage for acquisition, which is natural, subconscious, and intuitive by fostering an environment that is an engaging, low-stress environment that encourages them to communicate. Educational practices such as active, collaborative, cooperative, and problem-based learning can enable language learning by requiring skills in cooperation, communication, problem-solving, leadership, time management, and role allocation [31]. In early childhood education, researchers found that children will use more language and more complex language while engaging in more complex themes like science and math when interacting with a nature-based playground [32]. The research across disciplines shows that students who have more opportunities to explore language activities in outdoor environments have greater benefits to cognitive and emotional development [33].

5. Examples from Different School Campuses

Field research and experiences in the natural sciences can be an integral part of training, cementing knowledge and skills through the act of doing [34]. These transferable skills are essential for the workplace and future employers. Field opportunities provide hands-on learning which is an important part of scientific training [35] and can be used to optimize engagement with the natural world [36]. Identifying connections beyond the traditional classroom setting can create a sense of community and will forge classroom bonds through group connections. Research shows that building a sense of community can improve student retention rates [37], however at many institutions of higher education and school campuses, outdoor spaces can be treated by administration as waste spaces or empty vessels awaiting development.

The facilitation of field experiences and funding for long-term research by institutions of higher education are in decline [38]. Students need their academic institutions to actively support a holistic learning environment, but the litigious nature of these institutions is intervening with support for off-campus or out-of-the-classroom activities.

At Boise State University, research experiences for undergraduates in Raptor Research are funded by the National Science Foundation and Boise State University. Undergraduate students are selected from a pool of applicants to participate in field and laboratory projects during this 10-week summer research program. The Boise State University campus is located along the Boise River providing opportunities for outdoor exploration and aquatic nature based activities. Bee hives are located on building roof tops, and students frequently interact with the numerous waterfowl and bird species. One of the best ways to become familiar with environmental issues and potential careers is through an immersive learning experience. Students are able to examine endangered species policy on campus and while backpacking nearby. They learn applied biology and acquire field mapping or hydrology skills, and outdoor education techniques are available through through collaborative school and uniiversity expertise. By gaining and reflecting on invigorating outdoor classroom experiences in schools and communities, future educators begin the process of becoming professional educators through field experience intentionally designed to be mutually beneficial to teacher candidates and the schools and communities they serve.

At Georgia Gwinnett College, the implementation of a Microfarm offers exposure to a cultivated site that can be used to teach skills in biology and agronomy, but it is also used in courses on environmental writing, nutrition, environmental science, physical education, and political science. The farm can be used for independent research projects but is also used as a way to foster a sense of community and build relationships in classes and among our student body. These transferable skills are essential for the workplace and future employers. Through a Roots to Shoots program, the farm is used as a training tool to grow food to donate to local food banks, but campus food waste is also gathered from the dining halls and composted to be used for growing plants at the farm. The program acknowledges the cyclical nature of needing compost to build soil for roots that will later provide for the growth of shoots that can be harvested for that invested wealth.

Georgia Gwinnett College has a 261-acre campus, but a smaller portion of this is devoted to the built environment. Like on other campuses, many faculty in biology, environmental science, anthropology, and physical fitness, use these undeveloped spaces for teaching and training. They are invaluable places to learn about science and natural history but also bring about a cohesion in our classes by breaking the norms of the conventional classroom setting. We find ourselves constantly on the defensive line for these natural spaces with campus development that sees this part of our campus as not being utilized.

At Barrow Elementary in Athens, Georgia, a landscape architecture project was envisioned and executed to take a red clay waste space on an urban campus and transform it into a series of native habitats that formed an oasis of gardens and outdoor classrooms for students and teachers. This allowed participants to engage with their campus in an entirely different way and offered opportunities and aesthetic improvements that translated to a change in learning styles for those who embraced the space.

6. Conclusion

Taking a more comprehensive and holistic approach to the learning environment has countless benefits, including improving the quality of life for all involved by providing a singular location that embraces the sense of culture and place. Research suggests that incorporating the outdoor environment emphasizes the application and integration of many intersecting subjects, resulting in enrichment across disciplines [39]. This way of learning encourages a deeper understanding and the development of critical thinking skills through activities like problem-solving, analysis, and creative projects, rather than just rote learning.

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