SUSTAINABLE MOBILITY LITERACY IN PHYSICAL EDUCATION: A PHOTOVOICE AND CO-DESIGN APPROACH TO CLIMATE- AND SPATIAL-JUST SCHOOL MOBILITY

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ABSTRACT

Physical Education (PE) can play a key role in supporting lifelong movement, health, and well-being while shaping how young people experience safety, dignity, and belonging in and through space. Adolescence is a critical period for forming physical activity habits, yet inactivity remains high and unevenly distributed. At the same time, international health, education, and sustainability agendas call for school-based, multi-sector action that supports everyday movement, including walking and cycling. School routes and school-edge mobility spaces, however, are often uneven, climate-stressed, and socially contested. Conditions such as traffic danger, poor route legibility, heat, rain, ice, smoke, surveillance, and exclusion can constrain low-carbon mobility and daily physical activity, especially for students facing intersecting inequalities.

This article proposes sustainable mobility literacy as a PE-relevant competence linking physical literacy, health promotion, meaningful learning, and sustainability. Sustainable mobility literacy includes confidence, decision-making, risk-awareness, peer support, self-advocacy, and the ability to read environments critically for safety, comfort, and belonging. To operationalize this idea, this paper outlines a youth-centered photovoice-to-co-design pathway in which students document barriers and

support, co-analyze spatial and emotional patterns, and develop low-cost, temporary micro-interventions for trial with schools and community partners. A simple prioritization process and lightweight evaluation approach are included to support feasibility in school contexts. The paper offers a practical, transferable blueprint for translating PE learning into place-based improvements that foster safer, more inclusive, equitable, and sustainable everyday movement.

INTRODUCTION

Adolescence is a key developmental period for establishing movement habits that can shape health trajectories across the life course. A recent systematic review and meta-analysis found low but meaningful tracking of physical activity and sport participation from childhood and adolescence into adulthood, reinforcing the value of early, school-based support for sustained engagement (García-Hermoso et al., 2025). At the same time, physical inactivity remains widespread, with the World Health Organization (WHO) reporting that around four in five adolescents do not meet recommended physical activity levels, and girls are less active than boys (World Health Organization [WHO], 2024).

These concerns are increasingly addressed through policy agendas that connect physical activity to environments, systems, and coordinated action. WHO's Global Action Plan on Physical Activity 2018-2030 (GAPPA) highlights active societies, active environments, active people, and active systems, including school-connected supports for walking and cycling (WHO, 2018). UNESCO's Kazan Action Plan also positions physical education and active school as contributors to sustainable development through multisector collaboration (UNESCO, 2017). Likewise, the UN 2030 Agenda describes the Sustainable Development Goals as "integrated and indivisible" and emphasizes "deep interconnections" across goals and targets (United Nations, 2015, pp. 2-3). Taken together, these frameworks support a view of PE that is connected to health, sustainability, and social conditions rather than confined to lesson time alone.

School mobility offers a concrete daily site where these agendas intersect in practice. Walking, cycling, and transit use can support routine movement while contributing to transport mode shifts that reduce car dependence, which is relevant to climate mitigation pathways (Intergovernmental Panel on Climate Change [IPCC], 2022). Evidence also suggests that active travel interventions can generate co-benefits across safety, health, environmental, transport, economic, and social domains, while requiring stronger evaluation designs to clarify what works, for whom, and under what conditions (Ding et al., 2024). For PE, this makes school mobility more than a transport issue. It becomes meaningful context for learning, participation, inclusion and equity.

Equity is central because the feasibility of everyday mobility is uneven and shaped by space. Infrastructure quality, traffic danger, harassment, and climate exposure such as rain, heat, ice, smoke, and darkness can make active travel less viable for some students, especially those navigating intersecting barriers linked to gender, racialization, disability, migration, and neighborhood investment. These route conditions influence participation through bodies, peer dynamics, and

everyday experiences of comfort, fear, scrutiny, and belonging. Mobility is therefore experienced as a social and emotional geography as well as a physical one.

This concern also connects directly to longstanding critiques within PE. Critical scholarship shows how PE has often carried assimilative and normative discourses that center White, male, heterosexual, middle-class experiences, with racist and ableist assumptions shaping who is recognized as competent and who is positioned as "out of place" (Chhin et al., 2022). When these norms remain unexamined, efforts to promote "more movement" or "active travel" can reproduce exclusion, even when inclusion is an explicit goal. In this sense, questions about school mobility are also questions about whose movement is supported, whose safety is prioritized, and whose participation is treated as legitimate.

This article responds by proposing sustainable mobility literacy as a PE-relevant competence for future-oriented practice. Sustainable mobility literacy refers to students' capacity to participate in everyday mobility with confidence, care, and critical awareness, including route decision-making, risk awareness, peer support, self-advocacy, and the ability to read environments for safety and belonging under changing seasonal and climate conditions. Framed this way, sustainability in PE can move beyond policy aspiration and to an educational issue tied to teachable competence and lived participation.

This framing aligns with PE's long-term aims of physical literacy and lifelong participation by focusing on mobility practices that students repeat across everyday life. It also aligns with meaningful PE, which emphasizes personally relevant, socially connected learning experiences that support competence and autonomy (Fletcher et al., 2021). School routes, arrival spaces, and school-adjacent mobility zones are highly relevant sites for such learning because they are places where students already negotiate safety, peer relations, identity, and decision-making in real time. Positioning these spaces as PE-relevant learning environments expands PE's contribution while keeping its pedagogical aims visible.

A spatial lens further strengthens this proposal. Drawing on Lefebvre (1991), space is understood as socially produced through power, relations, and governance, which shapes visibility, vulnerability, and participation. In school contexts, this perspective helps connect movement opportunities to broader conditions of belonging and exclusion. An intersectional equity lens is therefore treated as a design requirement throughout the proposed process, informing how barriers are identified, whose experiences are centered, and which interventions are prioritized.

A youth-centered photovoice and co-design pathway provides a practical way to operationalize this framework. Participatory visual methods, including photovoice, have been used in PE/PHE research to surface embodied and place-based narratives, support reflective dialogue, and inform pedagogical and practical changes (Enright & O'Sullivan, 2012; Lorusso et al., 2020; Parker et al., 2016). In the model proposed here, student-generated evidence guides problem definition and solution design in school mobility ecologies. This can make hidden norms more visible, including which bodies and

movement modes are treated as expected, and which students experience recurring frictions in safety and belonging.

The article therefore presents a transferable action model for future PE: a youth-informed pathway that documents lived mobility conditions, analyzes barriers and supports with students, and co-creates trial-ready micro-interventions with partners. By linking PE learning to place-based improvement, the model aims to strengthen sustainable mobility literacy while contributing to more equitable conditions for everyday movement.

A TRANSFERABLE ACTION MODEL

This article proposes a transferable, youth-centered pathway that helps schools and local partners identify how school mobility ecologies shape safety, comfort, inclusion, and belonging, and then co-design low-cost micro-interventions that can be piloted as PE-connected sustainability and equity actions. The model is guided by four practical questions: (a) which features of routes, arrival areas, and school-edge spaces support or constrain students' safety, comfort, and belonging across travel modes; (b) how seasonal and climate conditions intensify or redistribute barriers (e.g., rain, heat, smoke, ice); (c) which micro-interventions are most meaningful to students and feasible to trial, including required approval; and (d) what lightweight evaluation approach can capture youth-relevant change while remaining feasible in school contexts.

Policy agendas emphasize active schools and enabling environments that support everyday movement (UN, 2015; UNESCO, 2017; WHO, 2018). The contribution of this model is to translate those agendas into an equity-centered, PE-anchored process in which youth experience informs both problem definition and solution selection.

STEP 1. DOCUMENT: YOUTH-LED EVIDENCE GENERATION THROUGH PHOTOVOICE AND MAPPING

Students document routes and school-adjacent mobility spaces using photovoice. This approach is well suited to sustainability-oriented PE because it makes everyday environments visible and discussable as part of learning. In PE/PHE research, participatory visual methods have been used with youth and educators to surface embodied, place-based narratives, support reflective dialogue, and inform pedagogical and practice change (Enright & O'Sullivan, 2012; Lorusso et al., 2020; Parker et al., 2016). Photovoice's methodological foundation emphasizes participation in representing lived conditions and analyzing them through dialogue (Wang & Burris, 1997).

Students take photos and add brief captions in response to prompts that foreground safety, comfort, belonging, and climate exposure (e.g., "What supports or constrains safety, comfort, dignity, and belonging across seasons?"). They are encouraged to focus on ordinary mobility features such as crossings, lighting, sidewalks, shade, weather conditions, bike parking, and social interactions. Captions remain short but purposeful, linking what is seen to willingness to move, confidence, emotions, and participation.

Given the visual nature of school movement spaces and bodies-in-motion in PE, this project treats visual representation as central to understanding how identity, space, and participation are produced in everyday practice. Photovoice supports youth voice by allowing students to document meaningful places and to co-interpret what those places mean for belonging, especially when experiences are difficult to express through words alone or when language-based methods create barriers for some participants. The resulting photo-caption pairs also function as boundary objects that can travel across stakeholder groups. When mapped to specific locations, they help researchers, educators, families, and community or municipal partners see route conditions from youth perspectives and identify actionable sites for micro-intervention.

STEP 2. ANALYZE AND CO-DESIGN: FROM LIVED EXPERIENCE TO FEASIBLE MICRO-INTERVENTIONS

Students then participate in facilitated co-analysis sessions where images are clustered into shared spatial and emotional themes and linked to specific locations using simple maps. Common themes may include conflict points, comfort points, climate exposure sites, visibility/surveillance, and belonging/identity dynamics. The result is a youth-generated mobility story that identifies priority micro-sites where small changes could reduce barriers.

Building from this evidence, students and partners co-design low-cost, temporary micro-interventions that can be trialed without long infrastructure timelines. Examples include crosswalk emphasis cues, barrier-free wayfinding, bike-parking visibility supports, rain or heat comfort points, and seating or water stations. Temporary trials can be especially useful where responsibility and budgets are fragmented or restricted across schools, districts, and municipalities.

To move from ideas to action, students and partners use a transparent prioritization process (e.g., dot-voting) based on shared criteria agreed in advance. Possible criteria include likely improvement in safety, comfort, and belonging; feasibility within time, materials, cost, and permission; responsiveness to seasonal and climate conditions; and equity, including whether the intervention reduces barriers for students facing the greatest constraints. The selected concept is then developed into a pilot-ready note that identifies the target location, summarizes student evidence, describes the proposed change, specifies required partners and approvals, and outlines basic materials, timeline, and indicators.

STEP 3. EXPERIMENT AND EVALUATE: LIGHTWEIGHT TRIALS WITH YOUTH-RELEVANT INDICATORS

The third step involves piloting a temporary micro-intervention and evaluating it using methods that are credible but also feasible in school contexts. The aim is to capture change in outcomes that students experience directly, including perceived safety, comfort, belonging, mobility confidence, and travel choices.

A lightweight evaluation may include brief pre/post micro-surveys, simple counts relevant to the intervention (e.g., bike-parking use or arrival-mode snapshots), photo re-takes at the same locations, and partner debriefs documenting implementation realities. Youth-defined outcomes should remain central because lived experience provides direct evidence of whether barriers have shifted and whether sustainable mobility has become more feasible in everyday practice, especially for marginalized students whose travel options are often constrained.

TABLE 1 : A TRANSFERABLE ACTION MODEL FOR SUSTAINABLE MOBILITY LITERACY IN PE

Step	Step Title	What happens	Tools / Methods
1	Document	Document everyday mobility experiences, identifying barriers and supports related to safety, comfort, belonging, and climate exposure.	Photovoice,caption, participatory mapping
2	Analyze and Co-Design	Co-analyze spatial and emotional patterns, identify priority sites, and co-design low-cost temporary micro-interventions.	Thematic clustering, co-analysis dialogue, co-design workshop, dot-voting
3	Experiment and Evaluate	Implement temporary micro-interventions and assess the impact using feasible, youth-friendly indicators.	Temporary prototyping, lightweight evaluation (pre/post), photo-retakes

DISCUSSION

This model matters for the future of PE because it treats school mobility ecologies as PE-adjacent learning environments while keeping core PE aims visible: meaningful participation, lifelong physical literacy, safety, confidence, and holistic well-being. It reframes PE as a contributor to movement culture across the school day rather than only within timetabled lessons.

A key strength of this approach is that it makes emotional geographies actionable. Mobility is experienced through emotion as well as infrastructure. Feelings such as comfort, fear, exclusion, and scrutiny are shaped through relationships, spaces, and power, and these feelings can influence participation as strongly as distance or traffic speed (Hargreaves, 2001; Kenway & Youdell, 2011). Photovoice supports this work by helping students connect emotions to concrete environmental features (e.g., lighting, crossings, visibility, crowding, and social interactions) and then translate those insights into design options. This keeps reflection central while also moving toward practical change.

The model also aligns with climate well-being perspectives by pairing emotional realism with feasible action. Young people increasingly report climate-related distress and concerns about the future, including effects on daily functioning (Hickman et al., 2021). In this context, school-based trials can support agency and collective care by reducing everyday frictions in mobility spaces, especially under seasonal and climate stressors that repeatedly shape access and comfort (Leung, 2024). This does not solve structural inequity, but it offers a realistic school-linked pathway for action, learning, and partnership with the broader community.

For PE systems, the proposed pathway can be adapted into curriculum and pedagogy through route mapping, scenario-based navigation tasks, and structured reflection on safety, comfort, and belonging.

It can also support collaboration across PE teachers, school administrators, families, district and municipal partners by clarifying roles, approvals, and decision pathways through the pilot-ready concept note and youth-relevant indicators. This action model can be piloted and evaluated in diverse school contexts.

CONCLUSION

This article proposes sustainable mobility literacy as a PE-relevant competence and offers a transferable photovoice-to-co-design action model for future PE. By treating school mobility ecologies as meaningful learning environments, the model connects PE to everyday movement, climate adaptation, and equity in ways that are practical for schools and relevant to students' lived experiences.

Its central contribution is documenting and amplifying youth experiences, co-analyzing barriers and supports, and co-creating changes that improve safety and belonging. In this sense, equity is addressed through attention to who faces barriers and through practical changes to the spaces that structure participation. This proposal also resonates with emerging whole-school approaches that integrate sustainability, mobility, and health promotion by treating school settings, routines, and cultures as key sites of change (Karlander & Geidne, 2025), while extending that conversation by positioning PE as a specific pedagogical home for youth-led, equity-centered mobility learning.

This approach strengthens PE's educational aims by building students' reflective capacity, decision-making, risk awareness, and self-advocacy in real-world movement contexts while supporting educators and partners to create safer, more inclusive conditions for participation. In a climate-changing world, these capacities and conditions are increasingly important for sustaining lifelong participation in movement and advancing the holistic health goals PE curricula have long sought to achieve. Framed this way, sustainable mobility literacy offers a concrete direction for a more just, meaningful, and future-responsive PE.

REFERENCES

Chhin, S., Petherick, L., Strachan, L., & Halas, J. (2022). Culturally relevant physical and health education: Perspectives from racially minoritized female high school graduates. *Revenue phénEPS / PHENex Journal, 12*(3). https://ojs.acadiau.ca/index.php/phenex/article/view/4234

Ding, D., Luo, M., Petrelli Infante, M. F., Gunn, L., Salvo, D., Zapata-Diomedi, B., Smith, B., Bellew, W., Bauman, A., Nau, T., & Nguyen, B. (2024). Co-benefits of active travel interventions beyond physical activity: A systematic review. *The Lancet Planetary Health*, *8*(10), e790–e803. https://doi.org/10.1016/S2542-5196(24)00201-8

Enright, E., & O'Sullivan, M. (2012). Producing different knowledge and producing knowledge differently: Rethinking physical education research and practice through participatory visual

methods. *Sport, Education and Society*, *17*(1), 35–55. https://doi.org/10.1080/13573322.2011.607911

Fletcher, T., Ní Chróinín, D., Gleddie, D., & Beni, S. (2021). *Meaningful physical education: An approach for teaching and learning*. Routledge. https://doi.org/10.4324/9781003035091

García-Hermoso, A., López-Gil, J. F., & Ezzatvar, Y. (2025). Tracking of physical activity and sport from childhood and adolescence to adulthood: A systematic review and meta-analysis. *Translational Pediatrics*, *14*(6), 1117–1128. https://doi.org/10.21037/tp-2025-89

Hargreaves, A. (2001). Emotional geographies of teaching. *Teachers College Record*, *103*(6), 1056–1080. https://doi.org/10.1111/0161-4681.00142

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health*, *5*(12), e863–e873. https://doi.org/10.1016/S2542-5196(21)00278-3

Intergovernmental Panel on Climate Change. (2022). *Climate change 2022: Mitigation of climate change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. https://doi.org/10.1017/9781009157926

Karlander, R., & Geidne, S. (2025). Health promotion meets sustainable movement-based education in school—a "walking school" initiative in Sweden. *Health Promotion International*, *40*(1). https://doi.org/10.1093/heapro/daaf006

Kenway, J., & Youdell, D. (2011). The emotional geographies of education: Beginning a conversation. *Emotion, Space and Society*, *4*(3), 131–136. https://doi.org/10.1016/j.emospa.2011.07.001

Lefebvre, H. (1991). *The production of space* (D. Nicholson-Smith, Trans.). Blackwell. (Original work published 1974)

Leung, N. (2024, May). *Climate wellbeing cohort brief* [Cohort brief]. UBC Sustainability Ambassadors Program, University of British Columbia. https://sustain.ubc.ca/sites/default/files/SustainabilityAmbassadors/2024-2025/Cohort_Briefs/Climate%20Wellbeing%20Cohort%20Brief.pdf

Lorusso, J., Bennett, S., & Ennis, C. D. (2020). Using photovoice to explore and extend physical education teacher education students' understandings of meaningful physical education.

Physical Education and Sport Pedagogy, *25*(6), 643–665. https://doi.org/10.1080/17408989.2020.1789572

Parker, M., Patton, K., & Sinclair, C. (2016). "I took this picture because …": Accessing teachers' depictions of change. *Physical Education and Sport Pedagogy*, *21*(3), 328–346. https://doi.org/10.1080/17408989.2015.1017452

Pate, R. R., Ward, D. S., O'Neill, J. R., & Dowda, M. (2007). Enrollment in physical education is associated with overall physical activity in adolescent girls. *Research Quarterly for Exercise and Sport*, *78*(4), 265–270. https://doi.org/10.1080/02701367.2007.10599424

Uddin, R., Salmon, J., Islam, S. M. S., & Khan, A. (2020). Physical education class participation is associated with physical activity among adolescents in 65 countries. *Scientific Reports*, *10*, Article 22164. https://doi.org/10.1038/s41598-020-79100-9

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development* (A/RES/70/1). https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_70_1_E.pdf

United Nations Educational, Scientific and Cultural Organization. (2017). *Kazan Action Plan*. https://unesdoc.unesco.org/ark:/48223/pf0000252725

Wang, C., & Burris, M. A. (1997). Photovoice: Concept, methodology, and use for participatory needs assessment. *Health Education & Behavior*, *24*(3), 369–387. https://doi.org/10.1177/109019819702400309

World Health Organization. (2018). *Global action plan on physical activity 2018–2030: More active people for a healthier world*. World Health Organization. https://iris.who.int/handle/10665/272722

World Health Organization. (2024, June 26). *Physical activity* [Fact sheet]. https://www.who.int/news-room/fact-sheets/detail/physical-activity