Nature-Based Physical Activity in Pictures: A Photovoice Unit in (and Beyond) Physical and Health Education

Jennifer Gruno and Sandra Gibbons

Abstract

Experts in public health and education alike have long advocated for the engagement of youth in nature to foster movement, human–nature connectedness, and mental wellbeing. Physical and health education teachers in school-based programs continue to find a variety of ways to help their students be physically active in the natural environment due to the plethora of positive benefits. This paper describes a unit entitled Nature-Based Physical Activity in Pictures that utilized Photovoice to engage youth and foster human–nature connectedness.

Introduction

Interactions with the natural environment, including urban nature, have been shown to reduce stress, provide relaxation (Cox et al., 2017), and help people stay physically healthy (Hartig et al., 2014; Markevych et al., 2017). For 13 years, Canadian children and youth spend a significant proportion of their waking day in school, and over time, experiences at schools affect nearly the entire population (McKenzie & Lounsbery, 2009). Physical and Health Education (PHE) is widely offered in schools (Pate et al., 2006), and PHE is also the only subject in which lifetime physical activity and health are primary outcomes (McKenzie & Lounsbery, 2009, 2014). However, many PHE programs in Canada include instructional practices that do not necessarily promote student learning of knowledge, behaviors, and skills for engagement in lifetime physical activity and healthy behaviors (Bulger & Housner, 2009; Kretchmar, 2006; Lee et al., 2007). Students are not always supported to be active in a way that helps them make the connection between being physically active in PHE and being active in the community and on the Lands where they live. This has led public health experts and leaders in PHE pedagogy to call for reform and urge PHE teachers to change (Institute of Medicine, 2013; Kretchmar, 2006; McKenzie & Lounsbery, 2014; Pate et al., 2006; UNESCO, 2021). The purpose of this article is to describe an instructional unit that used the action-research methodology Photovoice to help students in one PHE class foster human–nature connectedness through engagement in nature-based physical activity (NBPA). Students' connection to self, peers, community, Land, and technology throughout the unit is also discussed.

Human–Nature Connectedness

The PHE curriculum is provincially mandated in Canada and therefore can vary greatly across provinces. However, in 2023, PHE Canada published the Canadian PHE Competencies, which provides a unified approach for the subject in Canada. A vision mentioned in these national competencies is the goal for young people to be "respectful and empathetic towards themselves, others, and their environment"

(Davis et al., 2023). Specifically, one of the Grade 10 learning outcomes is to "enhance well-being and the well-becoming of others through exploration and movement in the outdoors" (Davis et al., 2023, p. 88). This national curriculum recognizes the wholistic nature of PHE and emphasizes human–nature connection for transformative wellbeing.

Educators nationwide now recognize the importance of human–nature connectedness as a determinant of children's and youth's lifelong health and wellbeing (Braus & Milligan-Toffler, 2018). Human–nature connectedness can be defined as "the extent to which humans see themselves as part of nature" (Barragan-Jason et al., 2022, p. 2). Several recent studies found that estimates of human–nature connectedness were positively correlated with pro-environmental behavior (Mackay & Schmitt, 2019; Vesely et al., 2021; Whitburn et al., 2020) and with human wellbeing (Capaldi et al., 2014; Pritchard et al., 2020). Although children from industrialized societies are known to show a strong affinity for other-than-human beings (Moore & Marcus, 2008), this affinity tends to fade with age (Hughes et al., 2019), and develop into low ecological concern in adulthood (Rosa et al., 2018), along with the acquisition of the perspective of humankind as the central element of existence (Wilks et al., 2021).

A global meta-analysis to assess human–nature connectedness found it can be used as a leverage point to reach sustainability (Barragan-Jason et al., 2022). The findings revealed that individuals with high human–nature connectedness had a deeper knowledge of nature, spent more time in natural outdoor spaces, engaged in more mindfulness practices, and were happier and healthier than those with low human–nature connectedness. They were also more humanistic, in the sense that they more strongly expressed their moral responsibilities to other humans, and their sense of connection to communities within society. The authors recommend promoting targeted and long-term interventions, including nature contact and mindfulness practices, and training those who educate young people in these practices to achieve the desired outcomes (nature conservation and human wellbeing) at a moderate cost (Barragan-Jason et al., 2022). One long-term targeted practice to achieve these outcomes is the implementation of NBPA in PHE.

Nature-Based Physical Activity

Human children and youth have never moved as little as they move today (Bowman, 2021). For almost the entire human timeline, movement has been woven into all aspects of living: foraging, learning, playing, building, celebrating, and traveling all required moving one's body over and over again in different ways (Bowman, 2021). However, over time, we have created a society that prioritizes conveniences that save us movement. Young people's desire and potential to move are often reflexive and innate, but they require an environment that signals and permits movement: nature. More nature usually equals more movement (Bowman, 2021), and this is where educators can utilize NBPA. NBPA is defined as physical activities that are done in natural spaces, require little specialized equipment, can be participated in by most youth, are cost-efficient, have connection to nature as a focus, and can be implemented by teachers on a regular basis (Gruno & Gibbons, 2023, 2020, 2021). A natural setting can be anywhere outdoors (on school campuses or in the local environment): woodlands, forests, beaches, gardens, farms, streams, or grass fields (Higgins & Nicol, 2002). Learning in natural environments can

offer many benefits for children's and youth's health, development, sustainability, and ecological and nature-friendly practices (Davies & Hamilton, 2018). While being outside is essential to getting acquainted with the Land, simply going outside is not enough. Encouraging deep connection with nature can transition into respect for the other-than-human world, develop children's and youth's sense of self, and help them understand their place in and connection to nature (Taylor et al., 2012).

NBPA differs from outdoor education programs which tend to draw students who already have experience in the outdoors, often have a costly fee associated with them, and focus on trip planning (Gruno & Gibbons, 2021). The goal of NBPA, on the other hand, is to be a cost-efficient and inclusive method of getting most kids moving in, and connecting to, nature on a regular basis. Students themselves, as part of a previous Photovoice study, have described NBPA as a means to connect to place, their classmates, and community; overcome challenges to being active in nature; and engage in mindfulness (Gruno & Gibbons, accepted).

Photovoice

Photovoice is a community-based participatory research method that empowers participants to identify experiences, concerns and elements of their environment through photographs (Catalani & Minkler, 2010; Wang & Burris, 1997). As a collaborative research method, Photovoice is a solution to support bottom-up, meaningful, youth-led collaboration to improve community and environmental resilience (Wang & Burris, 1997). The photo of Photovoice is the process that can turn the camera lens on the experiences of students when engaging in NBPA and provide them with the opportunity to record, reflect, and critique physical, community, and natural issues in creative ways (Wang & Burris, 1997). The voice aspect of Photovoice is a means to articulate lived experience and experiences of silencing, agency, and control (Liebenberg, 2018). It provides an opportunity for students to share their experiences in nature through photographic images. To have a voice also implies power—the power to express opinions (Liebenberg, 2018) —and it is builds strength and resilience (Dantas & Gower, 2021). By utilizing photos that participants have taken and then selected to discuss, discussions can be guided to reflect upon the reasons, emotions, and experiences that guided participants' chosen images. Photovoice can be adapted along a participatory continuum to suit the research design and purpose, ranging from individual, photo-elicited discussions to group interviews that collectively generate themes (Short et al., 2018). Due to this flexibility in methodology, previous Photovoice research has found that not only can Photovoice function effectively for research, but it can also be used as a powerful instructional tool by educators in the Kindergarten to Grade 12 school system. For example, Treadwell and Taylor (2017) utilized Photovoice to explore PHE students' physical activity in the community, and their methodology served as inspiration for this study. The steps taken by our team align with Treadwell and Taylor's (2017) first three steps: (a) select a topic; (b) take the photos; (c) select and analyze the photos. These steps within the unit entitled NBPA in Pictures are described in the next section.

NBPA in Pictures: Unit Description

Kate Baker, the teacher involved in this project, is a teacher-member of an ongoing schools–university partnership that studies the impact of NBPA in PHE (Gruno et al., 2018; Gruno & Gibbons, 2021). She is interested in the incorporation of NBPA to enhance meaning, lifetime physical activity, and health in PHE. She agreed to mentor pre-service teachers in the implementation of the NBPA in Pictures unit. NBPA in Pictures was the project of four pre-service PHE teachers for their major assignment in an assessment course. Kate opted to have the pre-service teachers work with a Grade 11/12 female identifying-only PHE class. The entire PHE class participated in the five-week unit, the taking of photos, and writing of captions, but only the photos and captions of those students who signed a district-approved media release form are included in this article.

Step 1: Select a Topic

NBPA was selected as the topic for this unit, as the benefits of participation for teachers and students have been well documented by the authors (Gruno & Gibbons, accepted, 2022, 2023, 2021). Prior to the unit, the pre-service teachers supplied the students in the PHE course with a survey identifying a variety of NBPA topics to explore over the five-week unit. Students were asked to rank the options, from the ones they were most interested in learning about to the ones they were least interested in learning about. Offering the opportunity to provide input into learning experiences has been identified by students as something that could help increase the personal relevance of activities in PHE and therefore the meaningfulness ascribed to the experiences (Beni et al., 2017). The top NBPA topics the students selected, and the pre-service teachers designed lessons for, were fitness and mindfulness in nature, forest games and teambuilding, survival skills, and connecting to community and yoga. The pre-service teachers then introduced the unit overview and assessment to the PHE students:

> Throughout this unit, you will be asked to take photos of yourself in nature or of your natural surroundings. Your assessment for this unit will be based on your photos and captions. For each topic, you will have the opportunity to submit a photo and an accompanying caption. Each week will have a different focus that you will center your photo and caption around. Details will be posted to Instagram for your reference and discussed during class time. You may be given opportunities to take photos in class, but you are also encouraged to take photos outside of class.

The teachers identified a theme and photo focus for each week of the unit. Every week, the teachers would send reminders on Instagram for students to post their pictures and captions.

Step 2: Take the Photos

The students were asked to use the Photovoice technique to visually document their experiences during the NBPA unit. Participants were provided prompts from the teachers about what to consider photographing. The teachers made the decision to have the students use their phones to take the photos, as Kate identified that all students in the course owned a phone and accessibility would be maximized. In designing the unit, the pre-service teachers and Kate also made the decision to not only suggest students take photos within the PHE lessons, but also encouraged students to take photos outside of class as well.

Many PHE experts have argued that PHE should further feature lifetime activities (Bulger & Housner, 2009; Ferry & McCaughtry, 2013; Palmer & Bycura, 2014), and many of these activities occur in nature, for example, swimming, walking, hiking, camping, and slack lining. They are activities youth can participate in alone or with others, and in a variety of natural settings (Schwab & Dustin, 2014).

Step 3: Select and Analyze the Photos

Students were encouraged to take many photos within and beyond the NBPA lessons in PHE, but they were only required to post one per week. That way, they could select the photo that best represented their experience in nature that week. We decided to use Instagram for the posting of pictures and captions because this was a medium that Kate was already using in her PHE classes and one that had received positive feedback from students. Additionally, a systematic review showed that apps can significantly impact physical activity behavior (Schoeppe et al., 2016), and Instagram as a tool to facilitate Photovoice research has been utilized and found to be effective (Pickering et al., 2022).

We created a private Instagram account and provided all students with the log-in information, so they did not have to use their private accounts. Instagram proved to be a valuable venue for the students' Photovoice exhibition, as it was an accessible medium that the students were comfortable with and visited daily. Also, Instagram offered the additional benefit that classmates could "like" and comment on their peers' photos and comments. In this paper, we use pseudonyms for all participating students in order to protect their identities. As the teachers identified the theme for the photos each week, the discussion occurred on Instagram through the captions and the comments. The next section is dedicated to exploring the teachers' NBPA themes and the students' photos and corresponding captions.

Learnings: NBPA Themes, Photos and Captions

The pre-service teachers selected the theme for each week of the unit based on research on how to facilitate NBPA in order to foster students' physical, emotional, and mental wellbeing, as well as human–nature connectedness (e.g. Barragan-Jason et al., 2022; Gruno & Gibbons, accepted). We identified some major themes that we wanted to emphasize, such as mindfulness, which has been identified as particularly impactful in having students connect with the natural world (Barragan-Jason et al., 2022). Mindfulness activities were woven throughout each week of the unit, and during these activities, students were asked to engage with their senses and their surroundings and disengage from their phones.

The first week of the unit functioned as an introduction to NBPA and featured a variety of outdoor activities—disc golf, orienteering, Indigenous plant identification, etc. All activities fit the definition of NBPA—they were done in natural spaces on, or adjacent to, school grounds; required minimal equipment; and had connection to nature as a focus. The Instagram prompt for the first week of the unit read, "Post a picture of yourself participating in a nature-based activity or the location of your activity." The teachers then added a follow-up question, asking students, "What elements of this activity make you feel motivated to participate?" This prompt resulted in a variety of images and captions from the students, including one from Michelle, taken in Mexico (Figure 1).

Fig. 1: Michelle's photo. "This is a photo I took in Mexico in the water. I love nature and I love to swim and take photos of nature. This was a family trip to Mexico; it made our family closer because we got to spend time together in nature."

The second week of the unit focused on fitness and mindfulness in nature. Students participated in a variety of movement activities while interacting with the natural landscape—running up a grass hill and over a bridge, balancing across a log, push-ups on some boulders, etc. The teachers then focused the last 15 minutes of each lesson on mindfulness activities where students were asked to engage with their senses while sitting silently by the creek adjacent to the school. After the first lesson, students were asked to complete the following during the week on Instagram:

> Take a photo of something that has the same colour that you are feeling right now based on the colour wheel provided on the Instagram feed. In the caption, describe what sort of techniques you may use to get your heart rate lower when in a stressful situation.

In response to this prompt, Madeline posted a photo of a sunset and her corresponding caption regarding her choice of capturing the color orange (Figure 2).

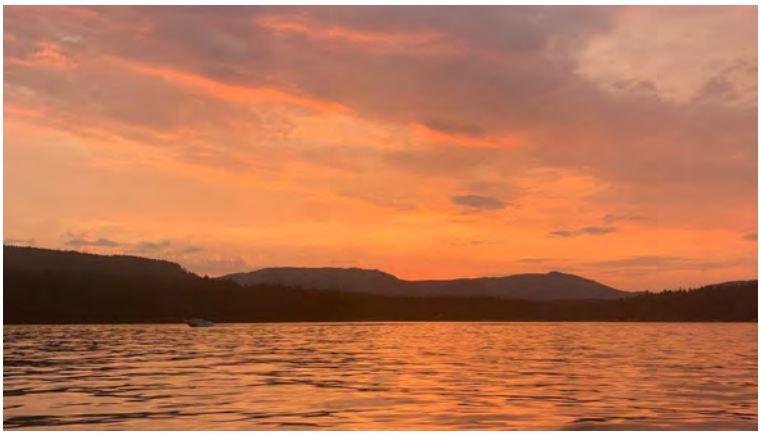

Fig. 2: Madeline's photo. "I've been feeling a lot of anticipation and optimism recently, so the colour I relate to the most is orange. A few ways I like to deal with stress are talking to friends, playing sports, listening to music, or going for hikes."

Purc-Stephenson et al. (2019), in their review of outdoor education programs in Canada, identified themes relating to the learning outcomes and psychosocial benefits of outdoor learning. The authors identified the incorporation of skills involved with recreational activities (hiking, canoeing, climbing) and camping (set-up, cooking, and fire building) to prepare students for these activities, either within the program or on their own time, as an important learning outcome. The third week of the NBPA in Pictures unit took inspiration from the results of this review and introduced students to a range of survival skills—shelter building, fire starting, and knot tying. After students had time to learn and practice the individual skills, they were asked to "select a photo taken during class that represents a practical skill you learned. In your caption, please describe what your photo is representing and when you might use that skill." Drew posted about their experience with knot tying (Figure 3) and Sam about her fire-starting experience in class (Figure 4).

Fig. 3: Drew's photo. "We learnt some simple knot tying in class and it is an important skill to know for survival skills like putting up shelters. Another important skill we learnt was untying the knots we made. This could come in handy in many dangerous situations."

Fig. 4: Sam's photo. "I took this photo during our fire-starting lesson. It was really fun to try and start fires, even if we didn't have much success. It was a valuable lesson that would be really useful in a worst-case scenario."

The fourth week of NBPA in Pictures focused on forest games and teambuilding activities in nature. Students participated in a variety of games such as Camouflage, Ring the Pin and Compass Walks. After participating in the games each lesson, students were then asked to walk silently back to the school while reflecting on their time in nature. As for the Instagram post, the student-teachers asked the PHE students to "post a picture of their environment while engaging in group games outside." In response, Annette took a picture of a flower in her school yard and reflected on nature games she played at summer camp (Figure 5).

Fig. 5: Annette's photo. "During our forest games classes, some of the games we played reminded me of summer camp when I would play Camouflage and Manhunt in the forest. Then when I saw the little flower in the photo [a student] took, it reminded me of how close spring is and then from there how close summer is!! I'm so excited for the warm days coming and can't wait to be back at camp soon."

The fifth and final week of NBPA in Pictures focused on connecting to community, and yoga in nature. Each lesson, students walked to a nearby beach and participated in a variety of yoga activities, including mindfulness, as well as beach clean-ups. The Instagram prompt for this week read: "Whether it is doing yoga on the beach or picking up garbage, post a picture of yourself connecting with your community and making an impact." Often, Kate, their teacher, would also post in response to the student-teachers' prompts to serve as a model for the students (Figure 6). Nikki followed Kate's post with her own insightful thoughts on yoga at the beach (Figure 7).

Fig. 6: Kate's photo. "I took this photo while I was observing the class during their mindfulness lesson at the beach. I chose to take this picture because I loved seeing the students do something different in nature and enjoy it. I also really enjoyed watching the community members' reactions to the activity and the students interacting with their surroundings. I will most definitely take them to do this in the future especially in the warmer months!"

Fig. 7: Nikki's photo. "I took this photo during yoga and mindfulness at the beach. To me, it highlighted the importance of connecting with both yourself and with nature. It also served as a reminder of how close and accessible this beauty is and how fun it is to experience with friends. I loved the feelings of calm and freedom this class brought me, and I feel like this photo encapsulated these."

Discussion and Conclusion

As a research and teaching team, we learned a lot from implementing the NBPA in Pictures unit with PHE students. From the photos, captions, and discussions with the students throughout the five-week unit, our number one takeaway was the sense of connection that the students emphasized throughout their learning experiences; connection not only to nature, which was the focus, but also to themselves, their classmates, and their community. This project supports previous Photovoice in PHE research (Gruno & Gibbons, accepted) and describes a promising instructional approach for eliciting student choice and voice, and connecting students to Land, themselves, others, and their community.

For this project, we did not focus on Treadwell and Taylor's (2017) fourth and fifth steps in conducting a Photovoice project in PHE: (d) create a needs assessment, and (e) advocate for change. Since a major goal of Photovoice is to advocate for change within the community, an area for future action will be to facilitate a class discussion after the NBPA in Pictures unit so students have an opportunity to share their selected photos and analyses as a key first step in creating a needs assessment. After sharing, we will ask students to list what they perceive to be shortcomings either on their school grounds, their neighborhood, or in the greater community when it comes to fostering human–nature connectedness and overall wellbeing. The final step advocated by Treadwell and Taylor (2017) is advocate for change. This could be at the class, school, district, or community level. The purest form of advocacy in traditional Photovoice projects occurs in the form of a photo exhibit (Wang, 1999). Another future goal of the NBPA in Pictures project is to put the students' photos on display around the school or host an exhibit in the evening and invite caregivers, teachers, administrators, and local community members to attend. The students, whose photos and captions would be on display, would be in attendance to answer questions about their photos

and talk about what they learned from their experiences in the unit. Taking these extended steps in a future iteration of NBPA in Pictures would further emphasize connection to community.

Another key learning from implementing this unit was the tension felt between technology usage and time in nature. The decision to include phones in this unit was a challenging one, as technology, when it comes to human–nature connectedness as well as health and wellbeing, "is like a double-edged sword" (Gao & Lee, 2019). It is often argued that media use leads to sedentary, indoor lifestyles and decreased time spent in nature (Pergams & Zaradic, 2006), and the rise of media technology is frequently identified as one of many factors that are distancing children and youth from the natural world (Payne, 2014). Seen from this perspective, media devices, such as cellphones, are unwanted intruders and disruptors of human–nature connectedness. "Green" and "screen" are seen to compete for young people's time in an increasingly time-poor society, and electronic media is blamed for drawing children and youth away from outdoor activity.

However, this imagined opposition between "green time" and "screen time" is complex. With the rise of mobile devices and interactive technologies, media consumption has diversified in a way that is not necessarily reflected in assertions that media "steals" children's and youth's "green time." Interactive and mobile media, therefore, can lead to intersections rather than divisions between "screen time" and "green time" (Hawley, 2022). Media can be consumed in nature (e.g., listening to a podcast while walking in a park) and it can also be produced in nature, for example, by using a cellphone to take and share photos as outlined in this project. Büscher (2016) points out that nature conservation organizations have adapted to the affordances and challenges of the digital age and identifies the importance of digital and interactive media in building support for causes relating to sustainability and conservation. This would be mirrored in future NBPA in Pictures projects when students utilize technology (cellphones to take pictures and then display them) to create a needs assessment and to advocate for sustainable change in their local environment. In this project, we felt it was important to begin exploring one way in which media can be more than a problem when it comes to connecting youth with the natural world (Hawley, 2022).

As popular media and research highlight increasing worries about young people, particularly in the context of climate injustice, implementing an NBPA in Pictures unit in PHE offers one potential for connecting youth with nature and fostering their health and wellness. A survey among adult environmental leaders showed that they attributed their commitment to sustainability to a combination of two sources in youth: many hours spent outdoors in keenly remembered wild or semi-wild places, and a mentoring adult who taught respect for nature (Chawla, 2006). NBPA in PHE can offer both sources. Perhaps we as educators can rethink how we foster wellbeing by asking our young people to take, select, and analyze photos of their time being active in nature. This critical engagement in their own learning within the local environment may help foster the realization that our health and wellbeing depend upon the health of the natural world.

References

Barragan-Jason, G., de Mazancourt, C., Parmesan, C., Singer, M. C., & Loreau, M. (2022). Human–nature connectedness as a pathway to sustainability: A global meta-analysis. *Conservation Letters, 15*(1), 1–7. https://doi.org/10.1111/conl.12852

Beni, S., Fletcher, T., & Ní Chróinín, D. (2017). Meaningful experiences in physical education and youth sport: A review of the literature. *Quest, 69*(3), 291–312. https://doi.org/10.1080/00336297.2016.1224192

Bowman, K. (2021). *Grow wild: The whole-child, whole-family nature-rich guide to moving more*. Propriometrics Press.

Braus, J., & Milligan-Toffler, S. (2018). The children and nature connection: Why it matters. *Ecopsychology, 10*(4), 193–194. https://doi.org/10.1089/eco.2018.0072

Bulger, S. M., & Housner, L. D. (2009). Relocating from easy street: Strategies for moving physical education forward. *Quest, 61*, 442–469. https://doi.org/10.1080/00336297.2009.10483625

Büscher, B. (2016). Nature 2.0: Exploring and theorizing the links between new media and nature conservation. *New Media and Society, 18*(5), 726–743. https://doi.org/10.1177/1461444814545841

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology, 5*, 1–15. https://doi.org/10.3389/fpsyg.2014.00976

Catalani, C., & Minkler, M. (2010). Photovoice: A review of the literature in health and public health. *Health Education and Behavior, 37*(3), 424–451. https://doi.org/10.1177/1090198109342084

Chawla, L. (2006). Learning to love the natural world enough to protect it. *Barn, 2*, 57–78.

Cox, D. T. C., Shanahan, D. F., Hudson, H. L., Plummer, K. E., Siriwardena, G. M., Fuller, R. A., Anderson, K., Hancock, S., & Gaston, K. J. (2017). Doses of neighborhood nature: The benefits for mental health of living with nature. *BioScience, 67*(2), 147–155. https://doi.org/10.1093/biosci/biw173

Dantas, J. A. R., & Gower, S. (2021). From ethical challenges to opportunities: Reflections on participatory and collaborative research with refugees in Australia. *Ethics and Social Welfare, 15*(2), 185–199. https://doi.org/10.1080/17496535.2020.1825765

Davies, R., & Hamilton, P. (2018). Assessing learning in the early years' outdoor classroom: Examining challenges in practice. *Education 3-13, 46*(1), 117–129. https://doi.org/10.1080/03004279.2016.1194448

Davis, M., Gleddie, D. L., Nylen, J., Leidl, R., Toulouse, P., Baker, K., & Gillies, L. (2023). *Canadian physical and health education competencies*. Physical and Health Education Canada.

Ferry, M., & McCaughtry, N. (2013). Secondary physical educators and sport content: A love affair. *Journal of Teaching in Physical Education, 32*, 375–393. https://doi.org/10.1123/jtpe.32.4.375

Gao, Z., & Lee, J. E. (2019). Emerging technology in promoting physical activity and health: Challenges and opportunities. *Journal of Clinical Medicine, 8*(11), 1–14. https://doi.org/10.3390/jcm8111830

Gruno, J., & Gibbons, S. L. (2020). Incorporating nature-based physical activity in physical and health education. *Journal of Physical Education, Recreation and Dance, 91*(3), 26–34. https://doi.org/10.1080/07303084.2019.1705210

Gruno, J., & Gibbons, S. L. (2021). Using discussion to inform action: Formative research on nature-based physical activity as a means of fostering relatedness for girls in physical and health education. *European Physical Education Review, 27*(4), 743–760. https://doi.org/10.1177/1356336X21991181

Gruno, J., & Gibbons, S. (2022). COVID-19 and beyond: Nature-based physical activities for physical and health education. *Physical and Health Education Journal, 87*(3).

Gruno, J., & Gibbons, S. (2023). Implementing nature-based physical activity in physical and health education teacher education. *Journal of Adventure Education and Outdoor Learning*, 1–18. https://doi.org/10.1080/14729679.2023.2243526

Gruno, J., & Gibbons, S. L. (Accepted). Using their (Photo)voice: Student experiences with nature-based physical activities in and beyond Physical and Health Education. *Canadian Journal of Action Research*.

Gruno, J., Gibbons, S., & Baker, K. (2018). Using Instagram to nurture relatedness amongst girls in physical and health education. *Physical & Health Education Journal, 84*(1), 5.

Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014). Nature and health. *Annual Review of Public Health, 35*, 207–228. https://doi.org/10.1146/annurev-publhealth-032013-182443

Hawley, E. (2022). Green time and screen time: Mapping the relationship between children, media, and nature. In *Environmental communication for children* (pp. 31–63). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-04691-9_2

Higgins, P., & Nicol, R. (2002). Outdoor education: Authentic learning in the context of landscapes (Volume 2). In *An international collaboration project supported by the European Union*. https://parkland.sd63.bc.ca/course/view.php?id=161

Hughes, J., Rogerson, M., Barton, J., & Bragg, R. (2019). Age and connection to nature: When is engagement critical? *Frontiers in Ecology and the Environment, 17*(5), 265–269. https://doi.org/10.1002/fee.2035

Institute of Medicine. (2013). *Educating the study body: Taking physical activity and physical education to school*. H. W. Kohl & H. D. Cook (Eds.). The National Academies Press. https://doi.org/10.17226/18314

Kretchmar, R. S. (2006). Life on easy street: The persistent need for embodied hopes and down-to-earth games. *Quest, 58*(3), 344–354. https://doi.org/10.1080/00336297.2006.10491888

Lee, S. M., Burgeson, C. R., Fulton, J. E., & Spain, C. G. (2007). Physical education and physical activity: Results from the school health policies and programs study 2006. *Journal of School Health, 77*(8), 435–463. https://doi.org/10.1111/j.1746-1561.2007.00229.x

Liebenberg, L. (2018). Thinking critically about photovoice: Achieving empowerment and social change. *International Journal of Qualitative Methods, 17*(1), 1–9. https://doi.org/10.1177/1609406918757631

Mackay, C. M. L., & Schmitt, M. T. (2019). Do people who feel connected to nature do more to protect it? A meta-analysis. *Journal of Environmental Psychology, 65*, 1–9. https://doi.org/10.1016/j.jenvp.2019.101323

Markevych, I., Schoierer, J., Hartig, T., Chudnovsky, A., Hystad, P., Dzhambov, A. M., de Vries, S., Triguero-Mas, M., Brauer, M., Nieuwenhuijsen, M. J., Lupp, G., Richardson, E. A., Astell-Burt, T., Dimitrova, D., Feng, X., Sadeh, M., Standl, M., Heinrich, J., & Fuertes, E. (2017). Exploring pathways linking greenspace to health: Theoretical and methodological guidance. *Environmental Research, 158*, 301–317. https://doi.org/10.1016/j.envres.2017.06.028

McKenzie, T. L., & Lounsbery, M. A. F. (2009). School physical education: The pill not taken. *American Journal of Lifestyle Medicine, 3*(3), 219–225. https://doi.org/10.1177/1559827609331562

McKenzie, T. L., & Lounsbery, M. A. F. (2014). The pill not taken: Revisiting physical education teacher effectiveness in a public health context. *Research Quarterly for Exercise and Sport, 85*(3), 287–292. https://doi.org/10.1080/02701367.2014.931203

Moore, R. C., & Marcus, C. C. (2008). Healthy planet, healthy children: Designing nature into the daily spaces of childhood. In *Biophilic design: The theory, science, and practice of bringing buildings to life* (pp. 153–203). Wiley.

Palmer, S., & Bycura, D. (2014). Beyond the gym: Increasing outside of school physical activity through physical education. *The Journal of Physical Education, Recreation & Dance, 85*(1), 28–35. https://doi.org/10.1080/07303084.2014.855597

Pate, R. R., Davis, M. G., Robinson, T. N., Stone, E. J., McKenzie, T. L., & Young, J. C. (2006). Promoting physical activity in children and youth: A leadership role for schools: A scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Physical Activity Committee) in collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing. *Circulation*, 114, 1214–1224. https://doi.org/10.1161/CIRCULATIONAHA.106.177052

Payne, P. (2014). Children's conceptions of nature. *Australian Journal of Environmental Education, 30*(1), 68–75. https://doi.org/10.1017/aee.2014.26

Pergams, O. R. W., & Zaradic, P. A. (2006). Is love of nature in the US becoming love of electronic media? 16-year downtrend in national park visits explained by watching movies, playing video games, internet use, and oil prices. *Journal of Environmental Management, 80*(4), 387–393. https://doi.org/10.1016/j.jenvman.2006.02.001

Pickering, C. J., Al-Baldawi, Z., Amany, R. A., McVean, L., Adan, M., Baker, L., Al-Baldawi, Z., & O'Sullivan, T. (2022). Photovoice and Instagram as strategies for youth engagement in disaster risk reduction. *Qualitative Health Research, 32*(12), 1897–1906. https://doi.org/10.1177/10497323221116462

Pritchard, A., Richardson, M., Sheffield, D., & McEwan, K. (2020). The relationship between nature connectedness and eudaimonic well-being: A meta-analysis. *Journal of Happiness Studies, 21*(3), 1145–1167. https://doi.org/10.1007/s10902-019-00118-6

Purc-Stephenson, R. J., Rawleigh, M., Kemp, H., & Asfeldt, M. (2019). We are wilderness explorers: A review of outdoor education in Canada. *Journal of Experiential Education, 42*(4), 364–381. https://doi.org/10.1177/1053825919865574

Rosa, C. D., Profice, C. C., & Collado, S. (2018). Nature experiences and adults' self-reported pro-environmental behaviors: The role of connectedness to nature and childhood nature experiences. *Frontiers in Psychology, 9*, 1–10. https://doi.org/10.3389/fpsyg.2018.01055

Schoeppe, S., Alley, S., Van Lippevelde, W., Bray, N. A., Williams, S. L., Duncan, M. J., & Vandelanotte, C. (2016). Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 13*(1). https://doi.org/10.1186/s12966-016-0454-y

Schwab, K., & Dustin, D. (2014). Engaging youth in lifelong outdoor adventure activities through a nontraditional public school physical education program. *The Journal of Physical Education, Recreation & Dance, 85*(8), 27–31. https://doi.org/10.1080/07303084.2014.946189

Short, C. E., DeSmet, A., Woods, C., Williams, S. L., Maher, C., Middelweerd, A., Müller, A. M., Wark, P. A., Vandelanotte, C., Poppe, L., Hingle, M. D., & Crutzen, R. (2018). Measuring engagement in eHealth and mHealth behavior change interventions: Viewpoint of methodologies. *Journal of Medical Internet Research, 20*(11), 1–18. https://doi.org/10.2196/jmir.9397

Taylor, A., Pacinini-Ketchabaw, V., & Blaise, M. (2012). Children's relations to the more-than-human world. *Contemporary Issues in Early Childhood, 13*(2), 81–85. https://doi.org/10.2304/ciec.2012.13.2.81

Treadwell, S. M., & Taylor, N. (2017). PE in pictures: Using photovoice to promote middle school students' reflections on physical activity during free time. *Journal of Physical Education, Recreation & Dance, 88*(4), 26–33. https://doi.org/10.1080/07303084.2017.1280436

UNESCO. (2021). Making the case for inclusive quality physical education policy development: A policy brief. https://www.sciencedirect.com/science/article/pii/S0003687013000513

Vesely, S., Masson, T., Chokrai, P., Becker, A. M., Fritsche, I., Klöckner, C. A., Tiberio, L., Carrus, G., & Panno, A. (2021). Climate change action as a project of identity: Eight meta-analyses. *Global Environmental Change, 70*, 1–8. https://doi.org/10.1016/j.gloenvcha.2021.102322

Wang, C. C. (1999). Photovoice: A participatory action research strategy applied to women's health. *Journal of Women's Health, 8*(2), 185–192. https://doi.org/10.1089/jwh.1999.8.18

Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education and Behavior, 24*(3), 369–387.

Whitburn, J., Linklater, W., & Abrahamse, W. (2020). Meta-analysis of human connection to nature and proenvironmental behavior. *Conservation Biology, 34*(1), 180–193. https://doi.org/10.1111/cobi.13381

Wilks, M., Caviola, L., Kahane, G., & Bloom, P. (2021). Children prioritize humans over animals less than adults do. *Psychological Science, 32*(1), 27–38. https://doi.org/10.1177/0956797620960398

Jennifer Gruno is an Assistant Teaching Professor in the School of Exercise Science, Physical and Health Education at the University of Victoria, British Columbia. Her research interests include fostering meaningful connection to nature in Physical and Health Education, and pre-service and in-service teacher education.

Sandra Gibbons is a Professor in the School of Exercise Science, Physical and Health Education at the University of Victoria in Victoria, British Columbia. Her primary research interest and scholarly contributions focus on increasing meaningful participation of girls and young women in school physical and health education programs.