Volume 2, Special issue n°1, 2026

KINESIS
SAVOIRS EN SCIENCES DU SPORT

FUTURE MATTERS

REIMAGINING PHYSICAL EDUCATION IN A CHANGING WORLD

SOAR2

ISSN : En cours d'attribution

Vision

Emerging from the vibrant discussions of the "Future Matters" specialist seminar, this special issue, titled "Architects of Change: Co-Designing the Next Generation of Physical Education," moves beyond critique to construction. It challenges the Physical Education (PE) community to shift its role from observers of systemic problems to active designers of systemic solutions. This collection is a testament to a new paradigm in our field: one where researchers, practitioners, and students collaborate as partners in co-designing a more equitable, inclusive, and socially sustainable future for all.

Scope and focus

For too long, conversations about the future of PE have been dominated by retrofitted solutions to address deep-seated inequities. This special issue forges a new path. We are not just identifying problems; we are showcasing the blueprints for a better future. The core of this issue is built on the principles of social sustainability, focusing on how PE can become a space that actively fosters well-being, equity, and inclusion for every student, particularly those who have been systematically marginalized.

This issue addresses critical questions facing the future of our field:

•How can we move from simply identifying exclusion to actively designing for inclusion?

•What does a co-construction process—involving students, teachers, and researchers—look like in practice?

•How can we create PE environments that are not only physically active but also socially and emotionally nurturing?

Content and format

In line with this forward-looking vision, the special issue features a collection of short communications (2,000–2,500 words). These are not traditional research articles but rather dynamic snapshots of innovation in progress. Contributors were invited to share the concepts, ideas, and projects that are poised to shape the future of PE. The submissions may include early empirical data, but their primary aim is to provide readers with a glimpse into the next generation of thought and practice in our field.

Ultimately, "Architects of Change" serves as both a manifesto and a practical guide. It is a call to action for the entire PE community to embrace a collaborative, evidence-based, and design-oriented approach to building the future we want to see—a future where PE is designed by many, for all.

Summary

Presentation

Scientific news

Scientific articles

FUTURE MATTERS: REIMAGINING PHYSICAL EDUCATION FOR A CHANGING WORLD A ZINE

Selchow Mac Arthur, Kelly

Keywords: Zine, Physical Education, Sustainability, Design Thinking, Future Scenarios

ABSTRACT

This document presents the zine created by Dr. Kelly Selchow MacArthur as a post-seminar deliverable from the AIESEP Specialist Seminar 'Future Matters: Reimagining Physical Education for a Changing World,' held in Lausanne, Switzerland, on 5–6 February 2026. The two-day hackathon brought together 41 participants from 18 countries across 5 continents to explore how Physical Education can promote sustainable lifestyles and contribute to a healthier, greener future. Using a Design Thinking methodology structured around four ADEME future scenarios, participants empathized with user personas, ideated, prototyped, and pitched tangible solutions. The zine captures the event's keynote speakers, working groups, design process, and the spectrum of prototyped interventions that emerged — spanning pedagogical innovation, systemic change, and the development of concrete tools. It stands as a creative and accessible record of a shared conviction: that the future of Physical Education lies in its capacity to evolve toward a more systemic, collective, and ecological role.

INTRODUCTION

The following pages reproduce the zine developed by Dr. Kelly Selchow MacArthur as a deliverable from the AIESEP Specialist Seminar 'Future Matters,' held in Lausanne, Switzerland, on 5–6 February 2026. Zines — self-published, small-circulation works — have long served as vehicles for grassroots knowledge-sharing and creative expression. In this context, the zine functions as a concise, visually engaging record of an intensive international event dedicated to reimagining the future of Physical Education in the face of global sustainability challenges. It documents the event's structure, participants, methodology, and outcomes, offering readers an accessible entry point into the ideas and prototypes generated during the seminar. The zine is presented here in its original form, as a testament to the collaborative and creative spirit of the 'Future Matters' community of practice

THE ZINE

Padlet

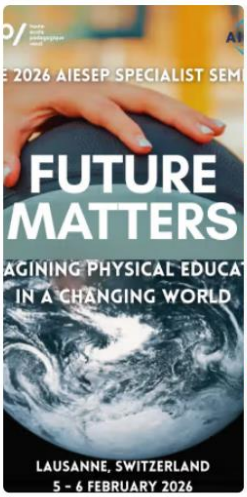
ksalchow 1/12/2026

AIESEP Specialist Seminar : FUTURE MATTERS / Feb 5-6, 2026 Lausanne, Switzerland

Overview

Future Matters: Reimagining Physical Education for a Changing World
A two-day hackathon exploring how Physical Education can promote sustainable lifestyles and contribute to a healthier, greener future.

https://aiesep-givnzd.manus.space



IGNITE Talks

DAY 1: Framing the Challenges
Marco Rieckman
Helen Kopnina
Paquito Bernard

Day 1: Collaborative Synthesis
Lombe Mwambwa
Cheryl Miller Houser

Day 2: Inspiration for Solutions
Julian Bleecker
Lucy Mills

UNESCO Chairs as Special Guests

Professor Tegwen Gadais & Dr. Karen Petry
UNESCO Chairs in Sport for Development, Peace and Environment (UQAM, Canada)

Professor Ann MacPhail & Professor Marco Rieckmann
UNESCO Chairs in Physical Education and Sport Pedagogy for Sustainable Development (University of Limerick, Ireland)

Professor Richard Giulianotti
UNESCO Chair in Sport, Physical Activity and Education for Development (Loughborough University, UK)

- **Future Matters participants**
  41 participants from 18 countries across 5 continents

  ORGANIZING COMMITTEE:
  Prof. Fiona Chambers
  Prof. Christophe Schnitzler
  Assoc. Prof. Lisa Lefévre
  Dr Laura Cashman
  Prof. Kelly Salchow MacArthur

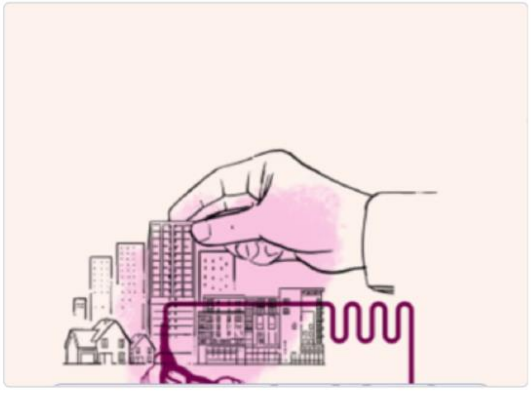
Photo: Filigrane

Working Groups

- **Each of the 4 working groups analyzed a distinct future scenario developed by ADEME (French Agency for Ecological Transition)**

- **Scenario 1. Frugal Generation: A world defined by sobriety and low-tech solutions.**
  Design Thinking Allies: Thomasson Claire & Valerian Cece / Supervisor: Lisa Lefévre
  Group A
  Paquito Bernard
  Tegwen Gadais
  Kelly Ohara
  Karine Sjödin
  Christina Stuhr
  Group B
  Oliver Farrel
  Suzanne Lundvall
  Laura Scott
  Menno Slingerland
  Josie Traberg
  Kim-Tamsin Williams

- **Scenario 2. Regional Cooperation: A future built on territorial networks and collaboration.**
  Design Thinking Allies: Oceane Cochon-Drouet & Matisse Gudin / Supervisor: Laura Cashman
  Group A
  Dean Barker
  Catherine Carty
  Donna Duffy
  Sally-Ann Jennifer Fischer
  Jacqui Peters
  Group B
  Nigel Green
  Seoin Heo
  Alexandre Mouton
  Elsa Salzedas



- **Scenario 3. Green Technologies: A society seeking a balance between technology and ecology.**
  Design Thinking Allies: Olivier Vors & Thomas Royet / Supervisor: Kelly Salchow MacArthur
  Group A
  Kristy Howells
  Pim Koolwijk
  Antonino Mulè
  Ivan Müller
  Sue Whatman
  Group B
  Nadja Černe
  Kyriaki Makopoulou
  Kwok Ng
  Pelagia Petraki
  Rachel Sandford
  Nick Sore

- **Scenario 4. The Restoration Bet: A world relying on large-scale technology to repair a damaged climate.**
  Design Thinking Allies: Lisa Lefevre & Valentin Arnal / Supervisor: Christophe Schnitzler
  Group A
  Annica Caldeborg
  SriPadmini Chennapragada
  Nikolaos Digelidis
  Oliver Hooper
  Gaëlle Le Bot
  Group B
  Nicholas Margas
  Nicholas Moreau
  Raymond Reynolds
  Matthew Ryan
  Petter Wiklander

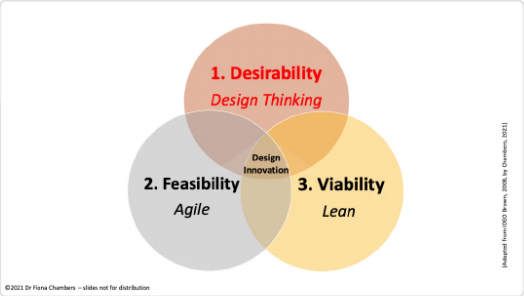
Design Thinking Process

- **How Might We...**
  Reimagine the future of physical education so that it fosters sustainability and sustainable lifestyle development for our citizens in global north and global south and planetary wellbeing.

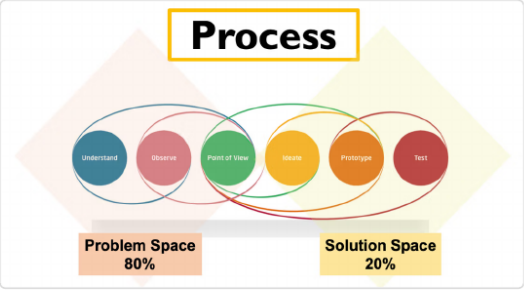
Photo: Aurore Petit Pierre

Using Design Thinking methodology,
groups deconstructed their scenario, empathized with a user persona, and ideated, prototyped, and pitched tangible solutions.

The Sweetspot of Innovation



Design Thinking is Our Superpower



Hasso Plattner Institute, 2018

Three Enabling Factors for the Design Team

© Dr. Fiona Chambers

- **We Pledge to...**
  Create a supportive environment, where everyone feels welcome, listened to and respected.

  Trust the process, knowing that by following the tasks, we will reach an agreed solution (but we may fail along the way)

  Keep things simple and clear, focusing on what matters most—solving our challenge and having fun while doing it.

  Prepare and support one another, jointly completing agreed tasks and helping our teammates feel confident and ready.

  Work collaboratively across languages, roles, and locations, valuing the strength of our diverse, global team of participants.

- **Day 1: Design Thinking Process**
  UNDERSTAND / OBSERVE / POINT OF VIEW
  After being introduced to the theoretical framework and the ADEME scenarios, participants chose the scenario they wished to join. Each of the four scenarios had two design teams groups. The first task was to build empathy for the inhabitants of their assigned future. This was facilitated through semantic analysis of the broad challenge, community mapping and interviewing a persona - fictional characters representing key community members i.e., the PE teachera teacher). By stepping into the shoes of these personas, participants moved from abstract concepts to concrete human challenges and aspirations. Groups then worked to define a specific problem (Point of View) being faced by the PE teacher persona

- **Day 2: Design Thinking Process**
  IDEATE / PROTOTYPE / PITCH
  The second day was dedicated to brainstorming solutions (ideation) and developing them into tangible concepts (prototyping). Once again teh persona and their actual problem was the focus. This practice of using fictional characters (personas) to explore possible futures is a form of design fiction (Bleecker, 2009), a creative tool that helps prototype not just products, but entire worlds. The prototypes were not expected to be polished products but rather concrete representations of an idea—a storyboard, a tool, a curriculum outline, a narrative. The process culminated in a "pitching" session, where each group had three minutes to present their prototype to the entire seminar. This final stage served as the "testing" phase, where ideas were shared and received feedback from peers.

Results

- **A Spectrum of Prototyped Futures for Physical Education**
  The seminar produced a spectrum of creative interventions, reflecting the varied expertise and perspectives of the international participants. The outcomes can be broadly categorised into three overlapping areas of innovation:
  1. Pedagogical and curricular transformation,
  2. systemic and professional development, and
  3. the development of tangible tools and methodologies.

One significant cluster of prototypes focused on **curricular and pedagogical innovation at the grassroots level**. These proposals often took the form of narrative case studies or project-based learning modules designed to be implemented directly by teachers. A common thread was the emphasis on shifting PE away from traditional, resource-intensive sports towards more sustainable, embodied, and locally relevant practices. Concepts included interdisciplinary projects that integrated skills like mechanics and sustainable transport, and curricula that leveraged community resources and knowledge to create a more inclusive and low-impact PE ecosystem. These prototypes championed a bottom-up approach, demonstrating how individual teachers and schools could enact meaningful change even in the face of systemic inertia.

A second category of prototypes addressed **systemic change through policy and professional development**. Recognising that grassroots efforts can be constrained by larger structures, these proposals targeted the systems that shape teacher practice. One powerful concept, presented through a compelling storytelling metaphor, argued for the necessity of disruptive, immersive professional development. It proposed a mandatory, long-term exchange program that would remove teachers from their familiar contexts, forcing them to confront their biases, develop intercultural empathy, and broaden their pedagogical horizons. Such proposals highlighted the need for institutional commitment to foster the deep, reflective, and adaptive capacity required of educators in a rapidly changing world.

Finally, several groups developed **tangible tools and methodologies designed to empower both teachers and students**. These prototypes were not abstract ideas but concrete instruments for navigating the complexities of their future scenarios. For instance, in response to a volatile and unpredictable future, one group designed a visual, collective decision-making tool to help students and teachers co-assess environmental conditions and adapt lesson content accordingly. Another group, tackling a future reliant on technology, proposed a framework for using accessible, low-cost tech (such as mobile phones and basic wearables) to enhance movement analysis and build climate-specific health literacy in heat-stressed environments. These tools exemplified a human-centred approach to innovation, where technology and methodology serve the primary goals of safety, agency, and learning.

Collectively, the eight prototypes demonstrated a remarkable capacity to translate abstract future scenarios into concrete, imaginative, and context-specific solutions. They moved the conversation from the problem of the planetary crisis to a diverse portfolio of possible responses, each grounded in the core values of sustainability, equity, and meaningful movement.

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1. Nature as a Partner:
The "Frugal Generation" group proposed a paradigm shift, viewing nature not as a resource to be consumed but as a pedagogical partner. Their prototypes included low-impact activities like "nature biathlons" and responsible climbing, emphasizing direct, embodied experience.

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2. The Teacher as a Network Weaver:
The "Regional Cooperation" group envisioned the PE teacher as a central actor in territorial cohesion, forging partnerships with local associations and municipalities to create integrated, place-based learning experiences.

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3. Technology as a Pretext for Action:
The "Green Technologies" group cautiously embraced technology, prototyping a gamified mobile application that turns waste collection into a fun, competitive, and educational activity, demonstrating how technology can serve as a catalyst for real-world environmental engagement.

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4. The Infrastructure Bet:
The "Restoration Bet" group transformed a high-tech scenario into a pragmatic call for investment in resilient educational infrastructure, prototyping a self-sufficient and climate-adapted school complex.

Post-Seminar Deliverables

Conclusion
The seminar demonstrated a shared conviction among international experts that PE's future lies in its capacity to evolve beyond individual performance toward a more systemic, collective, and ecological role. The event generated innovative ideas while fostering a global community of practice dedicated to designing a more sustainable and relevant Physical Education.

PRESENTATION OF THE SPECIAL ISSUE: "FUTURE MATTERS: REIMAGINING PHYSICAL EDUCATION FOR A CHANGING WORLD"

Christophe Schnitzler, Professor, HEP Vaud (Switzerland), laboratoire E3S, UR 1342, Université de Strasbourg

INTRODUCTION

The field of Physical Education (PE) stands at a critical juncture. Confronted by the cascading crises of the Anthropocene—from climate breakdown and biodiversity loss to social fragmentation and technological disruption—the assumptions, practices, and purposes that have long defined our discipline are no longer sufficient. The urgent question is no longer if PE should change, but how it can transform to meet the profound challenges of our time and actively contribute to building more sustainable, just, and resilient futures. This special issue of Kinesis is a direct response to that call. It is not merely a collection of articles but the curated result of a dynamic, experimental, and collaborative process: the AIESEP Specialist Seminar, "Future Matters: Reimagining Physical Education for a Changing World."

This issue documents a unique journey from identifying planetary-scale problems to prototyping actionable, hopeful futures for PE. It chronicles a novel methodology that brought together international scholars and practitioners to engage in a structured process of collective imagination. What follows is an invitation to explore not only the outcomes of this process but the process itself, offered as a potential model for how our field can move from a state of passive anxiety to one of active, creative agency.

THE GENESIS: A HACKATHON FOR HOPE

The heart of this special issue was a two-day design thinking "hackathon." The premise was simple yet ambitious: to create a space where the PE community could move beyond critique and begin the vital work of building. Participants were immersed in a structured, high-energy environment designed to foster creative problem-solving. The process was anchored by the "Transition(s) 2050" scenarios developed by the French Agency for Ecological Transition (ADEME). These four plausible, contrasting futures—Frugal Generation, Regional Cooperation, Green Technologies, and Restoration Gamble—were used not as predictions to be accepted, but as "controversial devices" to provoke debate, challenge assumptions, and provide a tangible context for innovation.

Working in collaborative groups, participants used these scenarios to empathise with future learners, define specific challenges, and ideate, prototype, and pitch novel solutions for PE. This process was a deliberate attempt to practice what we preach: to learn by doing, to embrace uncertainty, and to build community through shared purpose.

THE SPARK: IGNITE TALKS AND AI-ASSISTED SYNTHESIS

To fuel this creative process, the seminar was ignited by a series of powerful talks from leading international thinkers. These presentations, which form the basis of the "Actualité Scientifique" section of this issue, provided the conceptual and inspirational fuel for the hackathon. They explored the critical themes shaping our future, from Education for Sustainability (Marco Rieckmann) and the critique of dominant development paradigms (Helen Kopnina), to the intersection of climate change and physical activity (Paquito Bernard), the imperative of gender equality (Lombe Mwambwa), the power of narrative (Cheryl Miller Houser), the paradoxes of artificial intelligence (Lucy Mills), and the practice of world-building through design fiction (Julian Bleeker).

In compiling this section, we embraced an innovative and transparent methodology that reflects the issue's forward-looking theme. Each conference talk was recorded, transcribed, and then synthesised using Artificial Intelligence to produce a first-draft article capturing the core arguments, narrative structure, and unique voice of the speaker. This AI-assisted draft was then provided to each author, who reviewed, edited, and ultimately approved the final text. This collaborative workflow, blending the efficiency of machine processing with the indispensable nuance of human expertise, allowed us to faithfully represent these vital contributions. We are deeply grateful to all seven speakers for engaging in this experimental process and for approving the final articles that appear in this issue.

The Response: Original Articles and the Future in Practice

The "Original Articles" section represents the core of this special issue, where the energy of the seminar is translated into peer-reviewed scholarship. This section is intentionally structured in two parts, creating a powerful dialogue between process and practice, vision and evidence.

First, we present a comprehensive synthesis of the hackathon itself. The article, "Reimagining Physical Education Futures Through a Design Thinking Seminar," details the theoretical underpinnings and methodological design of the event. It provides a rich, qualitative analysis of the prototypes developed by the participants, showcasing the breadth of creativity and insight that emerged from the collaborative process. This article serves as both a record of the event and a replicable model for other educational fields seeking to engage in anticipatory action research.

Second, we are proud to feature a collection of original research articles from seminar participants. We offered attendees the opportunity to connect the seminar's themes to their own ongoing research, and the response was outstanding. These articles are not abstract reflections; they are concrete examples of how scholars are already building the future of PE. The work of Besseling and colleagues examines bullying as a critical issue of social sustainability, reminding us that a sustainable future must be a safe and inclusive one. The article by Howells and her team, itself a product of a hackathon group, presents a data-driven pedagogical model for protecting children from heat stress—a direct and practical response to the realities of climate change. Finally, the research by Williams explores the perceived preparedness of pre-service teachers in South Africa to engage with sustainability, highlighting the critical role of teacher education in enabling any future vision. In the spirit of methodological transparency, it is also noted that AI was used in the development of some of these articles for structural and linguistic support, again demonstrating a pragmatic and ethical engagement with new technologies.

CONCLUSION

This special issue of Kinesis is more than a snapshot of a conference; it is an invitation into a conversation in motion. It makes the case that the future of Physical Education will not be discovered, but designed. It will be built through the intentional, collaborative, and creative work of a community willing to grapple with complexity and imagine harder. By documenting a process that integrated visionary thinking (the ignite talks), collaborative creation (the hackathon), and empirical inquiry (the original research), we hope to offer both inspiration and a practical toolkit for others to join this vital work.

We believe that the challenges of the Anthropocene, while daunting, also present our field with an unprecedented opportunity: to reclaim our purpose, to deepen our relevance, and to empower a generation of learners with the embodied skills, critical consciousness, and hopeful agency needed to thrive in a changing world. This issue is our contribution to that effort—a down payment on a preferable future for Physical Education.

THE GLOBAL OBSERVATORY FOR GENDER EQUALITY & SPORT: A CATALYST FOR CHANGE IN PHYSICAL EDUCATION

Dr. Lombe Mwambwa, Global Observatory for Gender Equality & Sport

ABSTRACT

This article synthesises a lecture by Dr. Lombe Mwambwa, CEO of the Global Observatory for Gender Equality & Sport, on the organisation's mission to advance gender equality in and through sport, with a significant focus on physical education (PE). The central thesis is that achieving safe and inclusive PE for all girls and women requires a multi-stakeholder, evidence-based, and intersectional approach. The Global Observatory positions itself as a crucial intermediary, aggregating data and bridging the gap between policymakers, academics, and practitioners. The article outlines the Global Observatory's key functions, including its digital knowledge hub, its systematic mapping of global and national policy frameworks against commitments like SDG 5, and its development of indicators to measure progress. It highlights the organisation's focus on underserved populations, such as women and girls with albinism and deaf women and girls, and its efforts to track women's leadership in the Sport for Development (SDP) sector. The article also addresses critical challenges in knowledge mobilisation, including the accessibility of research and the need for cross-disciplinary collaboration. It concludes by summarising the Global Observatory's call to action, urging the PE community to reflect on its power, adopt an ethic of care, and engage in collaborative efforts to ensure that gender equality remains a central and actionable priority.

INTRODUCTION

The pursuit of gender equality is a central pillar of global development, enshrined in international agreements from the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) to the Sustainable Development Goals (SDGs) (UN General Assembly, 1979, 2015). Within this broad agenda, the domains of sport, physical activity, and physical education (PE) represent critical yet complex arenas for change. These spaces can serve as powerful platforms for empowering girls and women, fostering leadership skills, promoting health, and challenging restrictive gender norms. However, they can also be sites where inequalities are reproduced and reinforced, through discriminatory policies, unsafe environments, and a lack of inclusive practices.

Despite a growing body of research and advocacy, a persistent gap remains between policy commitments and on-the-ground reality. Progress is often fragmented, difficult to measure, and

unevenly distributed across different regions and populations. It is within this context that the Global Observatory for Gender Equality & Sport was established. This article synthesises a lecture by the Observatory's CEO, Dr. Lombe Mwambwa, which outlines the organisation's mission, methods, and priorities. The central thesis of the presentation is that accelerating progress towards gender equality in sport and PE requires a new kind of infrastructure: one that is dedicated to aggregating knowledge, fostering collaboration, and holding stakeholders accountable.

Dr. Mwambwa's lecture positions the Global Observatory as a vital intermediary—a catalyst designed to connect the distinct worlds of policymaking, academic research, and practitioner-led action. By systematically tracking progress, identifying gaps, and sharing promising practices, the Global Observatory aims to create a more coherent and effective global ecosystem for change. This article will explore the key pillars of the Global Observatory's work, from its intersectional approach and its focus on underserved populations to its ambitious data-mapping projects. It will also delve into the critical challenges of knowledge mobilisation and the ethical considerations that must guide this work. Ultimately, this synthesis aims to provide the PE community with a comprehensive understanding of the Global Observatory's role and a clear invitation to engage in its collaborative mission to collaborative mission.

PRESENTATION HIGHLIGHTS

Dr. Mwambwa's presentation provided a comprehensive overview of the Global Observatory for Gender Equality & Sport, detailing its strategic positioning, core functions, and programmatic priorities. The following sections synthesise the key arguments and initiatives discussed.

THE OBSERVATORY'S MISSION, FRAMEWORK, AND STAKEHOLDER MODEL

The lecture began by defining the Global Observatory's core purpose: to address gender inequalities across sport, PE, and physical activity by tracking progress, identifying areas of stagnation or regression, and documenting the global movement for change. The fundamental question driving its work is: "Is sport safe and inclusive for girls and women in all their diversity?" This mission is underpinned by a commitment to an intersectional framework. The presentation stressed that gender does not exist in a vacuum but intersects with other dimensions of identity, including race, ethnicity, disability, socioeconomic status, and geography. Consequently, achieving genuine equality requires moving beyond a monolithic view of "women and girls" to address the specific barriers faced by diverse and often marginalised sub-groups.

The Global Observatory's operational model is designed to bridge the persistent divides between three key stakeholder clusters: policymakers (governments and UN agencies), academics (universities and research experts), and practitioners (sports federations, NGOs, and educators). Dr. Mwambwa positioned the Observatory in the "middle" of these groups, acting as a knowledge broker to facilitate the uptake of research by policymakers and its practical application by those working on the ground. This involves aggregating data from primary research partners, connecting expertise across silos, and ensuring that knowledge is shared in a way that is legible and actionable for all parties.

To ground its work in a globally recognised consensus, the Global Observatory aligns its efforts with Sustainable Development Goal 5 (SDG 5), which calls to "achieve gender equality and empower all women and girls." This provides a powerful political framework that connects the specific issues within sport and PE to broader development goals related to autonomy, health, education, and economic empowerment.

PROGRAMMATIC PRIORITIES: THE DIGITAL HUB AND POLICY MAPPING

A cornerstone of the Observatory's strategy is its Digital Knowledge Hub (www.genderequalitysport.org). This online platform serves as the central repository for the data, research, and promising practices that the Global Observatory aggregates. It is designed with the three key stakeholder groups in mind, offering tailored content and resources for policymakers, researchers, and practitioners. The hub is the primary vehicle for the Global Observatory's knowledge mobilisation efforts, facilitating dialogue and ensuring that valuable insights do not remain siloed within the academic community.

One of the most ambitious programmatic priorities detailed in the lecture is the systematic mapping of policy and legal frameworks. The Global Observatory is undertaking a comprehensive global effort to catalogue and analyse commitments to gender equality in sport at international, regional, and national levels. This involves reviewing key international instruments like the Beijing Platform for Action and the UNESCO Charter of Physical Education, Physical Activity and Sport, as well as regional conventions (UN Fourth World Conference on Women, 1995; UNESCO, 2015).

At the national level, the process involves a meticulous review of legislation, policies, and action plans to determine whether they meet the "bare minimum" of eliminating discrimination and creating an enabling environment. The mapping framework is multi-dimensional, examining:

- Instrument Type: Whether the commitment is enshrined in legislation, a national policy, a strategy, or an action plan.
- Thematic Focus: The framework tracks 17 thematic axes of gender equality, including leadership, media coverage, coaching, gender-based violence (GBV), and monitoring and evaluation.
- Impact Area: It assesses whether the policy explicitly covers PE, physical activity, and/or sport.

Dr. Mwambwa reported that data had already been collected for 40 countries, with 12 country profiles published and a further 30 pending validation. This initiative provides a critical baseline for accountability, allowing for a clear-eyed assessment of whether governments are translating their stated commitments into concrete action and resource allocation.

A FOCUS ON UNDERSERVED POPULATIONS AND KNOWLEDGE GAPS

Beyond broad policy tracking, the Global Observatory directs its attention to specific knowledge gaps and underserved populations that are often rendered invisible in mainstream research and policy. The lecture highlighted several key focus areas:

- Leadership in Sport for Development (SDP): The Global Observatory is building a tracker to monitor women's representation in the leadership of SDP organisations. This is particularly crucial in the Global South, where SDP programmes often intersect with the delivery of school-based PE.
- Women and Girls with Albinism: This group is almost entirely absent from the literature on sport and PE. The Global Observatory is conducting a preliminary report to document their experiences and needs, aiming to inform more equitable resource distribution and practice.
- Deaf Women and Girls: The presentation called for greater attention to the inclusion of deaf learners in PE, urging for intentional design changes in curricula, pedagogy, and training to account for audio-related differences.
- Maternity and Parenthood: The lecture pointed to the practical disruptions that maternity and parenthood cause in the careers of PE teachers and the educational trajectories of students, advocating for solutions that go beyond high-profile issues like equal pay for elite athletes.

This focus on specific, marginalised groups is central to the Global Observatory's intersectional approach. It is a deliberate effort to answer the question, "Who is in the 'all'?" and to ensure that the push for gender equality leaves no one behind.

THE ETHICS AND CHALLENGES OF KNOWLEDGE MOBILISATION

Dr. Mwambwa dedicated a significant portion of the lecture to the ethical challenges inherent in the production and dissemination of knowledge. She questioned the accessibility of traditional academic outputs, such as expensive, paywalled journal articles and costly handbooks, which create hierarchies of access and leave many practitioners and educators behind. The Global Observatory advocates for more inclusive forms of engagement, such as online and low-cost conferences, and a move towards open-access publishing to democratise knowledge.

The presentation also stressed that because inequality is a multidisciplinary problem, the response must also be multidisciplinary. The PE community is urged to break out of its silos and engage with other disciplines to develop more robust research and delivery models. In this vein, the Global Observatory supports the development of global indicators for measuring gender equality in PE, an effort led by UNESCO. While promoting shared metrics to build a clearer global picture, Dr. Mwambwa also cautioned that such indicators must be relevant and useful for national-level practitioners and must be leveraged to advocate for resources.

Finally, the lecture emphasised the need for context sensitivity. PE curricula and teacher preparation cannot assume an ideal, stable environment. They must reflect the shifting realities of political instability, climate crises, and forced migration that impact education systems worldwide.

QUESTIONS AND ANSWERS

The summary document included a record of a panel discussion and Q&A session featuring Dr. Mwambwa and other experts, which explored several practical applications of the Observatory's principles.

How can storytelling be used as a tool for advocacy within institutions?

Dr. Mwambwa provided a powerful example from a digital storytelling project she worked on with young women peer educators in SDP organisations in Zambia. The young women were empowered to create their own short films to advocate for their needs and highlight how the organisations could better serve them. This demonstrated that storytelling is not just a tool for high-level policy change but a practical method for students and participants to advocate for change from within their own institutions, such as schools or sports clubs.

How can stories about specific, marginalised groups be made relatable to a broader audience?

This question, which focused on making the experiences of racialised girls in secondary schools relatable, was answered by framing the issue around the universal concept of power abuse. Dr. Mwambwa explained that while the specific experiences of marginalisation may differ, the underlying dynamics of power are widely understood. By focusing on this cross-cutting theme, a story about a specific group can resonate with others who have experienced different forms of exclusion. This approach avoids comparing or ranking suffering and instead builds solidarity based on a shared understanding of structural inequality.

How can the PE and academic communities support the Observatory's work?

In response to an offer of support, Dr. Mwambwa outlined several concrete pathways for collaboration:

1. Mobilise Research: Share existing research and help collate it for the Global Observatory's knowledge hub.
2. Shape Research Agendas: Join the Global Observatory's global expert network to help identify knowledge gaps and co-create research projects.
3. Translate Research: Help translate academic findings into actionable messages for policymakers.
4. Provide Support: The Global Observatory welcomes institutional collaborations and financial support to sustain its work.

CONCLUSION

Dr. Lombe Mwambwa's lecture presented a compelling vision for the Global Observatory for Gender Equality & Sport as a critical piece of infrastructure for driving meaningful change. The organisation's work is defined by a commitment to evidence, a sophisticated understanding of the global policy landscape, and a deeply intersectional ethic. By positioning itself as a connector between policymakers, researchers, and practitioners, the Global Observatory is not merely collecting data but actively building a more cohesive and effective ecosystem for action. Its focus on knowledge gaps and underserved populations is a crucial corrective to mainstream approaches that often fail to account for the diverse realities of girls and women.

The presentation concluded with a powerful call to action for the PE community, framed around the concepts of power, people, process, and possibility. Dr. Mwambwa urged educators and researchers to reflect on their own power in setting agendas, defining curricula, and shaping the discourse. She called for a deliberate focus on the "people" who are often left out of the conversation, ensuring that the term "all" is truly inclusive. She emphasised the importance of engaging with the "process" of systemic change, even when it is slow and difficult. Finally, she encouraged a sense of "pragmatic optimism"—an ethic of care that fuels a persistent belief in the "possibility" of a more equitable future.

For the physical education community, the Global Observatory offers both a resource and a challenge. It provides a wealth of data and a platform for collaboration, but it also challenges the field to be more self-aware, more inclusive, and more engaged in the broader struggle for gender equality. By embracing this challenge, PE professionals can play a vital role in turning the promise of safe and inclusive sport for all into a lived reality.

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WHY NO SUSTAINABLE DEVELOPMENT GOALS? A REVIEW OF EDUCATION BEYOND THE SDGS

Dr. Helen Kopnina, Northumbria University

ABSTRACT

This article synthesises a lecture by Dr. Helen Kopnina critiquing the Sustainable Development Goals (SDGs) and current Education for Sustainable Development (ESD). The central thesis argues that the SDGs' commitment to inclusive economic growth is inherently contradictory and anthropocentric, failing to address the root causes of ecological crises. The article examines evidence of this crisis, such as the decline in wild mammal biomass, linking it to consumption patterns driven by a growth-oriented economy. It argues for a fundamental shift away from the SDG framework towards alternative models like post-growth and degrowth, emphasizing the need to prioritize regeneration and refusal over recycling within circular economy approaches. The article concludes by advocating a return to the principles of 1970s environmental education, which confronted planetary limits and fostered genuine eco-literacy, as a more effective path towards a sustainable future for all species.

INTRODUCTION

The 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) form the dominant global framework for addressing world challenges, promoted as a synergistic roadmap to a better future (United Nations, 2015). Education for Sustainable Development (ESD) is the primary vehicle for this vision. However, Dr. Helen Kopnina that challenges this consensus, arguing that the SDG framework is fundamentally flawed and that ESD may reinforce the problems it aims to solve. Dr. Kopnina's thesis is that the SDGs' commitment to "inclusive economic growth" perpetuates a growth-dependent, anthropocentric paradigm driving ecological devastation (Kopnina, 2016, 2020). This article explores this critique by deconstructing the SDGs' contradictions and biases, examining the evidence of biodiversity decline, and presenting alternative frameworks like degrowth. It concludes by advocating a return to the principles of early environmental education, which confronted planetary limits, to highlight pathways for education that prioritise ecological integrity and interspecies justice.

PRESENTATION HIGHLIGHTS

Dr. Kopnina's presentation delivered a systematic deconstruction of the mainstream sustainability narrative, challenging the audience to look beyond the appealing facade of the SDGs. The following sections synthesise the core arguments and evidence presented.

THE FLAWED ARCHITECTURE OF THE SUSTAINABLE DEVELOPMENT GOALS

The lecture began by questioning the uncritical celebration of the SDGs. While the 17 goals and 169 targets are widely embedded in educational and policy frameworks, they are built on a foundation of critical contradictions and flawed assumptions (Kopnina, 2018). The central critique is aimed at the simultaneous pursuit of seemingly incompatible objectives. A prime example of this is the tension between alleviating poverty and hunger (SDGs 1 and 2) and protecting ecosystems (SDGs 14 and 15). The primary strategies for achieving the former often rely on expanding industrial agriculture, which is a leading driver of deforestation, soil degradation, and biodiversity loss—directly undermining the latter. The framework assumes a frictionless complementarity, ignoring the harsh trade-offs that define real-world resource management.

The presentation further highlighted the inherent anthropocentrism that pervades the goals concerning the natural world (Kopnina, 2016). SDG 14 (Life Below Water) and SDG 15 (Life on Land) are framed almost exclusively in terms of their instrumental value to humanity—as 'natural resources' and providers of 'ecosystem services'. Biodiversity is valued for its utility in fisheries, tourism, or its role in providing clean water, not for its intrinsic worth. This human-centred perspective is encapsulated in the very language of the goals, which fails to afford moral consideration to non-human species, effectively excluding them from the vision of a just and sustainable future. The lecture questioned this ethical stance, asking who we are to displace nearly every other species in our narrow pursuit of intra-human justice.

Perhaps the most fundamental flaw identified is the unwavering commitment to "inclusive economic growth" (SDG 8) as a core part of the solution. The lecture argued that this assumption is not only problematic but is the primary driver of environmental degradation (Kopnina, 2018, 2020). By failing to adequately address the root causes of ecological overshoot—namely, overconsumption, population growth, and the resource intensity of industrial production—the SDG framework effectively sustains the paradigm responsible for the crisis. The presentation posed a critical question: "Can you have your cake and eat it too?" The implicit answer was a resounding no; a truly sustainable future is incompatible with a model of perpetual economic expansion on a finite planet.

THE UNINHABITABLE EARTH: BIODIVERSITY LOSS AND CONSUMPTION

To illustrate the real-world consequences of the growth-centric paradigm, the presentation provided stark evidence of accelerating biodiversity loss. The case of the blue macaw, which became critically endangered in the wild between the first and second Rio Earth Summits, served as a poignant emblem of this decline. Its habitat in the Amazon has been decimated by deforestation, a process often justified by national policies aimed at fighting poverty through the expansion of export-oriented agriculture—a direct manifestation of the contradictions within the SDGs.

More broadly, the lecture presented a dramatic visualisation of the shift in global biomass distribution. Today, wild mammals constitute a mere 4% of the planet's total mammalian biomass. The vast

majority is now dominated by humans (34%) and their livestock (62%), which exist primarily to feed the human population. This staggering imbalance, which has emerged rapidly over the last century, is a direct result of land conversion for agriculture, particularly for meat production. The visual evidence makes it undeniably clear that the expansion of the human enterprise has come at the direct expense of the planet's wild inhabitants.

The presentation connected this macro-level crisis to individual consumption choices, noting that a reduction in meat consumption would be one of the most effective personal actions to combat biodiversity loss. However, it also acknowledged the complexity of the issue, recognising that sustainability is deeply intertwined with all aspects of modern life, from food to transport, making fundamental change a profound challenge. This led to a discussion of the ethical dimension of the crisis, posing the question: by what right do we, as one species, displace all others in our pursuit of intra-human justice and equality? The lecture called for an extension of moral consideration to non-human species, challenging the anthropocentric foundations of our dominant ethical and political systems (Kopnina, 2016).

BEYOND GROWTH: ALTERNATIVE ECONOMIC AND EDUCATIONAL FRAMEWORKS

Having established the limitations of the SDG framework, the presentation shifted to exploring viable alternatives that challenge the hegemony of economic growth. Several interconnected models were proposed:

- Post-Growth and Degrowth: These perspectives directly confront the imperative of endless economic expansion, arguing for a planned and equitable downscaling of production and consumption in high-income nations to bring human economy back within planetary boundaries. The work of scholars like Daniel O'Neill and Jason Hickel was referenced as providing a robust theoretical and practical foundation for this transition (Hickel, 2020).
- Steady-State Economy: Popularised by economist Herman Daly, this model envisions an economy where the throughput of resources remains constant and within ecological limits, shifting the focus from quantitative growth to qualitative development (Daly, 1996).
- Circular Economy Critique: While the concept of a circular economy has gained mainstream traction, the presentation warned against greenwashing. Dr. Kopnina argued that mainstream circular economy approaches often prioritize recycling, which frequently amounts to downcycling, rather than addressing consumption at its source. She emphasized that regeneration of ecosystems and refusal of unnecessary production and consumption should take precedence over recycling as strategies for genuine sustainability.

To make these abstract models more concrete, the lecture highlighted practical solutions such as the product-to-service shift. In this model, companies retain ownership of their products and sell their use as a service, incentivising them to design for durability, repairability, and longevity, rather than planned obsolescence. Sharing and collaborative economy models, such as car-sharing schemes, were

also presented as ways to reduce resource consumption by decreasing the need for individual ownership.

Crucially, the presentation argued that a shift in economic models must be accompanied by a corresponding shift in education. It called for a return to the principles of 1970s environmental education, as articulated in the Belgrade Charter and the Tbilisi Declaration (UNESCO, 1976). This earlier form of education was not afraid to confront the concept of limits to growth, aiming to foster a deep understanding of ecological principles and the systemic constraints of a finite planet. The lecture concluded this section with a powerful call to action: to develop a world population that is not just aware of environmental problems, but has the knowledge, skills, and commitment to work towards their solution, and to create inclusive goals that extend to all planetary citizens, not just humans.

QUESTIONS AND ANSWERS

Isn't economic growth necessary to alleviate poverty?

This is the central paradox the lecture confronts. The SDG model assumes that economic growth can be decoupled from environmental impact and that it is the primary vehicle for poverty reduction. However, Dr. Kopnina's critique argues that this is a false promise (Kopnina, 2018, 2020). In practice, growth in the current global system is intrinsically linked to increased resource consumption and environmental degradation. The pursuit of poverty alleviation through export-oriented agriculture, for example, directly causes deforestation and biodiversity loss. The alternative perspective offered is that genuine well-being, both for the world's poorest and for society as a whole, cannot be achieved by simply expanding a fundamentally unsustainable system. Instead, post-growth and degrowth models advocate for a radical redistribution of wealth and resources, a focus on well-being indicators over GDP, and a planned reduction in the material and energy throughput of high-income nations. The solution to poverty, from this perspective, lies not in more growth, but in more justice and a radical reimagining of economic life.

Isn't degrowth primarily a systemic issue beyond individual action?

The presentation acknowledges this tension between individual and systemic change. It offers simple individual actions—"just don't do it"—such as not mowing the lawn, reducing meat consumption, or avoiding air travel. These actions are presented as having real, positive impact. However, it is also recognised that focusing solely on individual responsibility can be disempowering, inducing feelings of guilt or cynicism when faced with the scale of systemic forces. The more profound solutions are indeed systemic: shifting from product-to-service models, implementing consumer choice editing (whereby unsustainable products are removed from the market), and redesigning the economy to prioritise regeneration and refusal of unnecessary consumption. The role of the individual, therefore, is twofold: to make personal consumption choices that align with ecological values, and, more importantly, to act as an engaged citizen advocating for the deeper, structural changes required.

How can education shift from the current ESD model to one based on 'limits to growth'?

This requires a fundamental pedagogical and philosophical reorientation. The lecture advocates for a return to the spirit of the 1970s Belgrade Charter and Tbilisi Declaration, which prioritised the development of an "eco-literate" global population that understands and respects planetary boundaries (UNESCO, 1976). In practice, this involves:

1. Critically Deconstructing the SDGs: Instead of teaching the SDGs as a given, educators should facilitate critical analysis of their internal contradictions and anthropocentric biases, as demonstrated in Dr. Kopnina's own pedagogical research (Kopnina et al., 2024, 2025).
2. Prioritising Eco-literacy: Ensuring all learners have a foundational understanding of ecological principles, including thermodynamics, nutrient cycles, and biodiversity.
3. Confronting Uncomfortable Truths: Directly addressing the root causes of the ecological crisis, including overconsumption and population growth, rather than avoiding them.
4. Fostering Ecocentrism: Moving beyond a purely human-centred ethical framework to cultivate a sense of justice and moral consideration for non-human species and future generations.

This approach, termed "ecopedagogy," aims to empower learners not just to "sustain" the current system of development, but to fundamentally transform it (Kopnina, 2020).

CONCLUSION

The dominant narrative of sustainable development, enshrined in the SDGs, presents a vision of harmonious coexistence between economic growth and environmental integrity. This article, synthesising the work of Dr. Helen Kopnina, challenges this as a dangerous illusion. The SDG framework, with its commitment to perpetual economic growth, exacerbates the planetary crisis by failing to address its root causes (Kopnina, 2016, 2018, 2020). The alternative path requires a profound intellectual and ethical reorientation beyond the anthropocentric, growth-obsessed logic of the SDGs towards models like degrowth that prioritise ecological regeneration and justice. This is a call to reimagine prosperity based on well-being and co-existence with the more-than-human world. Education is central to this transformation. The current ESD model must be challenged in favour of a resurrected spirit of early environmental education, grounded in eco-literacy and confronting planetary limits. By fostering a critical understanding of the ecological crisis and an ecocentric ethic of care, education can empower citizens to build a truly sustainable and just world.

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NAVIGATING THE INTELLIGENCE LAYER: THE PROMISE AND PARADOXES OF AI IN PHYSICAL EDUCATION AND SPORT

Lucy Mills, Founder and chief catalyst for *Ready Sports Global*

ABSTRACT

This article synthesises a lecture by Lucy Mills on the integration of Artificial Intelligence (AI) into sport and physical education (PE). The central thesis is that while AI presents transformative opportunities for the sector, its adoption must be guided by a discerning, human-centred, and ethically-grounded strategy. The article first demystifies AI, explaining the current "AI boom" as a confluence of big data, cloud computing, and deep learning. It then explores the dual nature of AI's impact through a "promise and paradox" framework. The promise includes personalisation at scale, time-saving automation, enhanced data-driven insights, and more compelling storytelling. However, each promise is shadowed by a paradox: personalisation risks eroding independent thought; automation can lead to over-dependency; enhanced insights may result in over-analysis and the crowding out of spontaneous play (the Jevons Paradox); and data-driven engagement can devalue intrinsic effort. The article concludes by outlining a practical roadmap for navigating the AI era, emphasising the need for organisational AI readiness, a problem-first approach to innovation, the safeguarding of unstructured activity, and a steadfast focus on using AI as a tool to amplify positive human and social outcomes, rather than as an end in itself.

INTRODUCTION

Artificial Intelligence (AI), once the domain of science fiction and specialised research labs, has rapidly evolved into a pervasive "intelligence layer" that is reshaping industries, societies, and daily life. From the algorithms that recommend content on streaming services to the complex systems that guide autonomous vehicles, AI is no longer a future prospect but a present-day reality. The field of sport and physical education (PE) is not immune to this transformation. AI-powered tools are increasingly being developed and deployed with the promise of revolutionising how we teach, learn, play, and perform.

This article synthesises a lecture by Lucy Mills, a leading expert on technology and sport, which provides a pragmatic and critical examination of AI's role in the PE sector. The presentation moves beyond the typical hype cycle of technological innovation to offer a nuanced perspective, balancing

the significant potential of AI with a clear-eyed assessment of its inherent risks and paradoxes. The central thesis is that for the PE community, navigating the AI era is not a matter of blind adoption but of careful discernment. The goal should not be to simply "keep up" with technology, but to strategically and ethically integrate AI in a way that aligns with the core values of education, well-being, and human development.

The lecture deconstructs the current AI landscape, explaining the technological and economic forces driving the "AI boom." It then introduces a powerful "promise and paradox" framework to analyse the application of AI in PE, exploring how the same technologies that offer personalisation and efficiency can also foster dependency and undermine intrinsic motivation. Finally, it provides a set of practical guidelines for educators, administrators, and policymakers. This article will unpack these key themes, providing a comprehensive overview of Mills's argument and a roadmap for the PE community to harness the power of AI responsibly, ensuring that technology serves as a tool to enhance, rather than diminish, the human experience of movement and play.

PRESENTATION HIGHLIGHTS

Lucy Mills's lecture was structured into three distinct parts: an exploration of AI fundamentals, a connection of AI's potential to the specific context of physical education, and the sharing of practical advice for navigating this new technological landscape. The following sections synthesise the key concepts from each part.

EXPLORING AI: DEMYSTIFYING THE CURRENT BOOM

The presentation began by defining AI as a broad, interdisciplinary field aimed at creating technologies that can replicate human-like problem-solving and decision-making. Mills traced the history of the field from Alan Turing's foundational 1950 question, "Can machines think?" [1], through a series of key milestones that demonstrated machines learning to master complex games (IBM's Deep Blue in 1997), understand natural language (IBM's Watson in 2011), and perceive the visual world more accurately than humans (ImageNet in 2015).

Mills explained that the current "AI boom," which follows several earlier "AI winters" where ideas outpaced technological capability, is driven by the convergence of three critical factors:

1. Big Data: The exponential growth in our ability to capture, store, and process vast and complex datasets from everyday life (e.g., social media interactions, sleep patterns, emails). This data contains the raw material from which AI models can extract insights.
2. Cloud Computing: The widespread availability of powerful, scalable, and cost-effective computing resources from providers like Amazon, Google, and Microsoft. This has democratised access to the immense processing power required for training sophisticated AI models.

3 Deep Learning Models: The development of highly sophisticated, brain-inspired algorithms that enable computers to learn from data in a hierarchical fashion, allowing them to perform tasks such as prediction, classification, generation, and analysis with unprecedented accuracy.

This section also provided a taxonomy of different AI types, including Natural Languag Processing (NLP), Computer Vision, Speech Recognition, Recommender Systems, and Robotics.

Mills identified Generative AI—the ability of AI to create new content—as the primary driver of the most recent wave of public interest and innovation.

CONNECTING AI TO PE: THE PROMISE AND THE PARADOX

The core of the lecture was the application of these AI concepts to the world of sport and physical education. Mills structured this analysis around a compelling "promise and paradox" framework, highlighting the dual-edged nature of AI-driven innovation.

The promise of AI in PE is fourfold:

- Personalisation at Scale: AI can analyse an individual's progress, learning style, and preferences to deliver tailored feedback and content. An example given was AI Scout, a UK-based platform that uses computer vision to analyse player videos, providing objective feedback and enabling decentralised talent identification.
- Time-Saving Automation: AI agents can automate repetitive administrative tasks, freeing up teachers and coaches to focus on human interaction. The example of Clubee, a Luxembourgish company, demonstrated how AI can handle routine club administration like emails and registrations.
- Enhanced Insights and Decision-Making: AI can process large datasets to identify patterns that are invisible to the human eye. Twinplay.ai, an Italian basketball analytics platform, was cited as an example of using computer vision to analyse game footage in real time, creating visual summaries and tracking player performance.
- Compelling Storytelling: Generative AI can transform dry statistics into engaging narratives and visuals, making sport and PE more relatable and visible, particularly for younger audiences.

However, for each promise, Mills identified a corresponding paradox that demands critical consideration:

- Personalisation vs. Independent Thought: If AI dictates every action and provides constant feedback, does the learner stop thinking for themselves? Over-reliance on AI-driven guidance could stifle creativity, problem-solving, and self-reflection.
- Time-Saving vs. Dependency: While automation is efficient, it can lead to an over-dependency on AI systems, potentially eroding the professional judgment and intuitive expertise of teachers and coaches.

- Better Insights vs. Over-Analysis (The Jevons Paradox): The Jevons paradox states that as a process becomes more efficient, its use tends to increase rather than decrease. In PE, the efficiency of AI in tracking and measurement could lead to an explosion of data analysis, where the focus shifts from the joy of movement to the quantification of performance. Mills posed the critical question: "*If I'm always going to be watched and tracked, will I still enjoy movement?*"
- Engagement vs. Devaluing Effort: If success is defined solely by AI-generated metrics of improvement, does the intrinsic value of effort and participation get lost? The question, "*If AI says I didn't improve, does that mean my effort doesn't count?"* highlights the risk of extrinsic data-driven validation overriding internal motivation.

SHARING ADVICE: A PRACTICAL GUIDE FOR NAVIGATING THE AI ERA

The final section of the lecture provided a series of actionable recommendations for the PE community to navigate the complexities of AI adoption. This guidance was framed as a response to common anxieties, such as the feeling of being overwhelmed by the pace of technological change and uncertainty about where to start.

The key recommendations were:

1. Establish Organisational AI Readiness: AI strategy should not be a bottom-up, ad-hoc process. Senior leadership within schools, clubs, and governing bodies must take the lead in developing a strategic vision for AI that is explicitly aligned with the organisation's core values and principles. This involves creating clear "guardrails" for AI use.
2. Involve Young People: Educators should actively engage with their students, who are "AI natives" and often have a sophisticated and intuitive understanding of these technologies. Their perspectives are invaluable in shaping how AI is integrated into the learning environment.
3. Adopt a Problem-First Approach: Mills strongly cautioned against adopting "technology for technology's sake." Innovation should always start with a specific problem or goal. The critical question to ask is not "*How can we use AI?"* but *"Will AI genuinely improve this specific outcome?"* This principle of discernment is crucial to avoid wasteful or counterproductive implementations.
4. Pilot Behind the Scenes First: Before deploying AI tools directly with students or athletes, practitioners should start by using them to automate their own background administrative tasks. This allows them to become familiar with the technology in a low-stakes environment and helps manage the Jevons paradox by ensuring that efficiency gains free up time for high-value human interaction, rather than simply creating more analytical work.
5. Safeguard Unstructured Play: A central theme was the need to protect moments of spontaneous, unstructured, and joyful movement from the encroachment of datafication. The goal of AI should be to create more space for this kind of activity, not less.

6. Address Ethics and Access: The adoption of AI must be accompanied by a rigorous consideration of ethical issues, including data privacy, algorithmic bias, and equitable access. Organisations must establish clear policies for data governance and be mindful of creating a two-tiered system where only some have access to the benefits of AI.
7. Embrace a Human-Centred Approach: Ultimately, AI should be viewed as a tool to support people-led goals. The focus should always be on using technology to amplify positive human interactions and social outcomes, such as collectivism and sustainability, rather than allowing the logic of the technology to dictate the goals.

CONCLUSION

Lucy Mills's lecture provides an essential framework for the physical education community as it stands on the precipice of the AI revolution. By moving beyond the simplistic dichotomy of AI as either a panacea or a threat, she offers a path of critical and strategic engagement. The "promise and paradox" framework is a powerful analytical tool that enables educators and leaders to evaluate AI not on its technical capabilities alone, but on its potential impact on human values, pedagogical principles, and the intrinsic joy of movement.

The overarching message is one of agency and discernment. The future of AI in physical education is not something that will simply happen to the field; it is something that the field must actively shape. This requires a proactive and human-centred approach, where the core values of education and well-being guide technological adoption, not the other way around. The call to establish organisational readiness, start with problems rather than solutions, and safeguard the spaces for unstructured play is a crucial corrective to the often-unthinking rush of technological adoption.

For practitioners, the lecture offers a reassuringly pragmatic starting point: begin with small, administrative applications to build familiarity and free up time for what truly matters—human connection. For leaders, it is a call to establish a clear ethical and strategic vision. For the entire PE community, it is a reminder that while AI may be a powerful tool, it is the wisdom, judgment, and human-centred values of the people wielding that tool that will ultimately determine whether it builds a more equitable, engaging, and healthy future for all.

STORYTELLING WITH IMPACT: A NEUROSCIENTIFIC FRAMEWORK FOR CHANGING ATTITUDES AND BEHAVIOUR

Cheryl Miller Houser, Documentary Filmmaker

ABSTRACT

This article synthesises a lecture by documentary filmmaker Cheryl Miller Houser on the power of storytelling to drive systemic change, particularly within the context of physical education and sustainability. The central thesis is that effective storytelling, grounded in neuroscientific principles, is the most powerful tool for shifting attitudes and behaviours. The article outlines a three-step framework for impactful storytelling: 1) Dream Big, which involves visualising a desired future to rewire the brain and align intention; 2) Make It Human, which focuses on creating empathy by featuring characters who express a universal range of emotions; and 3) Show Struggle and Triumph, which uses a classic narrative arc to create an immersive journey that empowers audiences to take action. The framework is illustrated with examples from sports (Serena Williams, Simone Biles) and social reform (a documentary on the US foster care system). The article explores the neuroscience of "narrative transportation," the importance of deep listening in understanding an audience, and the ethical responsibility of the storyteller. It concludes by positioning storytelling as a "superpower" that must be wielded to counter narratives of despair, inspire hope, and mobilise collective action towards a more sustainable and equitable world.

INTRODUCTION

The challenge of creating large-scale systemic change, whether in public health, social justice, or environmental sustainability, is fundamentally a challenge of changing human attitudes and behaviour. While data, logic, and policy are essential components of any reform effort, they are often insufficient to overcome inertia, cynicism, and deeply ingrained beliefs. In an era marked by complex global crises, from climate change to social inequality, the need for more effective tools of persuasion and mobilisation has never been more urgent. It is in this context that the ancient art of storytelling is re-emerging as a critical, evidence-based discipline for driving social transformation.

This article synthesises a lecture by documentary filmmaker Cheryl Miller Houser, which presents a compelling case for storytelling as the most powerful instrument for changing hearts and minds. Drawing on insights from neuroscience and her extensive experience in filmmaking, Houser argues that well-crafted narratives are not mere entertainment; they can transport us into the story, fostering

empathy, and inspiring action. The central thesis of her presentation is that by understanding and applying a core set of storytelling principles, leaders, educators, and advocates in any field can significantly amplify their impact.

The lecture deconstructs the mechanics of impactful storytelling, offering a practical, three-step framework that can be applied to diverse forms of communication, from conference presentations and academic papers to educational curricula and public advocacy campaigns. This article will explore each component of this framework, illustrating the concepts with the same powerful examples used in the presentation—from the worlds of elite sport and social reform. It will delve into the neuroscientific phenomena that underpin storytelling's efficacy, such as "narrative transportation" and emotional mirroring. Furthermore, it will examine the ethical dimensions of this work, positioning storytelling as a "superpower" that carries with it a profound responsibility. For the physical education and sports community, grappling with how to promote sustainable practices and equitable systems, this framework offers a powerful roadmap for translating bold visions into collective, transformative action.

PRESENTATION HIGHLIGHTS

Cheryl Miller Houser's lecture provided a masterclass in the art and science of storytelling for impact. It was structured around a clear, three-part framework, grounded in neuroscientific principles and illustrated with vivid case studies. The following sections synthesise the core concepts and examples presented.

THE NEUROSCIENCE OF STORYTELLING: NARRATIVE TRANSPORTATION

The presentation began by establishing the scientific basis for storytelling's power. Houser introduced the concept of "narrative transportation," a term coined by neuroscientists to describe the immersive experience of being lost in a story (Green et al., 2000). When a narrative is well-crafted, the brain does not merely process information; it enters the world of the story and is transported through the people featured in the story. This phenomenon is driven by several key neural mechanisms:

- Emotional Mirroring: The brain's mirror neuron system causes an observer to experience the same emotions as the characters in the story. Their joy becomes our joy; their struggle becomes our struggle.
- Hormonal Changes: Compelling narratives trigger the release of hormones that drive human connection. Oxytocin, the "trust hormone," is released, fostering empathy and a sense of social bonding with the characters and, by extension, the storyteller's message.
- Cognitive Engagement: Stories cause a spike in cortisol and adrenaline, which heightens attention and focus. This makes the information embedded within the narrative more memorable. As Houser noted, research suggests that the brain retains information significantly better more effectively when it is delivered within a story compared to a list of facts, and the impact on beliefs remains stronger over time (Mar et al, 2021).

This combination of emotional, chemical, and cognitive effects is what transforms a passive observer into an active participant, opening them up to new perspectives and making them more receptive to the message being conveyed.

STEP 1: DREAM BIG – THE POWER OF IMAGINATION

The first step in the framework, "Dream Big," is about harnessing the power of imagination to create a clear and compelling vision of the desired future. Houser argued that the stories we tell ourselves and others fundamentally shape our reality. This is not a metaphorical statement but a neurological one. She cited the work of Dr. James Doty, a Stanford neurosurgeon, whose research has shown that the repeated act of vividly imagining a desired outcome and believing in that outcome can physically rewire the brain, creating new neural pathways that align our focus, energy, and intention towards achieving that outcome (Doty, 2016).

This principle was illustrated with a powerful example from the world of sport: a Nike advertisement featuring a nine-year-old Serena Williams and her father, Richard Williams. In the ad, Richard repeatedly tells his daughter, "Imagine you are at the US Open." He was not just coaching her; he was co-creating a mental reality, a vision so powerful that it became an inevitability. By bringing Serena into his imagined world, he helped her to believe in it herself. Just seven years later, at the age of 16, she competed in her first US Open, and she won it the following year. The tagline, "It's only crazy until you do it," encapsulates the essence of this first step. Houser urged the audience to embrace this "crazy" thinking, to break free from the limitations of current reality and let their imaginations run wild. For those seeking to create systemic change, the journey must begin with a bold, audacious dream.

STEP 2: MAKE IT HUMAN – CREATING EMPATHY THROUGH UNIVERSAL EMOTION

Once a bold vision has been established, the second step, "Make It Human," is to bring that vision to life through emotionally resonant characters. Houser's central argument here is that lecturing people with facts and figures does not change behaviour; it often does the opposite, triggering defensiveness. To open hearts and minds, one must "show, not tell."

This was illustrated with a case study from Houser's own work: a documentary film titled «Truth to Transformation», created for the New Jersey foster care system. The Commissioner, Christine Beyer, had a bold vision: to transform the system from one that removes children from their families to one that supports families to keep them together. To achieve this, she needed to change the attitudes of her 6,600 employees and build trust with the families they serve.

The film achieves this by focusing on the deeply personal stories of three individuals—Tamia, Dashaan, and Kayann—who grew up in the foster care system. By sharing their experiences, they tap into a range of universal human emotions:

- Tamia expresses a profound yearning for identity and belonging.

- Dashaan articulates a deep-seated need for safety and security.
- Kayann voices a powerful demand to be seen, heard, and respected.

Because these are feelings that every human being can relate to, the audience sees themselves in the characters. Their specific experiences of the foster care system become a vehicle for a universal human experience. This is the mechanism of empathy. As Houser stated, “Their experiences become our experiences.”

Achieving this level of emotional connection requires what Houser calls “deep listening.” Before telling a story, the storyteller must first understand the needs, fears, beliefs, and perspectives of their audience. The goal is to craft a narrative in which the audience feels seen, heard, and understood. A crucial element of this is to avoid positioning oneself as a “saviour.” Instead, the storyteller should turn the audience into the heroes of the story, showing them the vital role they can play in co-creating the envisioned future.

STEP 3: SHOW STRUGGLE AND TRIUMPH – THE NARRATIVE ARC OF ACTION

The final step in the framework, “Show Struggle and Triumph,” provides the narrative structure needed to grab and hold an audience’s attention and, ultimately, inspire them to act. Houser outlined the classic story arc that is most effective for driving change:

1. Goal & Stakes: The character has a clear goal, and there are high stakes if they fail.
2. Obstacles & Struggle: The character faces significant obstacles that they must struggle to overcome.
3. Transformation: Through the struggle, the character undergoes a profound internal transformation.
4. Triumph: The character achieves their goal, resulting in a triumphant resolution.

The bigger the goal, the higher the stakes, and the more intense the struggle, the more emotionally transported the audience will be. This was illustrated with another example from sports: a Powerade ad celebrating Simone Biles’s return to the Olympics. Her goal was to compete again after her shocking withdrawal from the Tokyo Olympics. The stakes were her health, her career, and her legacy. The obstacles were immense: her physical injuries, the intense mental pressure, and the weight of public expectation. Her struggle was the arduous process of healing and rehabilitation. Her triumph was her victorious return to competition.

Houser stressed the critical importance of ending on triumph. When an audience witnesses a character they care about succeed after a difficult struggle, they feel a sense of vicarious victory. This feeling of empowerment is what converts the emotion generated by the story into the motivation for action.

This arc applies directly to the work of systemic change. To mobilise people, it is not enough to simply describe a problem. One must show the gravity of the current situation (the stakes) but also paint a

vivid picture of the joy and relief of the solution (the triumph). Houser warned against the common trap of environmental and social-issue storytelling, which often gets stuck in a tone of "gloom and doom." While it is necessary to be honest about the problems, focusing exclusively on the negative generates fear, anger, and shame, which ultimately leads to paralysis and a loss of hope. The key is to balance the struggle with a powerful vision of a triumphant outcome, giving the audience a sense of agency and a reason to believe that their actions matter.

CONCLUSION

Cheryl Miller Houser's lecture provides a powerful and practical framework for anyone committed to driving systemic change. By grounding the art of storytelling in the science of the human brain, she demystifies the process of changing attitudes and behaviours, transforming it from an intuitive art into a strategic discipline. The three-step framework—Dream Big, Make It Human, and Show Struggle and Triumph—offers a clear and replicable methodology for crafting narratives that can move audiences from passive observation to active participation.

The presentation's core message is a call to embrace our role as storytellers. For the physical education and sports community, this means moving beyond simply promoting the benefits of activity or highlighting the problems of sustainability. It means dreaming big about the future of sport in a thriving and equitable world. It means telling human-centred stories that connect with universal emotions, whether it's the story of a single student overcoming a barrier to participation or a community transforming its environment to enable active lifestyles. And it means crafting narratives of struggle and triumph that acknowledge the immense challenges we face while simultaneously inspiring a sense of hope and agency.

Ultimately, Houser's lecture is a reminder that the stories we tell matter. They can either reinforce the status quo or they can create new realities. In a world saturated with narratives of division and despair, the choice to wield the "superpower" of storytelling for good is not just a strategic advantage; it is an ethical imperative. By becoming more conscious and skilled storytellers, we can begin to write a new, more hopeful story for our planet and all who live on it.

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THINKING PHYSICAL ACTIVITY IN A CLIMATE CHANGE CONTEXT: A BIDIRECTIONAL RELATIONSHIP

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ABSTRACT

This article synthesises a lecture by Dr. Paquito Bernard on the bidirectional relationship between climate change and physical activities. The core thesis is that climate exposures (e.g., heatwaves, air pollution) are disproportionately reducing physical activity levels, while behaviours associated with physical activities (e.g., transport for sport) contribute to greenhouse gas emissions. The article reviews evidence on the impacts on active transport and athletic performance and underscores the social inequalities exacerbated by these effects. It advocates for promoting active travel, updating physical activity guidelines for climate realities, and revising high-emission transport practices in sports. It concludes with a call for physical education communities to engage in activism and advocacy to accelerate structural changes, such as cycling infrastructure, for a climate-resilient future.

INTRODUCTION

The escalating climate crisis, underscored by a series of stark warnings from the global scientific community, presents a profound and complex challenge to public health (Ripple et al., 2017,2020). While the impacts of climate change on public health is increasingly well-documented, its influence on physical activity behaviours remains a comparatively underexplored yet critical area of concern. Physical activities are a cornerstone of public health, with well-established benefits for preventing chronic diseases, improving well-being, and enhancing health related quality of life. However, the structural conditions that enable and encourage active lifestyles are being fundamentally altered by a changing climate consequence.

This article synthesises a lecture by Dr. Paquito Bernard which highligths the bidirectional associations between climate change and physical activities. The presentation's central thesis is twofold. First, it argues that climate-related hazards (i.e., rising temperatures, heatwaves, worsening air pollution, increasing frequency and intensity of natural disasters) are creating significant barriers to physical activities. All physical activity domains are impacted: leisure and sports activities, occupational and household activities and active transport. These impacts are not distributed equally, disproportionately affecting vulnerable populations (e.g., people living close to heat island in urban context) and exacerbating existing social and health inequalities.

Second, the lecture contends that the physical activities cannot be seen as a passive victim of climate change. Several behaviours associated with sport and physical activity (e.g., air/car travels for competitions and training, meat consumption) accelerate directly the greenhouse gas emissions. This creates a feedback loop where the pursuit of physical activities can inadvertently undermine the structural conditions necessary for its continuation. By examining this dual relationship, this article aims to provide a comprehensive overview of the challenges and opportunities at the intersection of climate change and physical activities. It will explore the evidence base for these impacts, analyse the associated inequalities, and outline a series of actionable recommendations for policy, practice, and research, calling for a fundamental rethinking of how we promote and engage in physical activity in the context of a climate emergency.

PRESENTATION HIGHLIGHTS

Dr. Bernard's presentation systematically unpacked the complex, two-way relationship between climate change and physical activities, grounding the discussion in recent scientific evidence and illustrating it with compelling case studies. The following sections synthesise the core arguments and data presented.

THE IMPACT OF CLIMATE CHANGE ON PHYSICAL ACTIVITY

The lecture established that climate change is no longer a future threat but a present-day reality that is actively reducing physical activity levels globally. Evidence from a systematic review revealed that climate-related hazards such as air pollution, heatwaves, and flood episodes have a substantial negative impact on leisure, active travel, and occupational physical activity (Bernard et al., 2021). For instance, rising air pollution or smog episodes are directly associated with decreased overall physical activity and a reduction in the use of urban cycling. Similarly, frequent flash floods in Asia, have been linked to significant declines in daily number of steps.

A key focus was the effect of rising global temperatures and heatwaves, which cause substantial reductions in physical activity. This was vividly illustrated through an analysis of shared bike systems in New York and San Francisco. The data revealed an inverted U-shaped relationship between daily bike use and outdoor temperature: usage increases with temperature up to a threshold of approximately ~32°C (around 90°F), beyond which it declines sharply as the heat becomes a significant deterrent (Pitois et al., 2025). are more early among vulnerable groups such as adults with obesity or older adults.

It is important to note that the negative impact of local identified temperature thresholds occur earlier for adults with chronic diseases, higher body mass index, and those over 60 years. Furthermore, extreme temperature can intensify social and geographical inequalities. For instance, in low-income neighbourhoods in the San Francisco Bay Area, residents did not show a decrease in active travel during heatwaves. It can be explained by a limited access to public transport or car, and it forced them to continue cycling for essential commuting despite the elevated health risks (Karner et al., 2015). The presentation also touched upon the impact of ozone and particulate matter concentrations on sports

performance, citing a systematic review that found strong evidence of negative effects on both elite and non-elite athletes. Modelling of football performance, for instance, showed a linear negative association between particulate matter concentrations and key metrics like the number of passes per match (Bernard et al., in press).

PHYSICAL ACTIVITY'S CONTRIBUTION TO GREENHOUSE GAS EMISSIONS

The lecture pivoted to the other side of the bidirectional relationship, arguing that the physical activity sector must also acknowledge its own contribution to greenhouse gas emissions. While physical activity itself is inherently low-carbon, the behaviours and systems surrounding it, particularly transport, diet, materials, can have a significant carbon footprint. The presentation highlighted the stark contrast between the Paris Agreement's benchmark of approximately ~2 tons of CO_2-equivalent (CO_{2e}) per person per year and the actual carbon footprints in many developed nations, which are often an order of magnitude higher.

Elite sport was presented as a particularly salient example. The annual travel-related carbon footprint of a single English Premier League football player was calculated to be approximately 30 tons of CO_2. This study only accounted for travel and housing to matches and excludes personal emissions, training camps, and other related activities (Pereira, 2019). This high level of emissions is driven by a culture of frequent air travel for (inter)national competitions, a practice that has become normalised across many professional sports.

The issue is not confined to the elite level. A German study of non-professional athletes found that sport-related emissions comprised between 8% to 25 % of their total individual carbon footprints. The study identified sports like golf, diving and surfing as having particularly high emissions, largely due to the travel required to access specific facilities or locations. The primary determinant of an athlete's carbon footprint their annual income. Higher income correlates strongly with higher sport-related emissions (e.g., more frequent air travel) (Castagneide, 2022). Beyond air travel, the presentation also identified high meat consumption, often promoted within sports culture to meet protein needs, as another behaviour with a significant impact on individual carbon footprints.

POSITIVE ROLES FOR PHYSICAL ACTIVITY AND POLICY RECOMMENDATIONS

Despite these challenges, the presentation emphasised that physical activities can be a central part of the solution to the climate crisis. The most powerful lever identified is the promotion of **active travel**. Scenario studies demonstrate that even modest mode shifts from private cars to cycling and walking can yield meaningful local reductions in air pollution and greenhouse gas emissions. This creates a powerful co-benefit scenario, where promoting active lifestyles simultaneously advances public health and climate mitigation goals.

The physical activity communities also have a vital role to play in building resilience to climate impacts. Studies from the US and the Philippines have shown the effectiveness of adapted physical education (PE) interventions in helping children exposed to natural disasters reduce their risk of post-

traumatic stress disorder at short term (Bell, 2019). This suggests an expanded mission for PE teachers and sports communities, positioning them as key actors in psychosocial recovery. Local sport clubs and communities can provide both concrete support (e.g., distributing water and medicine) and emotional support during and after climate-related disasters.

To harness this potential, the lecture concluded with a series of clear recommendations for structural change:

1 **Update Physical Activity Guidelines:** National guidelines must be revised to integrate current and future climate hazards. This includes providing advice on adapting activity during heatwaves and poor air quality, as well as explicitly highlighting the climate/health benefits of active travel.
2 **Revise Transport Modes:** A major rethinking of transport associated with sport is needed at all levels. This involves questioning the necessity of long-distance air travel for competitions, active leisure time or international events (e.g., Olympic games).
3 **Engage in Activism and Cooperation:** The question of climate change and physical activities is a "race against time". PE and public health communities are urged to engage in activism to advocate for and protect infrastructure that supports active travel, such as protected bicycle networks near schools.
4 **Integrate Climate Change Issues into Physical Education:** Climate change impacts and the role of physical activity in adaptation and mitigation must be systematically included in the curricula of PE, public health, and sports science courses. An international Delphi study identified these specific competencies.

QUESTIONS AND ANSWERS

How does meat consumption compare to transport in terms of carbon footprint?

The discussion acknowledged that both air travel and meat consumption are highly impactful behaviours. While the lecture focused more on transport-related emissions as they are directly linked to the logistics of physical activity, it was emphasised that dietary choices, particularly high meat consumption, represent a major component of an individual's overall carbon footprint. The response suggested that PE teachers and coaches have a role to play in educating athletes and students about dietary shifts, particularly in challenging the sports culture's often heavy emphasis on animal protein. The key takeaway was that both transport and diet are critical levers for reducing emissions.

Is there a risk that focusing on the carbon footprint of physical activity could discourage people from being active?

This question addresses a potential communications challenge. The response clarified that the goal is not to create a sense of guilt or to discourage activity, but to foster a more critical and conscious approach. The distinction was made between physical activity itself (which is beneficial) and the

high-emission behaviours often associated with it (which are problematic). The focus should be on promoting **low-carbon physical activity**, such as local active travel, community sports, and outdoor recreation that does not require long-distance travel. The message is not "be less active," but "be active differently."

Isn't building extensive bicycle infrastructure prohibitively expensive?

This common argument against active travel investment was directly countered with economic evidence. Dr. Bernard cited a paper from Schwarz et al. (2024), which has developed methods to quantify the health and economic savings generated by cycling . They found that >1 euro of intangible costs were prevented for every kilometer cycled in France.

CONCLUSION

The intersection of climate change and physical activities is a domain of growing urgency. As synthesised from Dr. Paquito Bernard's lecture, climate change is undermining physical activity opportunities, with disproportionate impacts on vulnerable populations, while the physical activity sector contributes to the crisis through emissions-intensive practices. This demands a paradigm shift from a passive stance to active engagement. The path forward requires a dual strategy of adaptation (e.g., updating guidelines, building resilient infrastructure) and mitigation (e.g., rethinking high-carbon transport in sports). Active travel emerges as a powerful 'win-win' strategy for public health and climate action. Physical activity professionals must embrace their roles as educators and advocates to accelerate the transition to a sustainable future by integrating climate considerations into practice and engaging in the political processes that support low-carbon, active lives.

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ARCHEOLOGY IN REVERSE: USING DESIGN FICTION TO BUILD AND INHABIT PREFERABLE FUTURES

Julian Bleecker, Near Future Laboratory

ABSTRACT

This article synthesises a lecture by Julian Bleecker, a leading practitioner in design fiction, on the critical importance of making futures tangible. The central thesis is that conventional methods of foresight—relying on abstract forecasts, trend lines, and reports—are insufficient for navigating complex challenges like climate change, AI policy, and social inequality. Instead, Bleecker advocates for design fiction, a practice that involves creating mundane, everyday artifacts from possible futures to make them feel visceral, relatable, and debatable. The core methodology, described as "archaeology in reverse," involves "bringing back" objects like product catalogues, HR manuals, or newspapers from a speculative future. These tangible artifacts act as powerful storytelling prompts, translating macro-level visions into the lived, everyday experience and allowing diverse groups to "see themselves in" a potential world. The article explores key concepts such as the "Go Over Backwards" mindset, a call for the creative courage to defy convention, exemplified by Dick Fosbury's revolutionary high-jump technique. It also examines the power of detailed worldbuilding, as seen in the Star Trek Technical Manual, which inspired real-world innovations like the flip phone. Ultimately, the article presents imagination not as a frivolous activity but as an essential, practical skill for innovation and societal change, concluding with Bleecker's urgent call to resist living in "someone else's future" and to actively build and articulate our own preferred worlds through the creation of tangible, story-rich artifacts.

INTRODUCTION

In an era defined by accelerating change and unprecedented complexity, the practice of foresight—how we anticipate and prepare for the future—has become a critical function for organisations, governments, and societies. Yet, the dominant methods of future-planning often rely on abstract models, statistical forecasts, and analytical reports that fail to capture the lived, human experience of what is to come. These approaches can leave decision-makers and the public alike feeling disconnected from, and passive within, the very futures they are supposed to be shaping. This article synthesises a compelling lecture by Julian Bleecker, an engineer, designer, and founder of the Near Future Laboratory, who presents a powerful alternative: design fiction.

Bleecker's central argument is that to truly understand and influence the future, we must first make it tangible. We need to move beyond asking "What will the future be?" and instead focus on "What will the future feel like?" Design fiction is the practice of answering this question by creating concrete, everyday artifacts from speculative futures. Co-developed with science fiction author Bruce Sterling, this methodology is not about predicting the future, but about prototyping it. By creating objects like product catalogues, instruction manuals, or newspapers that seem to have arrived from a possible tomorrow, design fiction provides a visceral, story-rich entry point into complex debates about technology, policy, and society.

The lecture reframes the creative process as "archaeology in reverse," where the practitioner's job is to "dig through the future" and bring back mundane fragments that can tell powerful stories about the world from which they came. This article will explore the core principles of this methodology, including the importance of tangibility, the power of speculative storytelling to challenge existing paradigms, and the necessity of creative courage—what Bleecker calls the "Go Over Backwards" mindset. Drawing on examples from his work with organisations like Apple, IKEA, and Bloomberg, as well as iconic cultural touchstones like the 1968 Olympics and Star Trek, this synthesis will illuminate how design fiction serves as a practical tool for fostering imagination, provoking dialogue, and empowering communities to actively build the futures they prefer, rather than passively accepting a default trajectory shaped by others.

PRESENTATION HIGHLIGHTS

Bleecker's presentation dismantled conventional approaches to foresight and offered a compelling, hands-on methodology for making futures tangible, debatable, and actionable. The following sections synthesise the core concepts and illustrative examples from his talk.

THE METHODOLOGY: ARCHAEOLOGY IN REVERSE AND THE POWER OF MUNDANE ARTIFACTS

The cornerstone of Bleecker's practice is a methodology he terms "archaeology in reverse." He argues that instead of trying to construct a complete, top-down vision of a future world—a task that is often overwhelming and prone to abstraction—it is more effective to act like an archaeologist who has travelled to the future and brought back a single, mundane object. This artifact, whether it be a product from a future IKEA catalogue, a page from a company's HR manual, or a simple receipt, becomes a "totemic object." It is a tangible fragment that serves as a powerful prompt for storytelling and dialogue.

The power of this approach lies in its focus on the ordinary. By creating artifacts that reflect the everyday, lived experience of a possible future, design fiction translates macro-level concepts (such as AI policy, climate regulation, or new economic models) into a human-readable format. For example, in a workshop with AI policymakers, Bleecker's team created a future newspaper. Instead of writing a white paper on the implications of a policy, participants wrote news articles, opinion pieces, and even advertisements that reflected what it would be like to live in a world shaped by that policy. This

process forces a connection between high-level strategy and on-the-ground reality, revealing the "unknown unknowns" and human impacts that are often missed in conventional analysis.

Bleecker insists that tangibility matters. These artifacts are not just illustrations; they are prototypes for conversation. When a diverse group of people can hold, read, and interact with an object from a possible future, it makes that future accessible and relatable. It allows them to ask critical questions: "Who used this? What was it for? What does its existence imply about the values, systems, and social arrangements of the world it came from?" This process surfaces hopes, fears, and practical considerations that abstract reports simply cannot.

THE MINDSET: PARADIGM INVERSION AND THE COURAGE TO "GO OVER BACKWARDS"

Beyond methodology, Bleecker emphasised the critical importance of a particular mindset: the courage to challenge deeply entrenched conventions. He illustrated this with the story of Dick Fosbury, the American high jumper who revolutionised his sport at the 1968 Mexico City Olympics. At a time when all high jumpers used the straddle technique (going over the bar face-down), Fosbury had developed a new method: going over the bar backwards, head and shoulders first. This technique, which became known as the "Fosbury Flop," was a radical departure from established practice.

Bleecker uses this story as a powerful metaphor for innovation. "Going over backwards" represents the willingness to take a disciplined, instinct-driven risk, even in the face of skepticism and potential failure. It is about challenging the assumption that there is only one correct way forward. This is not, Bleecker stresses, about "woo-woo imagination," but about a focused, committed effort to execute a new approach that one senses is right. Fosbury's success was not an accident; it was the result of courage, conviction, and the discipline to perfect a radically different paradigm.

This mindset is crucial for tackling today's complex challenges. The language and metaphors we currently use, Bleecker argues, are often insufficient for the new territories we are entering, such as the governance of AI or the transition to a post-carbon economy. To break free from these outdated frameworks, we need to be willing to "go over backwards"—to question our fundamental assumptions and explore unconventional paths with rigour and focus. Design fiction provides a safe and structured space to practice this kind of paradigm-inverting thinking.

THE IMPACT: HOW TANGIBLE REPRESENTATIONS SHAPE REALITY

Bleecker provided compelling historical examples to demonstrate that creating tangible, detailed representations of a future is not merely an academic exercise, but a powerful force for shaping reality. These stories underscore how making a future imaginable is the first step toward making it achievable.

One key example was Bill Bowerman's 1968 paperback, Jogging. At the time, jogging was not the global phenomenon it is today. Bowerman, a track and field coach, wanted to sell the public on a future where jogging was a normal, accessible form of exercise. Instead of writing a dry medical text, he created a book filled with rich, aspirational photography and simple, relatable instructions. This

artifact, Bleecker explained, did not just describe a future; it depicted it in a way that allowed people to see themselves participating in it. The book made the abstract idea of "fitness" feel concrete and achievable, and in doing so, helped catalyse a worldwide movement.

Another powerful example came from Bleecker's own childhood: the Star Trek Starfleet Technical Manual. This book, filled with detailed engineering schematics of starships and equipment, made the fictional universe of Star Trek feel real and operational. It focused not on the dramatic adventures on the bridge, but on the mundane, "service and repair" aspects of the world. This level of detail, Bleecker argued, creates a profound "sense of possibility." It makes a fictional world feel inhabitable. The impact of this worldbuilding became clear years later when the lead designer of the iconic Motorola StarTAC flip phone, a Star Trek fan, explicitly stated that he was trying to create the communicator device from the show. A fictional representation, made tangible through detailed worldbuilding, directly inspired a landmark piece of real-world technology.

These examples demonstrate that the act of creating a detailed, tangible vision of a preferred future is a critical form of innovation. It provides a concrete reference point that can guide and inspire action over the long term.

THE PRACTICE: IMAGINATION, COLLABORATION, AND PERSISTENCE

Finally, Bleecker addressed the practical and existential dimensions of this work. He framed imagination not as a soft skill but as an "existentially vital" and "evolutionary gift." He argued that imagination is like a muscle that often atrophies in adulthood due to social conditioning but is essential for breaking free from outdated paradigms. In a world grappling with unprecedented challenges, the work of "imagining harder" is not a luxury but a necessity. He even posited a future where one could earn a PhD in "practical imagination" due to its immense value.

He also emphasised that the process of creating design fiction artifacts is often as valuable as the output. The most fascinating outcomes emerge from the collaborative dialogue that happens during workshops. By bringing together diverse groups—engineers, artists, policymakers, students—and giving them a shared, creative task without the pressure of solving a specific problem, a rich and generative conversation emerges about the kinds of futures people actually want to inhabit. This collaborative, interactive process allows organisations to "sense into" the future in a way that reading a static report never could.

In response to a question about overcoming societal impasses like systemic inequality, Bleecker stressed the importance of persistence. He acknowledged that even well-articulated, evidence-based visions for a better future can fail to gain traction or succeed in the market. The response, he argued, is not to give up, but to "keep trying different ways." If a product fails, tell the story as a film. If a film doesn't get made, write it as a short story. A commercial failure is not a total failure if the work succeeds in making a different future tangible and visible. The act of creation itself is a form of progress.

CONCLUSION

Julian Bleecker's lecture offers a powerful and timely challenge to conventional modes of thinking about the future. In a world saturated with abstract data and disembodied forecasts, the call to make futures tangible, visceral, and debatable is both a practical strategy and a deeply humanistic imperative. The methodology of design fiction, grounded in the concept of "archaeology in reverse," provides a clear and accessible pathway for organisations and communities to move from being passive consumers of the future to active creators of it.

The core insight is that stories, embodied in mundane artifacts, are the most effective medium for navigating complexity and inspiring change. By translating macro-level challenges into the language of everyday life, design fiction democratises the future, inviting diverse voices into a conversation that is too often confined to expert circles. The mindset of "going over backwards" serves as a crucial reminder that transformative innovation requires not just analytical rigour but also creative courage and the willingness to challenge fundamental assumptions.

Ultimately, Bleecker's work is a call to reclaim imagination as a core competency for the 21st century. It is a rejection of the notion that the future is a predetermined destination to be predicted, and an embrace of the idea that it is a malleable medium to be shaped. For any leader, educator, or citizen concerned with building a more preferable world, the message is clear: stop trying to analyse the future into existence. Instead, pick up the tools of the storyteller and the archaeologist, and start building it, one tangible, conversation-starting artifact at a time.

EMPOWERING EDUCATORS: BUILDING COMPETENCIES FOR SUSTAINABLE FUTURES

Marco Rieckmann, University of Vechta

Keywords: Education for Sustainable Development (ESD); Sustainability Competencies; Action Competence; Transformative Learning; Whole-Institution Approach (WIA); Teacher Education; Citizenship Education; Physical Education

ABSTRACT

This article builds on a keynote lecture by Professor Marco Rieckmann and situates Education for Sustainable Development (ESD) as a transformative framework for empowering learners to contribute to sustainable futures. It argues that achieving a "safe and just space for humanity" requires a profound shift in educational paradigms—from knowledge transmission to competence-oriented, action-based learning. The article outlines core sustainability competencies, reframes ESD as citizenship education that strengthens critical political agency, and highlights the importance of action-oriented pedagogies and the Whole-Institution Approach (WIA). Special attention is given to educator competencies, particularly within the "A Rounder Sense of Purpose" (RSP) framework, and to current research initiatives aimed at assessing action competence. The article concludes that empowering educators—conceptually, pedagogically, and institutionally—is the cornerstone of transformative learning and essential for embedding sustainability across educational fields, including physical education.

INTRODUCTION

The 21st-century challenge of fostering an environmentally sustainable and socially equitable world is increasingly framed through the concept of a "safe and just space for humanity," balancing human well-being with planetary boundaries Raworth (2017). While the UN Sustainable Development Goals (SDGs) provide a global roadmap for this vision, their realisation requires more than policy commitments: it demands profound societal transformation—and education is central to this transformation (United Nation, 2015).

Education for Sustainable Development (ESD) represents a fundamental reorientation of education's purpose. Rather than merely transmitting knowledge about sustainability, ESD seeks to empower learners to navigate complexity, critically reflect on values, and actively shape more sustainable futures. However, this transformative ambition cannot be achieved without empowering educators themselves.

This article argues that educator competence is the decisive leverage point for embedding ESD across educational systems. It explores key sustainability competencies, reframes ESD as citizenship education that strengthens political and structural awareness, and highlights the role of action-oriented pedagogy and the Whole-Institution Approach (WIA). In doing so, it outlines how education—and including fields such as physical education—can contribute meaningfully to sustainable futures.

PRESENTATION HIGHLIGHTS

Professor Rieckmann's presentation articulated a clear and compelling vision for ESD. The following sections expand on the key themes and arguments presented in the lecture, synthesising insights from the slide deck and accompanying summary document into a coherent written reflection.

THE CONCEPTUAL FRAMEWORK: DEFINING THE SAFE AND JUST SPACE

The presentation was grounded in the notion of a "safe and just space for humanity," a model visualising a zone for sustainable development between a "social foundation" of human well-being and an "environmental ceiling" of planetary limits (Raworth, 2017). The SDGs are presented as a practical, though imperfect, framework for navigating this space, highlighting key action areas and the complex trade-offs learners must analyse (United Nation, 2015).

Within this context, ESD is framed around three core aims. First, it is **future-oriented**, creating space for learners to imagine multiple possible futures. Second, it is **values-based**, facilitating critical discourse on social values without indoctrination. Third, it is **competence-focused**, empowering learners with the capabilities needed for sustainable transformations (Rost, 2002).

KEY COMPETENCIES FOR SUSTAINABLE DEVELOPMENT

The development of cross-curricular competencies is a cornerstone of the ESD paradigm. One influential framework is the model of "key competencies in sustainability," which identifies a set of interconnected, transversal competencies required for engaging with complex sustainability challenges (Brundiers et al., 2021). These include **systems thinking** (analysing complexity and interdependencies), **values or normative thinking** (negotiating sustainability-related values and trade-offs), **futures thinking** (developing and assessing alternative scenarios), **strategic competence** (designing transformative interventions), **implementation competence** (putting sustainability strategies into practice and managing change processes), **interpersonal competence** (collaborating effectively and facilitating participation), and **intrapersonal competence** (self-reflection and the regulation of emotions and motivations).

Importantly, these competencies are not acquired through passive knowledge transmission. They emerge through active, iterative processes of analysis, visioning, decision-making, and action. Reflection

and collaboration are essential components of this learning cycle, enabling learners to connect cognitive understanding with ethical positioning and practical engagement.

ESD AS CITIZENSHIP EDUCATION: BEYOND INDIVIDUAL CONSUMERISM

A critical argument is the reframing of ESD as citizenship education, challenging the narrative that sustainability is merely a matter of individual consumer choice. This narrow focus obscures the structural, political, and economic forces that constrain individual behaviour. ESD must therefore elevate learners from consumers to empowered citizens with critical political agency (Fedorchenko, 2021). It should equip them to understand and engage with the structural conditions and power relations underpinning sustainability challenges, fostering their agency as "sustainability citizens" (Rieckmann, 2020 ; Schank and Rieckmann, 2020). By shifting focus from individual behaviour to collective political action and structural change, ESD becomes a powerful tool for democratic participation (Rieckmann, 2018).

ACTION-ORIENTED PEDAGOGY AND THE WHOLE-INSTITUTION APPROACH

Cultivating these competencies requires a departure from traditional teaching. An **action-oriented transformative pedagogy** is needed—one that is learner-centred, participatory, and experiential (Unesco, 2017). This approach moves from teaching *about* sustainability to creating spaces where learners can *do* sustainability, developing competencies through active participation, reflection, and creation. Methodologies like design thinking and project-based learning are central to this.

Furthermore, ESD must extend beyond the classroom via a **Whole-Institution Approach (WIA)**, embedding sustainability into the fabric of the educational organisation (Holst, 2023). This holistic model integrates sustainability across curriculum, campus operations, governance, and community engagement. This approach acknowledges the power of the "hidden curriculum" of an institution's own practices. Empirical research confirms the efficacy of this model, with a large-scale German study showing a strong positive correlation between WIA implementation and key outcomes like empowerment and motivation for both students and educators (Holst et al, 2024).

EMPOWERING EDUCATORS: COMPETENCIES AND RESEARCH INITIATIVES

The success of ESD hinges on educator capacity. Expertise in sustainability is insufficient; specific pedagogical competencies are required. The "A Rounder Sense of Purpose" (RSP) framework, developed through an Erasmus+ project, outlines these essential competencies for educators: a critical understanding of ESD concepts, a grounding in its pedagogy, and the ability to practice an action-oriented, transformative approach (Milican, 2022 ; Vare et al., 2022).[1]

[1] https://aroundersenseofpurpose.eu

To advance the field, two key research projects were highlighted. **Project Senatra** investigates how service-learning contributes to competence development and a WIA.[2] **Project Imp>Act**, a Horizon Europe initiative, addresses the critical gap in assessing learning outcomes by developing and validating an assessment framework for action competence.[3]

These initiatives demonstrate a commitment to building an evidence base for ESD, developing practical frameworks (RSP), exploring innovative pedagogies (Senatra), and creating reliable assessment tools (Imp>Act) to ensure a more rigorous and impactful implementation.

QUESTIONS AND ANSWERS

How can ESD avoid becoming a form of indoctrination?

This is a central concern in the field. The answer lies in the pedagogical approach. ESD is not about transmitting a fixed set of values or predetermined solutions, but about creating spaces for critical discourse and transformative learning (Rost, 2002). Educators should facilitate reflection on values such as resource conservation, human dignity, and justice, but they should not impose specific standpoints. Instead, learners are encouraged to develop their own positions through engagement with diverse perspectives and evidence. This process of critical value discourse allows for conceptual change over time, but it is neither guaranteed nor forced. The emphasis is on empowerment and agency, not behaviour control (Rieckann, 2018 ; Unesco, 2017).

Why is ESD framed as citizenship education rather than environmental education?

The shift from environmental education to ESD, and specifically to ESD as citizenship education, reflects a deeper understanding of the nature of sustainability challenges. Sustainability is not merely an environmental issue; it is fundamentally a social, economic, and political one. Individual consumer choices, whilst relevant, are often constrained by structural factors such as infrastructure, information availability, and economic systems. By framing ESD as citizenship education, the focus shifts to empowering learners to understand and engage with these structural conditions and power relations (Fedorchenko, 2021 ; Rieckmann, 2020 ; Schank and Rieckmann, 2019). This approach recognises students as "sustainability citizens" with the potential to participate in democratic processes and advocate for systemic change, rather than simply as consumers making individual purchasing decisions (Schank and Rieckmann, 2019).

What is the role of physical education in ESD?

Physical education (PE) offers unique opportunities for ESD, though it requires a shift in pedagogical approach. Traditional PE is often "activity-oriented," focusing on participation in sports and physical

[2] https://senatra-projekt.de/english
[3] https://impactforaction.eu

activities. However, ESD calls for an "action-oriented" approach, where students are empowered to implement projects and initiatives that address sustainability challenges. This might involve designing and leading campaigns to promote active travel, collaborating with local communities to create green spaces, or exploring the connections between physical health, well-being, and environmental sustainability. The key is to move beyond simply doing activities to engaging in meaningful action that develops the full range of sustainability competencies.

How can educational institutions realistically implement a Whole-Institution Approach?

Implementing a WIA is a complex, long-term process that requires commitment at all levels of the organisation. It begins with a clear vision and strategic plan that articulates sustainability goals across all institutional dimensions: curriculum, operations, governance, and community engagement. Practical steps include appointing an ESD coordinator or sustainability officer, conducting an institutional audit to identify current practices and gaps, engaging stakeholders (students, staff, community partners) in participatory decision-making, and investing in professional development for educators. Crucially, the institution must be willing to model the values and practices it seeks to teach, recognising that the "hidden curriculum" of its own operations sends powerful messages to learners. The empirical evidence from large-scale studies demonstrates that this investment yields significant returns in terms of student and educator empowerment, motivation, and engagement (Holst et al., 2024).

What are the next steps for research in ESD?

The field is advancing rapidly, with several key priorities. First, there is a need for robust assessment tools to measure the development of action competence and other key sustainability competencies. Projects like Imp>Act are addressing this gap. Second, more research is needed on effective pedagogical approaches, including service-learning, project-based learning, and other forms of experiential education. Third, there is a need to understand how to scale up successful ESD initiatives and embed them within policy frameworks at local, national, and international levels. Finally, research must continue to explore the role of ESD in diverse cultural and educational contexts, ensuring that approaches are inclusive and responsive to local needs and priorities.

CONCLUSION

The imperative for a sustainable future demands a profound transformation where education is a primary catalyst. Professor Rieckmann's framework for ESD provides a compelling roadmap, beginning with the goal of creating a "safe and just space for humanity" (Raworth, 2017). This vision requires moving beyond passive knowledge transmission to an action-oriented, transformative pedagogy that cultivates core competencies like systems and futures thinking (Brundiers et al., 2021). A pivotal shift is framing ESD as citizenship education, elevating learners from consumers to politically engaged citizens who can challenge structural barriers to sustainability (Fedorchenko, 2021 ; Rieckmann, 2020).

These innovations cannot succeed in isolation. The WIA provides a blueprint for embedding sustainability into the DNA of educational organisations, a model empirically linked to greater student empowerment and motivation (Holst et al., 2024). Ultimately, the success of this enterprise rests on educators. Empowering them with the competencies, tools, and support to facilitate transformative learning is the cornerstone of the entire strategy. It is through the empowerment of educators that we will empower a generation of learners to build the sustainable futures our world so urgently needs.

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MEASURING PHYSICAL ACTIVITY AT SCHOOL IN SWITZERLAND: A MODEL BASED ON CONSENSUS AND CONTROVERSY

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Keywords: Physical activity, School, Switzerland, Global Matrix, Delphi process

ABSTRACT

Evaluating the promotion of physical activity (PA) in Swiss schools is a challenge due to cantonal disparities. A first round of the Delphi method was conducted with 17 experts from the field of education, mainly researchers, to collect their views on the grading process, based on the School benchmark of the Global Matrix, an internationally recognized framework for physical activity assessment. The results of this initial consultation revealed an overall consensus of approximately 82%, thereby providing strong legitimacy to the initial evaluation. However, nearly half of the sub-indicators remain subject to controversy. A second Delphi round is therefore planned in order to achieve a *"slight consensus"* (at least 70% agreement) across all sub-indicators. Ultimately, this study aims to propose an engaging evaluation model for experts. This deliberative process is intended to help them better understand the challenges of physical activity promotion in Swiss schools, identify research gaps, and reflect on coordinated solutions at the national level.

INTRODUCTION

Regular engagement in physical activity (PA) significantly reduces the risk of numerous chronic diseases, including cardiovascular diseases, type 2 diabetes, certain cancers, obesity, and osteoporosis. Physically active individuals have approximately half the risk of developing heart disease compared with sedentary individuals (Dhuli et al., 2022). Despite these well-established benefits, 43% of the Swiss population is overweight or obese (Federal Statistical Office, 2023). This situation is largely explained by the decline in physical activity during childhood and adolescence, a decrease whose effects persist throughout the life course (Varma et al., 2017). In Switzerland, school represents a central setting in which children and adolescents spend, on average, eleven years of their lives from the age of four onward. Moreover, it has been shown that school, alongside family and peers, plays a crucial role in the development of young people's behaviors (Bronfenbrenner, 1979).

However, based on our review of the literature (Lamprecht et al., 2021 ; Hänggi et al., 2022 ; Enquête auprès des cantons, CDIP, 2025), previous studies assessing physical activity in school settings present significant limitations. Most have either adopted an overly broad focus on physical activity or, conversely, concentrated on highly specific and isolated situations within physical education classes. As a result, although the role of school appears to be decisive in shaping individuals' levels of physical activity, evaluations of physical activity promotion initiatives within Swiss schools remain scarce or are limited to opinion based assessments, with little concrete verification in the field. Cantonal diversity further constitutes a major constraint for this type of research. Finally, no study comparable to the Global Matrix (Table 1), which offers a holistic assessment of the school's role, has yet been conducted in Switzerland, although the country is currently participating in the fifth edition of this initiative.

TABLE 1 : Global Matrix indicators

Indicators
Overall Physical Activity
Organized Sport and Physical Activity
Active Play
Active Transportation
Sedentary Behaviour
Physical Fitness
Family and Peers
School
Community and environment
Government
Sleep

This situation raises a central question: how can the role of the Swiss school system in promoting physical activity be assessed in a reliable and context sensitive manner within a country characterized by decentralized educational governance? To address this challenge, this study adopts a deliberative approach based on a Delphi process involving experts from the Swiss education system. This approach makes it possible to account for contextual complexity while leading to the attribution of a meaningful grade, and is intended to serve as a replicable model for future assessments in similarly fragmented educational systems.

THE GLOBAL MATRIX FRAMEWORK AND PROJECT OVERVIEW

This study is embedded within the Global Matrix 5.0 initiative, an international effort led by the Active Healthy Kids Global Alliance (AHKGA), which aims to assess and compare physical activity levels among children and adolescents, including children and adolescents with disabilities (CAWD), worldwide (Aubert et al., 2022). Drawing on Urie Bronfenbrenner's ecological systems model (1979), this framework proposes an evaluation based on 11 indicators (Table 1), ranging from individual behaviors to broader environmental determinants, in order to provide a holistic assessment of physical activity. In its current edition, 69 countries are involved in this international initiative. Within this context, the present study positions us as researchers and evaluators for Switzerland, marking the country's first participation in the Global Matrix initiative.

METHOD

THE SCHOOL BENCHMARK

Among the 11 indicators, this study focuses on the assessment of physical activity among Swiss children aged 5-17 years, using the School indicator. As part of the microsystems, alongside family and peers (Bronfenbrenner, 1979), this indicator is particularly relevant for analyzing physical activity levels, given that students spend a substantial portion of their daily lives in school settings. More specifically, the School indicator requires an examination of the role of the education system through a broad range of complementary sub-indicators (Table 2).

TABLE 2 : Benchmark for the school indicator

Benchmark
% of schools with active school policies
% of schools in which the majority (≥80%) of students are taught by a specialist Physical Education (PE) teacher
% of schools in which the majority (≥80%) of students receive the prescribed amount of Physical Education (PE) time
% of schools that offer opportunities to practice physical activity (outside PE) to the majority (>80%) of their students
% of parents reporting that their children and adolescents have access to physical activity opportunities at school, in addition to Physical Education (PE) classes
% of schools where students have regular access to facilities and equipment that promote physical activity
Physical Education curriculum: 100%: Yes, a national PE curriculum exists and it is comprehensive 75%: Yes, a national PE curriculum exists, but it lacks completeness 50%: Yes, a national PE curriculum exists, but its implementation is weak 25%: No national PE curriculum exists, but local or regional curricula are available and implemented to some extent 0%: No national or regional PE curriculum exists
% of schools with sports facilities compliant with accessibility standards (CAWD)

STEP 1: DEVELOPMENT OF THE INITIAL REPORT BASED ON THE SCHOOL BENCHMARK

In order to conduct the Delphi process (Step 2), an initial report on physical activity (PA) was first developed by a member of the Swiss Global Matrix team for the School indicator. The aim was to assess students' PA levels by assigning grades ranging from A to F to each School sub-indicator (Table

2), thereby producing a detailed grade for the overall School indicator. This process required, first and foremost, the identification of reliable data sources. To assign these grades, we primarily searched for quantitative data, more specifically percentage-based indicators, reflecting PA levels among Swiss students in school settings.

However, given the lack of available data for certain sub-indicators, we also relied on grey literature, including cantonal and federal reports, as well as qualitative studies, to inform our assessments. As the Global Matrix does not impose a single standardized data-collection procedure, these percentages were identified through a combination of recent studies using open searches, structured searches, AI-assisted searches, and snowballing techniques. The collected data were then converted into grades according to the Global Matrix grading rubric (Table 3; Aubert et al., 2022). This initial report was subsequently shared with experts from the Swiss education system as part of the Delphi process (Step 2).

TABLE 3 : Percentage to grade conversion

%	Grade
94%-100%	A+
87%-93%	A
80%-86%	A-
74%-79%	B+
67%-73%	B
60%-66%	B-
54%-59%	C+
47%-53%	C
40%-46%	C-
34%-39%	D+
27%-33%	D
20%-26%	D-
<20%	F
No data	INC

STEP 2: SELECTION AND ENGAGEMENT OF EXPERTS WITHIN THE DELPHI PROCESS

Through a multi-round deliberative Delphi process (Hsu and Sandford, 2007), the aim is to achieve expert consensus on a given topic in a non-biased manner. In this study, the process seeks to establish a consensus among experts from the Swiss education system regarding the level of physical activity in school settings. First, the initial report is sent individually to the experts selected for the study, who were primarily identified through scientific articles, institutional reports, and the professional journal *l'EP en mouvement*. Each expert is asked to respond individually to a questionnaire assessing their level of satisfaction (using a 6-point Likert scale) and to provide written comments on the way the grades in the report were assigned.

Second, the Delphi process is organized into successive rounds (Round 1, Round 2, Round 3, etc.), with the process being stopped once a satisfactory level of consensus is reached. We defined the following consensus thresholds: slight consensus (70%), robust consensus (80%), very robust consensus (90%), and unanimous consensus (100%), reflecting the degree of expert agreement regarding the way a grade was assigned (Chia-Chien Hsu, 2019). As long as a 70% consensus is not achieved for each School sub-indicator, the initial report is revised between rounds by taking into account experts' satisfaction levels and comments, and is then resubmitted in the subsequent round to assess the updated level of consensus.

RESULTS STEP 1 AND 2

STEP 1: THE INITIAL REPORT

Three data sources were identified to address the benchmark criteria and to develop the initial report:

(1) Sport Suisse 2020 – Children and Adolescents Report. This population-based survey examines sport and physical activity behaviors and includes a specific report focusing on youth aged 10 to 19

years. The study uses a mixed-methods approach combining telephone and online interviews. Data were collected in January 2019 from a sample of 3,407 respondents using a detailed questionnaire that distinguishes between different physical activity contexts, including school commuting, physical activity at school, and physical activity outside school settings.

(2) Cantonal survey (EDK/CDIP) (Questions 123A, 123, 122). This survey is based on a standardized questionnaire administered to cantonal education authorities. Each canton provides an official response, which enhances the reliability and comparability of the data across regions. The methodology is primarily declarative and relies on administrative information held by the respective public education departments.

(3) SOPHYA (Swiss Children's Objectively Measured Physical Activity, 2022). This representative study objectively measures physical activity using accelerometers among children aged 6–16 years and includes a longitudinal follow-up of a cohort into adulthood since 2014. For the purposes of the present study, we used only the component based on students' self-reported participation in optional school sport, drawn from a subsample of 1,234 students aged 6–20 years collected in 2019.

Table 4 (below) presents a summary of the grading results.

TABLE 4 : Initial report grades and sources

Sub-indicator	%	Grade	Source
% of schools with active school policies	93%	A	Survey of the cantons Q123A
% of schools in which the majority (≥80%) of students are taught by a specialist Physical Education (PE) teacher	-	INC	-
% of schools in which the majority (≥80%) of students receive the prescribed amount of Physical Education (PE) time	93%	A	Survey of the cantons Q122 Q123
% of schools that offer opportunities to practice physical activity (outside PE) to the majority (>80%) of their students	57%	C+	Sport Suisse 2020 Enquête Sophya
% of parents reporting that their children and adolescents have access to physical activity opportunities at school, in addition to Physical Education (PE) classes	-	INC	-
% of schools where students have regular access to facilities and equipment that promote physical activity	67%	B	Sport Suisse 2020
Physical Education curriculum	25%	D-	PER Lehrplan 21 Piano di studio
% of schools with sports facilities compliant with accessibility standards (CAWD)	-	INC	-

The average of the results (Table 4) assigns the School indicator an overall grade of B, according to the Global Matrix grading framework (Table 3).

Each grade in the initial report is accompanied by a paragraph explaining how the grade was assigned based on the available data sources. Items labeled *"INC"* refer to incomplete evidence, indicating that no relevant data were identified despite extensive searches to support grading for certain benchmark criteria. These items were therefore excluded from the overall calculation and represent potential research gaps.

STEP 2: THE DELPHI PROCESS

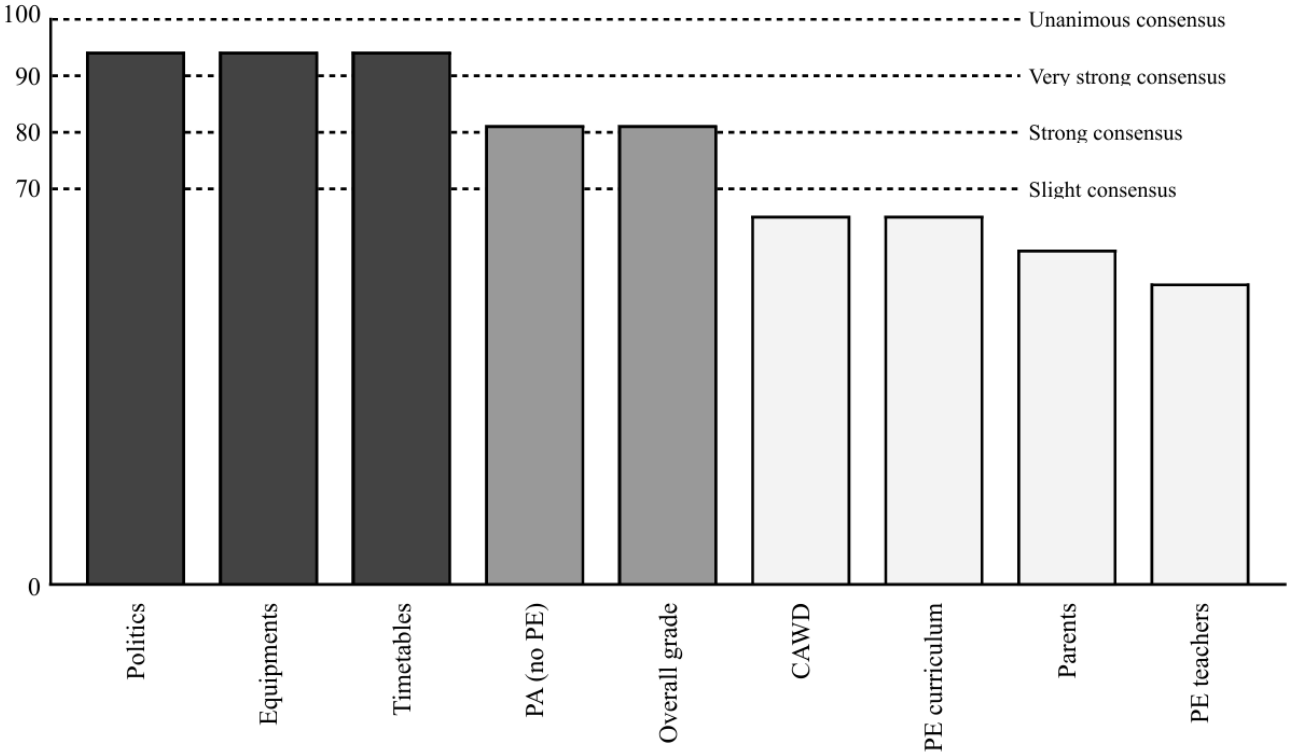
During the first Delphi round, out of the 51 experts identified and invited, 17 participated in the evaluation, generating a total of 153 ratings and 111 comments. Each expert therefore represented approximately 6% of influence on the final grading.

Regarding the question *"Assess the overall quality of the School indicator,"* 82% of experts reported being satisfied with the overall grading quality of the indicator. This result exceeds the 70% threshold and even reaches above 80%, allowing this aspect to be considered as having achieved a robust consensus.

With respect to the grading of the School sub-indicators, four of them reached consensus (Figure 1):

- Active school policies: 94%
- Allocated PE instructional time: 94%
- Opportunities for physical activity outside PE: 82%
- Access to facilities and equipment: 94%

Figure 1 : Experts satisfaction (%) with the way the initial report grades were assigned



In contrast, four approaches to grading the sub-indicators remain contested (Figure 1):

- Specialist PE teachers: 47%
- Parental reports: 59%
- PE curriculum: 65%
- Optional courses and supervised activities (CAWD): 65%

Thus, 4 out of the 8 sub-indicators (50%) reached consensus at the end of the first Delphi round.

DISCUSSION: A MODEL BASED ON CONSENSUS AND CONTROVERSY

THE EARLY SIGNS OF A CONSENSUS…

Our results show that 82% of experts are satisfied with the overall grade assigned to the School indicator, which constitutes a first robust consensus on the initial report. More specifically, a broad level of agreement was observed for four sub-indicators: the assessment of active school policies,

compliance with Physical Education (PE) instructional time, access to equipment, and opportunities for physical activity outside PE classes. These sub-indicators share the common feature of relying on data sources that take cantonal or regional diversity into account.

We therefore hypothesize that experts are particularly demanding of an explicit consideration of this diversity, which may explain the consensus observed. Several comments illustrate this point, notably when experts emphasize that *"almost every canton has its own education system"* or that *"the lack of information collected at the cantonal level greatly biases the results."* However, this strong focus on the cantonal level raises questions about the nature of the consensus itself: does it reflect a shared willingness to better integrate the institutional complexity of Switzerland in order to produce relevant responses at the federal level, or does it reveal deeper intercantonal divides, where logics of comparison and competition between cantons may sometimes prevail over a collective national ambition? This tension represents a central issue for the evaluation and promotion of physical activity in Swiss schools.

… BUT NUMEROUS CONTROVERSIES

Despite these initial signs of consensus, four grading approaches for the sub-indicators remain contested, particularly the one related to the PE curriculum. The assigned grade of D–, although already low, was still considered too lenient by some experts (*"I think that D- is too generous given the reality of the curricula"*), while others criticized the curriculum objectives as being *"predominantly technicist."* Conversely, several participants argued that the benchmark itself is not suited to the Swiss context (*"Switzerland is very specific in this respect and the question may simply not be adapted to this specificity"*), going so far as to question the relevance of a national curriculum altogether (*"I do not see the necessity of having a national curriculum"*). These positions illustrate the difficulty, for some experts, in distinguishing the evaluation of how the grade was assigned from their personal views on the framework or the content being assessed, sometimes leading them to criticize the internationally referenced framework used in this study.

The three other sub-indicators that did not reach consensus relate to the level of specialization of PE teachers, the inclusion of CAWD (Children and Adolescents With Disabilities), and parental reports. In the absence of specific national data, these items were graded as *"INC"* (incomplete), which appears to have led experts to rely primarily on their local or cantonal experiences, as reflected in comments such as *"in the case of Geneva where I work…"* or *"in Valais, students in cycles 1 and 2 are taught by generalist teachers".* This reliance on situated experiences, which do not necessarily reflect the national reality, partly explains the observed divergences and the frustration expressed by some experts (*"I understand the INC, but it poorly reflects what is probably a fairly good situation"*). These findings highlight significant gaps in the available data and underline the need to address these research gaps in future studies.

METHODOLOGICAL LIMITATIONS

Several methodological limitations should be acknowledged. First, the representativeness of the expert panel is limited, as it was exclusively composed of authors from the journal *L'EP en mouvement*. This recruitment strategy restricts linguistic and geographic diversity at the national level and may have

facilitated informal exchanges among experts sharing professional networks or workplaces, thereby introducing a potential conformity bias contrary to the principles of the Delphi process.
Second, the relatively high number of experts consulted (n = 17) may have resulted in heterogeneity in expertise profiles, with some participants being more specialized in Physical Education than in the broader functioning of the school system, which could have influenced the levels of consensus observed. Finally, the use of a Likert scale introduces an inherent degree of subjectivity into the evaluation. Experts may at times have been inclined to assess the grade itself, depending on whether it was perceived as too lenient or too strict, rather than the methodology underlying the grading process, which represents a potential bias to consider when interpreting the results.

PERSPECTIVE AND ROADMAP: REIMAGINING PE FOR A CHANGING WORLD

In conclusion, the deliberative Delphi process adopted in this study represents both a methodological strength and a future-oriented model for evaluation in fragmented and decentralized educational contexts. By fostering structured dialogue, this approach enables the development of consensus and a shared vision despite institutional and regional fragmentation. It also supports the collaborative identification of research gaps, particularly areas where evidence remains insufficient or inconclusive (INC), thereby offering clear directions for future research. By actively engaging experts as co-constructors of the assessment, this model promotes empowerment and accountability, positioning them not merely as evaluators but as key actors in driving system-level change.
With regard to the present study, the next steps involve continuing additional Delphi rounds with the aim of achieving stronger consensus among experts. As consensus deepens, research gaps can be more precisely identified and consolidated. These gaps should then be disseminated to the wider research community, encouraging other scholars to address them, potentially by drawing on the Global Matrix benchmarking framework as a reference for future investigations (Table 5).

TABLE 5 : Roadmap

Step	Objective	Key action
Consolidate	Achieve consensus on the remaining indicators.	Conduct a second Delphi round focusing on points of controversy.
Address	Tackle the identified data gaps (INC).	Formulate priority research recommendations for academic institutions and federal agencies.
Disseminate	Translate the findings into practical tools for policymakers.	Develop a visual synthesis and a policy brief summarizing the final results.
Sustain	Integrate this process into national evaluation cycles.	Propose a governance model to repeat the assessment at regular intervals (every 4–5 years).

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DATA-INFORMED RESILIENCE PROTECTING CHILDREN AND YOUNG PEOPLE FROM HEAT STRESS VIA WEARABLE TECHNOLOGY IN PHYSICAL EDUCATION LESSONS – A DESIGN THINKING APPROACH

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ABSTRACT

Climate change is reshaping the conditions under which children and young people learn and move. Rising temperatures and more frequent heatwaves expose pupils to increased physiological strain, heightening risks to health, wellbeing, and learning during Physical Education (PE). While heat-safety guidance exists, it remains largely reactive, threshold-based, and externally imposed, offering limited pedagogical support for teachers' real-time decision-making or children's understanding of their own physiological responses.

This paper conceptualises children's heat stress as a pedagogical design problem arising from persistent mismatches between physiological strain, perceptual awareness, and educational practice. Drawing on interdisciplinary literature and prior research on children's hydration and perceptual mismatches in physical activity (PA), the paper synthesises evidence on physiological vulnerability, differential risk (including obesity, diabetes, and medication-related thermoregulatory impairment), and educational impact.

Using Chambers et al.'s (2019) design thinking framework aligned with Quality Physical Education (QPE), the paper advances a wearable-informed pedagogical model. Wearable technologies are framed not as surveillance or performance tools but as educational mediators and instructional tools that make invisible physiological processes visible, interpretable, and discussable for learning, self-regulation, and safeguarding in PE. Benefits are critically evaluated alongside ethical, psychological, and equity-related constraints. An implementation-oriented infographic is presented as a knowledge mobilisation artefact for both teachers and researchers.
The paper concludes with a call for climate-resilient PE, positioning data-informed pedagogy as a means of enhancing children's heat literacy, supporting teachers' professional judgement, and reducing heat-related risk under conditions of environmental uncertainty.

INTRODUCTION

CLIMATE CHANGE, HEAT STRESS, AND PHYSICAL EDUCATION

Climate change is a defining condition of contemporary education, characterised by heightened risk and uncertainty (Sakschewski et al., 2025). Rising global temperatures and increasingly frequent heatwaves are now enduring features of children's environments rather than exceptional events. Schools, many of which were designed for temperate climates, must now operate safely under sustained thermal stress. PE is particularly exposed, as lessons occur indoors and outdoors, combining environmental heat with metabolically generated heat from PA, and often involve greater skin exposure. PE teachers are responsible for delivering safe, inclusive, and developmentally appropriate movement experiences, while safeguarding in physically demanding learning environments.

Heat stress arises in children when their thermoregulatory capacity cannot keep pace with the combined demands of movement and environmental heat, resulting in cumulative physiological strain that can impair wellbeing, cognition, attention, learning, and physical safety. Although professional bodies provide guidance on safe thresholds (Racinais et al., 2023), heat-related decision-making in schools remains largely perceptual and reactive, relying on ambient temperature, visual cues, or children's self-reports. These approaches are poorly equipped to detect "silent" physiological strain. UNICEF (2022) estimates that by 2050 almost every child (under 18) globally will be exposed to high heatwave frequency, indicating that heat stress is a widespread educational issue rather than a regional anomaly. Currently, 624 million are exposed to high heatwave duration, high heatwave severity, or extreme high temperature. Heat stress is not just limited to some parts of the world but impacts children globally and raises the need for this topic to be discussed and researched in more detail.

Existing research tends to address thermoregulation, climate risk, or wearable monitoring in isolation. This paper integrates these strands by framing children's heat stress as a pedagogical design problem rather than solely a medical or environmental concern. A design thinking approach enables wearable technology to be understood as a pedagogical tool that shapes learning, behaviour, and values (Schnitzler et al., 2026), rather than as surveillance or performance monitoring.

Informed by Chambers et al.'s (2019) design thinking framework and tools such as S.C.A.M.P.E.R., developed at the *Future Matters: Reimagining Physical Education for a Changing World* AIESEP Specialist Seminar, children's heat stress is conceptualised as a wicked problem marked by uncertainty, uneven vulnerability, and the absence of a single technical solution (Chambers et al., 2025). Drawing on anticipatory perspectives, design thinking was used to surface tensions between environmental change, duty of care, and pedagogical decision-making, and to explore how wearable technologies might translate into more responsive and ethically grounded PE pedagogy (Chateauraynaud, 2013). This aligns with UNESCO's Fit for Life (2021) and Quality Physical Education (McLennan & Thompson, 2016) initiatives and international calls for climate-resilient schooling that extend beyond infrastructure to pedagogical transformation.

CHILDREN'S PHYSIOLOGICAL VULNERABILITY TO HEAT STRESS

Heat-safety guidance in youth sport and education is commonly structured around environmental thresholds, particularly the Wet Bulb Globe Temperature (WBGT) (Patel et al., 2013). Organisations such as the American College of Sports Medicine (ACSM, 2007), the International Olympic Committee (Racinais et al., 2023), Sports Medicine Australia (Tartarini et al., 2025), and the American Academy of Pediatrics (AAP, 2025) provide recommendations for training and competition in hot environments. ACSM and AAP recommend limiting moderate-to-vigorous physical activity (MVPA) at 27.5–30°C and ceasing activity at 30–32.3°C. However, WBGT was not designed to account for the dynamic variability of children's physiology, nor for the interaction between metabolic heat production, hydration status, and developmental capacity.

Children differ fundamentally from adults due to higher surface-area-to-mass ratios, reduced evaporative cooling efficiency, greater metabolic heat production during movement, slower acclimatisation increases children's vulnerability during MVPA and extreme heat (Morrison, 2022). Children have an underdeveloped thirst reflex compared to adults and can miss the physiological signs as to when they need to drink and hydrate (Howells & Coppinger, 2021). Consequently, children may accumulate significant thermal strain even when external conditions appear manageable.

Heat stress also affects children unevenly. Symptoms range from irritability and fatigue to dizziness, nausea, clammy pale skin, and excessive sweating (UK Health Security Agency, 2024). Children with obesity are at heightened risk due to increased insulation from adipose tissue, lower heat dissipation, and slower acclimatisation, causing them to heat more rapidly during activity. Those with diabetes face additional challenges related to dehydration and hyperglycaemia, impaired cardiovascular and thermoregulatory responses (Satow et al., 2025). Common childhood medications, including antihistamines, antibiotics, and some ADHD treatments, may induce side effects that inhibit sweat production, suppress thirst, and further impair thermoregulation.

These vulnerabilities are rarely visible in routine PE practice. Heat stress develops progressively and is shaped by interactions between physiology, hydration, medication, and environment. In school PE

settings, where physical activity (PA) is organised and delivered collectively, and activity modification is typically applied uniformly, individual vulnerability can be obscured, rendering heat risk structurally invisible despite outward signs of coping. This structural invisibility reframes heat stress not as an individual failure of awareness, but as a pedagogical design problem requiring new forms of heat literacy that do not depend on diagnosis, disclosure, or stigma.

HEAT STRESS, WELLBEING, AND LEARNING

Heat stress undermines wellbeing and learning well before medical emergencies occur. Elevated temperatures impair attention, working memory, and executive function, with even modest increases in school-year temperatures associated with measurable learning losses (McClain, 2025). Behavioural changes such as irritability, lethargy, and reduced motivation often precede physical symptoms but are frequently misinterpreted in PE as disengagement or poor behaviour. As a result, children may continue and teachers may encourage them to exert themselves in conditions that compromise both their wellbeing and learning.

The educational significance of heat stress lies in its unequal distribution. Cuartas et al. (2025), following 19,607 children, found disproportionate impacts on those with limited access to cooling or hydration infrastructure and those with underlying vulnerabilities. Addressing heat stress is therefore both a safeguarding obligation and an equity imperative for education systems. As climate exposure intensifies, failure to address heat stress risks amplifying existing health and participation inequalities within PE.

PERCEPTUAL MISMATCH AS A PEDAGOGICAL DESIGN PROBLEM

A persistent challenge in managing heat stress in PE is the mismatch between perceived and actual physiological states. Children often lack interoceptive awareness to accurately judge PA intensity, hydration needs, or physiological strain (Howells & Coppinger, 2021, 2022). During play and sport, attention is externally focused, further obscuring internal cues.

In hot conditions, this perceptual gap becomes critical: skin and core temperatures may rise substantially without overt symptoms, creating a “silent” risk period (Satow et al., 2025). This mismatch should not be understood as individual failure but as a predictable outcome of developmental capacity and pedagogical contexts that rely on external observation. Reframing perceptual mismatch as a design problem shifts responsibility from children’s self-awareness to the learning environment, opening space for pedagogical tools such as wearable technology that translate internal physiological processes into shared, interpretable signals to inform real-time decision-making.

LIMITS OF EXISTING HEAT GUIDANCE IN PE

PE combines internal metabolic heat with environmental exposure, creating risks that are poorly captured by traditional pedagogical metrics such as speed, distance, or repetitions. A child moving slowly may be operating near maximal cardiovascular capacity, while a confident athlete may approach dangerous thresholds without visible distress.

Although heat-safety guidelines are essential for population-level risk management, they provide limited support for in-lesson decision-making. WBGT estimates environmental risk but does not account for individual variability in fitness, hydration, obesity, medication use, or engagement. Consequently, activities may continue below threshold values while some children experience substantial physiological strain, reinforcing false perceptions of safety (AAP, 2025). This highlights the need for complementary approaches that support dynamic individual interpretation of heat stress within PE lessons.

WEARABLE TECHNOLOGY AS PEDAGOGY: A DESIGN THINKING RESPONSE

Wearable technologies offer a bounded pedagogical response by supporting professional judgement where physiological risk is not visible. Their educational value lies not in data collection alone but in interpretation, governance, and integration into pedagogical decision-making (ADEME, 2021).

As pedagogical tools, wearables can scaffold heat literacy by linking sensation, action, and physiological consequence during PA. This supports pacing, hydration, and rest decisions within PE lessons (IHT Spirit, 2021). Over time, scaffolding can be reduced as children develop greater interoceptive awareness, narrowing the mismatch between perceived and actual PA (Howells & Coppinger, 2022), which is key in heat stress situations. It also enables teachers to make proportionate adjustments to task intensity, duration and grouping in real time.

For teachers, wearable-informed pedagogy enables differentiated, effort-based assessment relative to individual baselines rather than peer comparison or competition. This supports inclusion and allows differential vulnerability to be addressed pedagogically without diagnosis, disclosure, or stigma (AAP, 2025), while preserving professional judgement.

PSYCHOLOGICAL, ETHICAL, AND EQUITY CONSIDERATIONS

Integrating wearables in PE raises psychological, ethical, and equity concerns. Risks include anxiety, obsessive monitoring, and negative social comparison if data are framed competitively (Wort et al., 2021). Ethical issues relate to informed consent, data privacy, and the creation of digital health records for minors. Practical constraints include cost, access, accuracy, distraction, and safety in some activities.

Responsible implementation, therefore, requires bounded, intermittent, teacher-mediated use focused on effort and safety rather than competition or body metrics. Equity considerations are central: reliance on personal devices risks widening inequalities, necessitating school-owned equipment alongside investment in shade, hydration, and environmental mitigation.

IMPLEMENTATION AND FUTURE DIRECTIONS

The proposed model complements frameworks such as UNICEF's B.E.A.T. the Heat (2024) by embedding heat literacy within routine PE practice. Making physiological strain visible before symptoms escalate strengthens preventative intent and supports real-time action. To guarantee that

this approach is both transparent and scalable, implementation must be addressed across multiple operational layers, moving beyond individual classroom practice to a wider systemic change. Specifically, at the teacher and classroom levels, focus should remain on integrating real-time biometric feedback into lesson planning, enabling immediate intensity and duration adjustments based on individual physiological strain rather than arbitrary thresholds. This can be supported at the school leadership level by prioritising the purchase of school-owned wearable devices to ensure equitable access and to enable them to become part of learning, not an add-on extra. This would enable teachers to create their own adaptive curriculum and body of knowledge based on information from wearables, allowing them to make decisions tailored to their regional climate challenge. Also, for school leadership to invest in resilient infrastructure, such as permanent shade structures and accessible, safe hydration stations. A systems response approach to be weather-aware and to timetable PE lessons appropriately for when they could be delivered safely. Finally, at the policy and system level, it is essential for preservice teachers within teacher education to be taught how to respond to biometric feedback so that wearables can be integrated seamlessly within the spectrum of teaching approaches already in use in PE, and to standardise heat-safety training while establishing clear governance safeguards regarding data privacy and the ethical management of digital health records for minors.

Future research should examine how heat literacy informed by wearables develops across childhood and adolescence, as responsibility for self-regulation shifts with age, in an equivalent way to how, for example, children with type 1 diabetes become more responsible for their readings and responses with age. Understanding how pedagogical responsibility transitions across developmental stages is essential for supporting lifelong PA under increasingly unfavourable climatic conditions. This research should also establish robust evaluation frameworks to monitor the long-term psychological impacts of data-informed pedagogy on children's relationships with PA. In the short term, priorities may include developing training modules focused on “heat literacy” and piloting wearable-integrated lessons that monitor internal physiological responses to ensure student safety, while simultaneously developing children's own knowledge of how they feel and how to respond to those sensations. Medium-term goals may focus on funding and scaling school infrastructure, such as integrating wearable data with cooling stations and shaded play areas to provide comprehensive protection. In the long term, heat-resilient PE frameworks should be fully embedded in national curricula, ensuring that pedagogical responsibility transitions effectively across developmental stages and schooling sectors. This empowers students to take full ownership of their physiological self-regulation, ensuring they can safely sustain lifelong PA under increasingly unfavourable climatic conditions. Future research on how knowledge of heat literacy is developed for pupils and teachers, using wearables within national PE curricula, leading to resilient school policy and beyond, is important to follow longitudinally to examine lessons learned from the heat literacy development.

CONCLUSION

This paper advances a pedagogical reorientation that makes heat stress visible, interpretable, and teachable within PE. As climate change redefines the material conditions of schooling, PE cannot rely on temperate-era pedagogies of effort, endurance, and visible performance. By positioning heat stress

as a learnable phenomenon rather than an invisible background risk, the paper opens new directions for research, teacher education, curriculum design, and climate-resilient schooling.
Wearable-informed pedagogy enables teachers to respond to emerging physiological strain before visible harm occurs, supporting safeguarding in conditions where self-regulation cannot be assumed. In doing so, it shifts heat stress in PE from reactive guidance toward structured, data-informed, climate-resilient practice.

Figure 1 operationalises this framework into an infographic, a knowledge mobilisation artefact, linking children's physiological vulnerability and perceptual mismatch to concrete wearable-informed pedagogical strategies in PE lessons and system-level responses to support both teachers and researchers alike.

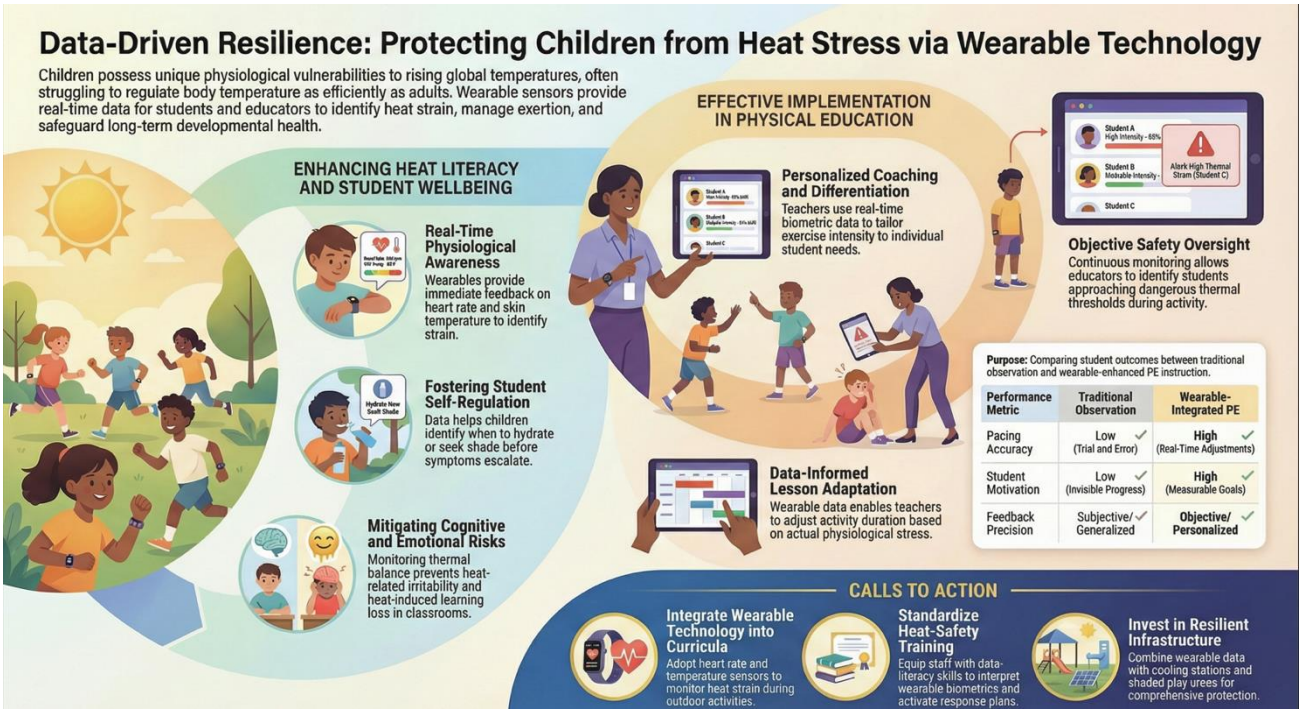

Figure 1 - Data-Informed Resilience: An Implementation Model for Protecting Children from Heat Stress via Wearable Technology in PE lessons (source: Howells et al., 2026).

Acknowledgments
The content of this research work is supported by UNESCO Switzerland and the UNESCO Chair on '*Physical Activity and Health in Educational Settings*.' We would like to thank Prof Fiona Chambers, Prof Christophe Schnitzler, Prof Kelly Salchow-MacArthur, and Prof Olivier Vors for their expert advice on the design thinking process. We would also like to thank AIESEP for running the Specialist Seminar on the Future of Physical Education, enabling the authors to come together as a team.

Abbreviations
AAP: American Academy of Pediatrics.
ACSM: American College of Sports Medicine.

ADEME: Agence de l'Environnement et de la Maîtrise de l'Énergie (French Environment and Energy Management Agency).
ADHD: Attention-Deficit/Hyperactivity Disorder (ADHD).
AIESEP: Association Internationale des Écoles Supérieures d'Éducation Physique (International Association of Physical Education in Higher Education).
IHT: Interactive Health Technologies.
MVPA: Moderate-to-Vigorous Physical Activity.
PA: Physical Activity.
PE: Physical Education.
QPE: Quality Physical Education.
S.C.A.M.P.E.R.: Substitute, Combine, Adapt, Modify, Put to new use, Eliminate, Rearrange.
UNESCO: United Nations Educational, Scientific and Cultural Organization.
UNICEF: United Nations Children's Fund.
WBGT: Wet Bulb Globe Temperature.

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REIMAGINING PHYSICAL EDUCATION FUTURES THROUGH A DESIGN THINKING SEMINAR

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ABSTRACT

In an era defined by the profound ecological and social disruptions of the Anthropocene, all educational sectors are called upon to reimagine their purpose and practice. This article reports on a novel methodological approach to this challenge within the field of Physical Education (PE). It details the design and outcomes of the AIESEP Specialist Seminar, "Future Matters," which employed a design thinking framework to move from identifying planetary crises to prototyping actionable futures for PE. The article first establishes the theoretical imperative for this work, synthesising the concepts of the "Great Acceleration" and the Planetary Boundaries framework to argue for the urgent integration of Education for Sustainability (EfS) into PE. It then provides a detailed account of the seminar's methodology, which structured an anticipatory trial around four distinct, plausible futures derived from the ADEME[4] "Transition(s) 2050" scenarios (Frugal Generation, Regional Cooperation, Green

[4] The French Environment and Energy Management Agency (*Agence française de l'environnement et de la maîtrise de l'énergie* (ADEME)) coordinates environmental protection and energy management activities under the supervision of the Ministries of Higher Education, Research and Innovation, and Ecological Transition and Solidarity. To accelerate the reduction of energy consumption, promote the introduction of renewable energy and reduce greenhouse gas emissions, the Agency collaborates with the government, businesses, communities and citizens through the following main programmes:

Technologies, Restoration Gamble). We describe how participants used these scenarios and fictional personas to engage in a two-day design thinking "hackathon." The core of the article presents the results of this process: tangible prototypes for future PE, presented as narrative pitches. These prototypes include a community-based resource-sharing model, a collective decision-making tool for volatile environments, a transformative professional development program, and a human-centred application of low-cost technology. The discussion analyses these outcomes, highlighting emergent themes of agency, resilience, community, and critical pedagogy. We conclude that this structured, creative, and collaborative methodology offers a powerful and replicable process for educational fields to move beyond abstract critique and actively engage in the vital work of building preferable futures.

INTRODUCTION

The contemporary world is defined by a state of profound and accelerating change. We are living in the Anthropocene, a new geological epoch in which human activity has become the dominant force shaping the planet's biophysical systems (Crutzen, 2006). This era is characterised by the "Great Acceleration," a dramatic post-1950s surge in human population, economic activity, and resource consumption that has pushed multiple critical Earth systems beyond their safe operating space (Steffen et al., 2015). This planetary crisis is not an abstract future threat; it is a present reality that demands a fundamental re-evaluation of the purpose, values, and practices of all societal sectors, including education.

Within this context, the field of Physical Education (PE) finds itself at a critical juncture. Traditionally focused on motor competence, health, and sport culture, PE has often operated as if it were insulated from these larger socio-ecological challenges. However, as this article will argue, PE is not only deeply implicated in the drivers of the planetary crisis but also holds unique potential to contribute to a more sustainable and equitable future. The urgent question is no longer if PE should change, but how.

While there is a growing body of literature calling for the integration of Education for Sustainability (EfS) into PE (e.g., Baena-Morales & Gonzalez-Villora, 2023), there is a notable gap between theoretical critique and practical implementation. How can a field move from acknowledging a crisis to actively prototyping viable, alternative futures? This article reports on a novel methodological approach designed to bridge this gap. We detail the design, process, and

Green Fund - To support significant industrial investment projects with substantial positive impacts (territorial, ecological, and socio-economic), which contribute to bolstering the industrialisation of strategic value chains for ecological transition.
Circular Economy Fund – To support the implementation of waste and circular economy policy in France. Its goal is to assist local authorities and influence stakeholders' behavior through investments in sorting, recycling, valorisation facilities, and preventive actions.
Heat Fund – To develop renewable heat production facilities and district heating networks in collective housing, communities, and businesses to achieve the national target of 32% renewable energy by 2030.
France 2030 – To support and finance innovations and industrialisation, through calls for projects in the following areas: decarbonisation of industry, decarbonised hydrogen, recycling, bio-based products, decarbonisation of mobility, renewable energies, sustainable cities and wood-forestry. Managed by the General Secretariat for Investment (SGPI) on behalf of the Prime Minister, the plan is implemented by 4 operators: ADEME, the National Research Agency (ANR), Bpifrance, and the Banque des Territoires.

(The European Commission, 2025)

outcomes of the AIESEP Specialist Seminar, "Future Matters: Reimagining Physical Education for a Changing World," an international gathering of scholars and practitioners in Lausanne in February 2026 that employed a structured design thinking framework to move from problem analysis to creative solution-building.

This article has a dual purpose. First, it makes the theoretical case for why such an intervention is necessary, synthesising the scientific and philosophical arguments that compel a reimagining of PE. Second, it provides a detailed empirical account of the seminar itself, presenting it as a replicable methodology (an "anticipatory trial", Chateauraynaud, 2013) for fostering creative and collaborative futures thinking in an educational field. By presenting the tangible prototypes developed by participants, we aim to demonstrate how structured, imaginative processes can unlock actionable pathways for change. We argue that such methodologies are essential if PE is to transition from a passive subject of change to an active agent in the creation of more sustainable futures.

THEORETICAL FRAMEWORK: THE IMPERATIVE FOR A TRANSFORMED PHYSICAL EDUCATION

To understand the necessity of the seminar's intervention, one must first grasp the foundations upon which it was built: the non-negotiable reality of the planetary context, the educational mandate of EfS, the unique potential of PE, and the psychological landscape of our time.

The scientific consensus is clear: human enterprise has pushed the Earth System into a new, more volatile state. The Planetary Boundaries framework identifies nine critical processes that regulate the stability of the planet (e.g., climate change, biosphere integrity) (Rockström et al., 2009). The most recent assessment indicates that six of these nine boundaries have been transgressed, placing humanity outside the "safe operating space" that has characterised the Holocene epoch (Sakschewski et al., 2025). This is the defining context for all future human activity and, therefore, for all education.

In response to this crisis, global bodies have called for a reorientation of education (UNESCO, 2020). Education for Sustainability (EfS) is an approach that aims to develop the knowledge, skills, values, and attitudes that empower learners to contribute to a more sustainable world (UNESCO, 2017). It is not a separate subject but a holistic vision for education that emphasises interdisciplinary thinking, problem-solving, critical pedagogy, and the development of core competencies such as systems thinking, anticipatory competence, and strategic competence (Rieckmann, 2018). The integration of EfS is no longer an optional add-on but a fundamental requirement for providing a relevant and responsible education in the 21st century.
PE is uniquely positioned to be a powerful vehicle for EfS. The UNESCO Kazan Action Plan (2017) explicitly links Quality Physical Education (QPE) to the achievement of the Sustainable

Development Goals, but the connection is more profound than policy alignment. PE's intrinsic characteristics offer a fertile ground for the kind of transformative learning EfS requires:

- Embodied Learning: Unlike purely cognitive disciplines, PE engages the whole person in a sensitive approach—body, mind, and emotions. This embodied nature provides a powerful medium for understanding complex concepts like interdependence and resilience in a felt, visceral way (Howell, 2021).
- Connection to Nature: PE can be a primary site for fostering a deep and respectful relationship with the natural world. By emphasizing outdoor activities and concepts like the Scandinavian Friluftsliv (open-air living), PE can help shift the dominant anthropocentric perspective to a more ecocentric one (Lefèvre et al., 2025).
- Emotional Engagement: Behavioural science demonstrates that emotion is a powerful driver of sustainable action (Brosch & Steg, 2021). The joy of movement, the challenge of skill acquisition, and the camaraderie of teamwork are emotional experiences that can foster a positive and proactive engagement with the world.
- Critical Pedagogy: The field has a rich tradition of critical pedagogy, particularly in addressing social inequalities (Kirk, 2019). This critical lens is essential for EfS, which requires students to question dominant narratives of progress and consumption and to envision more just and equitable alternatives.

THE PSYCHOLOGICAL LANDSCAPE: FROM ECO-ANXIETY TO AGENCY

Finally, any attempt to reimagine education must confront the emotional reality of the planetary crisis. Many people, particularly the young, experience "eco-anxiety", a rational response of fear, grief, and anger to the threats we face (Hickman et al., 2021). Rather than treating this as a pathology to be neutralised, our approach reframes these emotions as vital signals that something in the future demands our attention (Chateauraynaud, 2013). The educational challenge is to channel this emotional energy into productive inquiry and action. This requires cultivating what philosopher Jonas (1984) termed an "ethic of responsibility", a commitment to act in ways that ensure the possibility of a dignified human future. It is a call to move from a state of passive anxiety to one of active, hopeful agency.

METHODOLOGY: AN ANTICIPATORY TRIAL THROUGH DESIGN THINKING

To bridge the gap between acknowledging the crisis and generating actionable solutions, the AIESEP Specialist Seminar was structured as a two-day "anticipatory trial" grounded in a design thinking framework. Design thinking is a human-centred, iterative approach to creative problem-solving that moves through stages of empathizing, defining, ideating, prototyping, and testing (Brown, 2008). The seminar was organized around six core phases: understand, observe, define a point of view, ideate, prototype, and test, interwoven with keynote presentations (called

Ignite Talks, conceptualised to spark inspiration. Our methodology streamlined and adapted these phases to address the specific challenge of reimagining the future of PE.

The process was guided by shared principles: creating a supportive and collaborative environment based on listening, respect, trust in the process, and valuing diversity; working in a simple, clear, and mutually supportive way to address our challenges together; and consenting to the use of photographs, video, audio recordings, and other conference-related outputs.

STRUCTURING UNCERTAINTY: THE ADEME SCENARIOS

The cornerstone of the methodology was the use of scenario planning to structure the exploration of the future. Scenarios are not predictions, but plausible, coherent stories about alternative future pathways. They are tools for challenging assumptions and making more resilient decisions in the face of uncertainty (Schwartz, 1991). We used the "Transition(s) 2050" scenarios developed by the French Agency for Ecological Transition (ADEME, 2021). These four scenarios present distinct visions of a carbon-neutral society by 2050, each with different social, economic, and technological choices:

1. Frugal Generation: A future shaped by sobriety, sufficiency, and a cultural shift away from consumerism.
2. Regional Cooperation: A decentralised future where power shifts to self-sufficient, collaborative regional networks.
3. Green Technologies: A future that places its faith in technological innovation and ecological modernisation to decouple growth from impact.
4. Restoration Gamble: A world that, having been slow to act, now relies on high-risk geoengineering to repair a damaged planet.

Participants were introduced to these scenarios as "controversial devices" (ADEME, 2021), or frameworks designed to provoke debate and critical reflection rather than passive acceptance. Participants were able to choose a scenario that matched their values in terms of desirable future.

THE DESIGN THINKING PROCESS

The seminar unfolded over two days, guiding participants through a condensed design thinking cycle:

- **Day 1**: Understand, Observe and Point of View. After being introduced to the theoretical framework and the ADEME scenarios, participants chose the scenario they wished to join. Each of the four scenarios had two design teams groups. The first task was to build empathy for the inhabitants of their assigned future. This was facilitated through semantic analysis of the broad challenge, community mapping and interviewing a

persona - fictional characters representing key community members i.e., the PE teachera teacher). By stepping into the shoes of these personas, participants moved from abstract concepts to concrete human challenges and aspirations. Groups then worked to define a specific problem (Point of View) being faced by the PE teacher persona

- **Day 2**: Ideate, Prototype, and Pitch. The second day was dedicated to brainstorming solutions (ideation) and developing them into tangible concepts (prototyping). Once again teh persona and their actual problem was the focus. This practice of using fictional characters (personas) to explore possible futures is a form of design fiction (Bleecker, 2009), a creative tool that helps prototype not just products, but entire worlds. The prototypes were not expected to be polished products but rather concrete representations of an idea—a storyboard, a tool, a curriculum outline, a narrative. The process culminated in a "pitching" session, where each group had three minutes to present their prototype to the entire seminar. This final stage served as the "testing" phase, where ideas were shared and received feedback from peers.

This methodology was designed to be highly iterative, structured and creative. It provided the scaffolding (design thinking problem space and solution spaces, all linked to scenarios and personas) necessary to guide the work, while allowing ample space for in which there are multiple divergent and convergent moments, collaboration, and imaginative leaps. The goal was to create a process that was both intellectually rigorous and creatively generative.

RESULTS: A SPECTRUM OF PROTOTYPED FUTURES FOR PHYSICAL EDUCATION

The design thinking process culminated in a rich and diverse collection of prototypes, each offering a unique response to the challenges and opportunities presented by its assigned future scenario. Rather than converging on a single vision, the seminar produced a spectrum of creative interventions, reflecting the varied expertise and perspectives of the international participants. The outcomes can be broadly categorised into three overlapping areas of innovation: pedagogical and curricular transformation, systemic and professional development, and the development of tangible tools and methodologies.

One significant cluster of prototypes focused on curricular and pedagogical innovation at the grassroots level. These proposals often took the form of narrative case studies or project-based learning modules designed to be implemented directly by teachers. A common thread was the emphasis on shifting PE away from traditional, resource-intensive sports towards more sustainable, embodied, and locally relevant practices. Concepts included interdisciplinary projects that integrated skills like mechanics and sustainable transport, and curricula that leveraged community resources and knowledge to create a more inclusive and low-impact PE

ecosystem. These prototypes championed a bottom-up approach, demonstrating how individual teachers and schools could enact meaningful change even in the face of systemic inertia.

A second category of prototypes addressed systemic change through policy and professional development. Recognising that grassroots efforts can be constrained by larger structures, these proposals targeted the systems that shape teacher practice. One powerful concept, presented through a compelling storytelling metaphor, argued for the necessity of disruptive, immersive professional development. It proposed a mandatory, long-term exchange program that would remove teachers from their familiar contexts, forcing them to confront their biases, develop intercultural empathy, and broaden their pedagogical horizons. Such proposals highlighted the need for institutional commitment to foster the deep, reflective, and adaptive capacity required of educators in a rapidly changing world.

Finally, several groups developed tangible tools and methodologies designed to empower both teachers and students. These prototypes were not abstract ideas but concrete instruments for navigating the complexities of their future scenarios. For instance, in response to a volatile and unpredictable future, one group designed a visual, collective decision-making tool to help students and teachers co-assess environmental conditions and adapt lesson content accordingly. Another group, tackling a future reliant on technology, proposed a framework for using accessible, low-cost tech (such as mobile phones and basic wearables) to enhance movement analysis and build climate-specific health literacy in heat-stressed environments. These tools exemplified a human-centred approach to innovation, where technology and methodology serve the primary goals of safety, agency, and learning.

Collectively, the eight prototypes demonstrated a remarkable capacity to translate abstract future scenarios into concrete, imaginative, and context-specific solutions. They moved the conversation from the problem of the planetary crisis to a diverse portfolio of possible responses, each grounded in the core values of sustainability, equity, and meaningful movement.

CONCLUSION

This article has chronicled a journey from crisis to creation. It began by establishing the urgent need for Physical Education to engage with the profound challenges of the Anthropocene. It then detailed a novel methodological approach—a design thinking seminar structured around plausible futures—designed to facilitate this engagement. The results, in the form of five tangible prototypes, demonstrate that when educators are provided with the appropriate conceptual tools, creative space, and collaborative environment, they are capable of generating insightful, innovative, and hopeful visions for the future of their field.

The prototypes themselves offer valuable pathways for PE. They point towards a future that is more community-integrated, more ecologically aware, more technologically savvy in a human-

centred way, and more focused on building the resilience and agency of both students and teachers. They are not final blueprints, but provocative starting points for further research, development, and implementation.

Perhaps more importantly, the process itself offers a replicable model for other educational domains grappling with similar challenges. In a world of increasing complexity and uncertainty, the ability to collectively imagine, prototype, and debate alternative futures is not a luxury; it is a core capacity for institutional and societal learning. The "Future Matters" seminar demonstrates that by structuring this imaginative work, we can move beyond a discourse of crisis and anxiety and into a practice of constructive, collaborative, and hopeful creation.

The future of Physical Education, like the future of the planet, is not yet written. It will be the product of the choices we make, the values we prioritise, and the courage we bring to the task of building something new. This work is an invitation to the entire PE community to join in that effort—to see the future not as a fate to be endured, but as a project to be undertaken together.

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ENVIROACTIF 360: A BUEPRINT FOR THE FUTURE OF INCLUSIVE PHYSICAL EDUCATION

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Keywords : Inclusion, Adolescents with disabilities, physical activity

ABSTRACT

Physical inactivity among youth is a global crisis, disproportionately affecting students with special educational needs (SEN) who face systemic barriers to participation. This paper presents the **Enviro Actif 360** project, an innovative three-stage research initiative in Switzerland that provides a blueprint for building the inclusive Physical Education (PE) of tomorrow.

Stage 1 employed the Global Matrix 5.0 framework to conduct a comprehensive national mapping of physical activity promotion across 11 indicators. Results revealed a striking paradox: while Switzerland excels in providing supportive environments (Community and Environment: A-, School: B), behavioral outcomes are concerning, with sedentary behavior receiving a failing grade (F). Most critically, the study exposed a complete data void for children and adolescents with disabilities (CAWD), with all 11 indicators graded as Incomplete (INC), rendering this population systematically invisible.

This empirical invisibility mandates a paradigm shift. Stage 2 will generate missing data through accelerometry and qualitative methods, giving voice to CAWD's lived experiences. Stage 3 will co-construct Universal Design for Learning (UDL)-based interventions with stakeholders. This sequential **Diagnose → Listen → Co-Create** model offers a transferable roadmap for transforming inclusion from rhetoric to evidence-driven reality, architecting a PE system designed for all students from the ground up.

INTRODUCTION

The global decline in physical activity (PA) among youth has reached a critical point, representing a significant public health challenge (Aubert et al., 2022). The World Health Organization's recommendation of 60 minutes of daily moderate-to-vigorous PA is missed by a vast majority of

adolescents (Guthold et al., 2020). This crisis is profoundly amplified for students with special educational needs (SEN) or disabilities, who are systematically left behind due to pervasive physical, social, and pedagogical barriers (Kiselev et al., 2023). In Switzerland, a country with advanced health and education systems, this disparity is particularly jarring. While objective data from the SOPHYA study shows that overall PA levels in childhood are relatively high, they plummet dramatically during adolescence, with only 21.5% of 14-16 year-olds meeting the guidelines (Bringolf-Isler et al., 2022). This decline is even more pronounced for girls and youth from lower socioeconomic backgrounds (Delgrande et al, 2024; Lamprecht et al., 2021).

Existing policies, while well-intentioned, often fail to bridge this gap, creating a chasm between inclusive rhetoric and exclusionary reality. This paper argues that a fundamental paradigm shift is necessary. We must move beyond retrofitted solutions and architect a Physical Education (PE) of tomorrow that is inclusive by design. This article introduces the **Enviro Actif 360** project, a pioneering research initiative in Switzerland that provides a blueprint for this transformation. By first conducting a rigorous national-level diagnosis using the Global Matrix framework, the project exposes the systemic invisibility of students with disabilities and lays the groundwork for an evidence-based, co-constructed, and truly inclusive PE. This paper details the findings of the project's first stage and outlines its innovative roadmap for building the future of physical education.

CONCEPTUAL FRAMEWORK AND PROJECT OVERVIEW

THE GLOBAL MATRIX FRAMEWORK

The Enviro Actif 360 project is methodologically anchored in the **Global Matrix** framework, a worldwide initiative by the Active Healthy Kids Global Alliance (AHKGA) to benchmark PA among children and adolescents (Aubert et al., 2022). The framework's socio-ecological model utilizes 11 core indicators—spanning from individual behaviors like **Overall Physical Activity** to environmental factors like **Community and Environment**—to provide a holistic assessment. By assigning standardized grades, the Global Matrix serves as a powerful tool for international comparison and policy guidance. However, its strength in providing a macro-level view can also mask deep-seated inequalities if data on specific subpopulations is not actively sought and analyzed.

ENVIRO ACTIF 360: A THREE-STAGE RESEARCH DESIGN

Recognizing this, the Enviro Actif 360 project is architected as a progressive, three-stage research program. This sequential design is the cornerstone of its innovative approach, ensuring that each phase logically and purposefully builds upon the last to move from diagnosis to a sustainable, co-created solution.

Stage	Objective	Status
Stage 1	Conduct a national mapping of PA promotion in Switzerland using the Global Matrix 5.0 framework to establish a baseline and critically identify data gaps.	Completed

Stage	Objective	Status
Stage 2	Investigate the specific barriers and facilitators to PA for students with disabilities through objective measurements (accelerometry) and qualitative interviews, giving voice to their lived experiences.	In preparation
Stage 3	Co-construct and implement a targeted intervention based on Universal Design for Learning (UDL) principles to create empowering and inclusive PE environments for all.	Prospective

METHODS

STAGE 1: NATIONAL MAPPING OF PHYSICAL ACTIVITY PROMOTION

DATA SOURCES AND INDICATORS

The project's first stage involved a comprehensive national mapping exercise adhering to the rigorous methodology of the Global Matrix 5.0. The research team synthesized the "best available evidence" from a wide array of Swiss sources. These included large-scale objective measurement studies like the **SOPHYA cohort** (Bringolf-Isler et al., 2022, 2018), national self-report surveys such as **Health Behaviour in School-aged Children (HBSC) 2022** (Delgrande et al., 2024), and major governmental reports like **Sport Suisse 2020** (Lamprecht et al., 2021). This multi-source approach allowed for a robust evaluation of Switzerland's performance across the 11 core PA indicators.

RATING PROCEDURE

A standardized rating procedure (A to F, or INC for incomplete) was used. To ensure the highest degree of validity, a formal **Delphi process** was conducted with a panel of national experts in public health, sports science, and education. Through three iterative rounds of review and consultation, a consensus was reached on the final grades, ensuring they reflect a nuanced and expert-validated assessment of the national landscape.

SPECIFIC FOCUS ON CHILDREN AND ADOLESCENTS WITH DISABILITIES (CAWD)

A central, critical objective of Stage 1 was to create a parallel report card for Children and Adolescents with Disabilities (CAWD). The research team executed a targeted search strategy to locate any data sources disaggregating information for this population. This included searching for studies on inclusive playgrounds (Wenger et al., 2023), access to sports, and specific health reports. The success of this endeavor was entirely contingent on the existence of such data within Switzerland's research and monitoring landscape.

RESULTS – STAGE 1

OVERALL RESULTS FOR THE GENERAL POPULATION

The results for the general population reveal a stark paradox: Switzerland provides a world-class environment for physical activity, but this fails to translate into active behaviors, particularly among adolescents.

Indicator	Grade	Key Finding
Community and Environment	A-	Excellent access to public spaces and infrastructure.
School	B	Strong policies and infrastructure for physical education.
Family and Peers	B-	Generally supportive social environment.
Overall Physical Activity	B-	65% meet WHO recommendations, but this masks a dramatic age-related decline (Bringolf-Isler et al., 2022).
Organized Sport	C+	Only 54% participate, with significant gender and socioeconomic gaps (Lamprecht et al., 2021).
Physical Fitness	C	Moderate fitness levels, with some studies showing concerning secular trends (Knaier et al., 2023).
Sleep	C+	Only ~58% of adolescents meet sleep duration recommendations (Delgrande et al., 2024).
Sedentary Behaviour	F	A clear failure, indicating excessive screen time and passive behavior (Bringolf-Isler et al., 2018).
Active Play	INC	Lack of harmonized measurement tools prevents a national grade (Blinkert, B., & Höfflin, P., 2016)].

While the country excels in providing supportive contexts (**Community and Environment: A-**), the behavioral outcomes are deeply concerning. The **F grade for Sedentary Behaviour** is a major public health red flag, and the steep drop in overall activity during the teenage years signals a systemic failure to maintain engagement.

THE DATA VOID: CRITICAL GAPS REGARDING CAWD

The most profound finding of this study is the complete and utter data vacuum concerning children and adolescents with disabilities. For all 11 indicators, without exception, the research team was forced to assign a grade of **INC (Incomplete)**. This is not a mere gap; it is a void. There is no representative national data on PA levels, participation rates, or the accessibility of environments for CAWD. This empirical invisibility stands in shocking contrast to Switzerland's official inclusive discourse. Recent work highlights that even pediatric health professionals perceive significant barriers and a lack of sufficient activity for these children, but their views are not yet supported by national statistics

(Kisaelev et al., 2023). Without data, these children remain ghosts in the system, and evidence-based policymaking is impossible.

DISCUSSION: PAVING THE WAY FOR THE PE OF TOMORROW

FROM INVISIBILITY TO ACTION

The findings from Stage 1 should not be interpreted as a conclusion, but rather as a foundational impetus for subsequent phases of the Enviro Actif 360 project. The systemic invisibility of children and adolescents with disabilities (CAWD) constitutes a compelling justification for advancing to the next stages of the initiative, demonstrating that the development of a new conceptual and operational framework is not merely desirable but necessary. Incremental adjustments to an existing system that fails to adequately identify and represent a substantial segment of the student population are insufficient. The uniform attribution of an "INC" grade therefore represents a clear call to action, underscoring the need to transition from assumption-based policy frameworks toward evidence-informed, human-centered design approaches.

STAGE 2 AND 3: THE BLUEPRINT FOR A NEW PE

The subsequent stages of Enviro Actif 360 are the active response to this call and form the blueprint for the **Physical Education of tomorrow**.

Stage 2 is about making the invisible visible. By employing **accelerometry**, it will generate the first objective, quantitative data on the PA levels of CAWD in Switzerland. But it goes further. Through **qualitative interviews** and photovoice methods, it will give these students a voice, centering their lived experiences and allowing them to become experts on their own needs, barriers, and aspirations. This mixed-methods approach moves beyond cold statistics to embrace the rich, complex realities of inclusion and exclusion.

Stage 3 is where the transformation is realized. Grounded in the data and voices from Stage 2, this phase will use **co-construction** with teachers, students, and parents to build a new model of practice. By leveraging the principles of **Universal Design for Learning (UDL)**, it will create interventions that are not adapted *for* disability, but are universally designed *for diversity*. This creates an empowering, flexible, and motivating environment that fosters physical literacy for every student, building a system that is inclusive by its very nature.

TOWARD AN INCLUSIVE PHYSICAL EDUCATION: A ROADMAP FOR THE FUTURE

The Enviro Actif 360 project is more than a study; it is a **transferable model for building the PE of tomorrow**. Its true innovation lies in its structured, sequential, and cyclical process: **Diagnose -> Listen -> Co-Create**. This roadmap offers a clear pathway for any educational system seeking to move beyond performative inclusion towards genuine, systemic change.

The expected outcomes will be transformative:

- For **researchers**, it provides a robust methodology to tackle data deserts and generate actionable insights.
- For **teachers**, it will deliver practical, evidence-based, and co-designed tools that build their capacity and confidence to teach in diverse classrooms.
- For **policymakers**, it offers the empirical foundation required to craft intelligent, targeted, and measurable inclusive policies (Stamm, H., & Fischer, A., 2021).

The ultimate vision is a future PE grounded in **objective data**, the **authentic voices of all students**, and **co-constructed, universally designed practices**. This is a PE that does not ask students to fit into a rigid system, but rather designs a flexible and empowering system to fit the needs of every student.

CONCLUSION

This paper has laid bare a fundamental flaw in Switzerland's approach to physical activity promotion: children and adolescents with disabilities are systematically overlooked and uncounted. The Enviro Actif 360 project, through its initial diagnostic stage, has not only highlighted this critical data void but has also forged a clear, innovative, and replicable path forward. By moving sequentially from a national-level diagnosis to deep listening and finally to co-creation, the project provides a powerful blueprint for transforming inclusion from a passive ideal into an active, evidence-driven process. It is an invitation to architects of education everywhere to stop retrofitting the past and start co-designing the inclusive, active, and healthy future that all our students deserve.

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PRE-SERVICE TEACHERS' PERCEIVED PREPAREDNESS TOWARDS SUSTAINABILITY IN SOUTH AFRICAN FOUNDATION PHASE PE

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Keywords: Foundation Phase, Physical education, Pre-service teachers, Sustainability, Teacher preparedness

ABSTRACT

The sustainability of physical education (PE) in the Foundation Phase (Grade R-3) depends on what teachers feel capable of sustaining in their daily teaching practice. This paper examines Foundation Phase (FP) PE-service teachers' perceptions of their preparedness to teach PE, drawing on qualitative responses to a single open-ended question from a broader questionnaire distributed to selected South African teacher education institutions. The perceived strengths and vulnerabilities of these pre-service teachers reveal a need to work toward sustainable, inclusive PE teacher education. The full questionnaire had 96 respondents, of which 37 provided qualitative responses to the preparedness questions. Thematic analysis revealed four themes for areas in which pre-service teachers felt well prepared and four themes for areas in which they felt they needed more preparation. Analysis revealed clear patterns of confidence and vulnerability that shape the aspects of FP PE teachers perceive to sustain their teaching practice. The limited response rate to this single open-ended question is discussed as an indicator of PE's marginal status within teacher education in South Africa. This paper argues that teacher education is not merely an individual attribute but a core sustainability condition for PE in the FP.

INTRODUCTION

In South Africa, 11 universities offer early childhood education (ECE) as part of their teacher-training programs (Steyn et al., 2012). These universities integrate literacy, numeracy (mathematics), and life skills (LS). Higher education institutions (HEIs) utilize the National Curriculum Statement (NCS) and the Curriculum Assessment Policy Statement (CAPS) as guides for structuring ECE programs (Steyn et al., 2012). As outlined in CAPS, the LS curriculum is strategically designed to promote the holistic development of learners, addressing their social, personal, intellectual, emotional, and physical well-being (DBE, 2011). Physical Education, a vital component of the LS subject, plays a crucial role in fostering this holistic development (Kohl & Cook, 2013). However, despite its importance, the state of Physical Education Teacher Education (PETE) in South African higher education institutions

remains under scrutiny, necessitating innovative solutions to address persistent challenges (Couto et al., 2024)

Current PETE programs for FP teachers lack structured and comprehensive training, leaving teachers underprepared for effective and inclusive PE delivery. Van Deventer (2011) claims that "the CAPS policy does not permit HEIs to train teachers specifically for LS because, with all its broad topics, LS does not constitute a specific discipline at HEIs". Issues such as unclear content scope, insufficient practical training, and the absence of specific performance descriptors for assessing learner progress exacerbate the problem (Stroebel et al., 2017; Burnett, 2020). Additionally, there is limited guidance on how to adapt PE lessons to meet diverse learner needs, particularly in resource-constrained environments (Burnett, 2020; Tee, 2020).

At the seventh International Conference of Ministers Officials responsible for Physical Education and Sports (MINEPS VII) held in Baku, Azerbaijan, the ministerial representatives' key recommendations included recognition of PE as a fundamental right, the integration of PE into Sustainable Development Goals (SDGs), implementation of the Fit for Life initiative, addressing physical inactivity and health crises, ensuring quality PE and safeguarding participants in PE (UNESCO, 2023).

Critical issues aside, there has recently been growing interest in exploring and establishing links between PE and perspectives on sustainable development (Fröberg & Lundvall, 2022). The paper addresses the question of what must change for FP PE to be reimagined.

THEORICAL FRAMEWORK AND PROJECT OVERVIEW

TEACHER PREPAREDNESS & SUSTAINABLE PE

The study is theoretically framed by Vygotsky's socio-interaction theory and the Diffusion of Innovations theory, which underscore the importance of collaborative learning and the adoption of new teaching strategies in education for sustainability. Together, they provide a lens for understanding teacher preparedness as a socially constructed and systemically sustained process rather than an individual attribute.

Vygotsky (1978) provides a socio-interactionist perspective in which teacher learning is understood as a socially mediated process shaped by interaction, guided practice, and participation in professional contexts. In teacher education, the goal is for pre-service teachers' preparedness to teach PE to develop through collaborative learning experiences, modelling and scaffolded practice during coursework and work-integrated learning. Burnett (2020) Arufe-Giráldez et al. (2023) emphasizes that quality PE requires pedagogical approaches that provide meaningful experiences, promote learner engagement, and allocate sufficient time for practice. However, many teachers struggle to achieve these goals due to gaps in training and resource availability (Burnett, 2020). Complementing this view, the Diffusion of Innovations theory highlights how teaching practices can be adopted based on perceived complexity and pre-service teachers' existing beliefs (Rogers, 2003).

In the South African FP context, the sustainability of PE depends on whether pre-service teachers are sufficiently supported to adopt and sustain effective practice, which is currently affected by its integration into Life Skills and by its typically being taught by generalist teachers.

PROJECT OVERVIEW

This paper forms part of a broader, ethically approved research project. Ethical clearance was obtained from the Faculty of Education's Ethics Committee of the University of Pretoria, South Africa (Ref: EDU105/23). The research followed all relevant ethical guidelines and principles stipulated by the University of Pretoria and adhered to the principles outlined in the Helsinki Declaration. The project titled *FP PE* examines FP pre-service teachers' perceptions, knowledge, and preparedness to facilitate PE in South African schools. The purpose of this paper is to examine pre-service teachers' perceived preparedness to teach as a sustainability condition in FP PE.

METHODS

SAMPLE AND DATA COLLECTION

The data for this paper were drawn from an online questionnaire distributed via the South African Universities Physical Education Association (SAUPEA) network to the pre-service FP teachers enrolled in South African teacher education institutions. Participation was voluntary, and responses were anonymous. In total, 96 pre-service teachers completed the broader questionnaire. This paper draws specifically on qualitative responses from a single open-ended question: *Identify one area where you feel well-prepared to teach physical education and one area where you feel you might need more preparation,* to which only 37 participants responded.

DATA ANALYSIS

The study adopted an adaptation of the six-step thematic analysis process developed by Braun and Clarke (2006). These steps serve as a roadmap to meticulously process qualitative data. They enhance the rigour of the research process and the depth of the research findings (Naeem et al., 2023). Initial engagement with the data involved reviewing all 37 responses and identifying recurring keywords and phrases related to both perceived preparedness and areas requiring further preparation. These keywords were used to organise the data into two broad categories: perceived preparedness and perceived unpreparedness. Rather than treating the keywords as standalones, they were interpreted in context and iteratively developed into patterns of meaning. Through this process, themes were generated per category to inform the discussion.

FINDING

The responses from the 37 participants revealed distinct patterns in how they described areas of perceived preparedness versus areas requiring further preparation. The recurring keywords and phrases were interpreted in context and developed into themes reflecting shared meanings. The findings are presented in two sections: perceived preparedness and perceived unpreparedness.

PERCEIVED PREPAREDNESS

Responses relating to areas of perceived preparedness were characterised by recurring keywords such as motor skills development, fundamental movement skills, and creative and play-based

activities. Below is a breakdown of the recurring keywords and their interpretations for thematic meaning.

Keywords	Interpretive focus	Themes
Motor skill development	Confidence in supporting age-appropriate physical development	*Confidence in fundamental movement and gross motor skill development*
Fundamental movement skills	Familiarity with core movement competencies (e.g., running, jumping, throwing)	
Movement games	Use of structured and semi-structured activities to teach movement	*Movement through play and play-based pedagogy*
Creative and play-based activities	Alignment with FP teaching philosophies and learner-centered practice	

PERCEIVED UNPREPAREDNESS

In contrast, responses described various areas which require further preparation such as adaptation toward inclusive education as well as planning and assessment. The table below represents the thematic meaning derived from the recurring keywords.

Keywords	Interpreted meaning	Themes
Inclusive, special needs, adaptation	Uncertainty in inclusive pedagogical practice	*Inclusive and adapted PE*
Assessment, progress, criteria	Limited assessment literacy	*Assessment and monitoring of physical development*
Planning, lesson design, structure	Difficulty translating knowledge into pedagogy	*Lesson planning, structure, and progression*

DISCUSSION

The findings extracted from this single open-ended question demonstrate that sustainability in FP PE is closely tied to teacher preparedness. The findings lead to the argument that PE's sustainability depends on what teachers feel capable of sustaining in practice. There is a clear divide between confidence in familiar, play-based movement activities and uncertainty about more complex

pedagogical demands, with important implications for the future of PE in relation to SDG 4 – inclusive education, to ensure inclusive and quality education for all and promote lifelong learning (UN, 2015). The discussion points below provide insight into pre-service teachers' perceptions of preparedness and unpreparedness and discuss how these perceptions inform the reimagining and sustainability of PE in the FP.

PERCEIVED PREPAREDNESS & SUSTAINABLE PRACTICE

Participants most frequently reported preparedness in relation to motor skill development, fundamental movement skills, movement games, and creative, play-based activities. This pattern aligns with existing research indicating that early childhood and generalist teachers tend to feel most confident when PE practices reflect broader early childhood pedagogies that emphasise play, enjoyment, and learner engagement (Tsangaridou et al., 2021). As one participant noted, *"I feel well-prepared to design and implement engaging physical activities that develop fundamental movement skills… using games, music, and playful routines"*. Tsangaridou et al. (2021) further notes that most teachers employ generic, rather than content-specific practices in their PE classes. This tendency was also evident in respondents' responses, in which pre-service teachers expressed preparedness in broad pedagogical or affective terms rather than PE-specific content or a learning progression. One respondent stated, "*I feel prepared when learners are enthusiastic towards PE"*, while another described being *"well-prepared for fun and interactive, engaging lessons."* While enjoyment is a valuable foundation, research cautions that PE risks being marginalised when it is sustained primarily as an informal activity rather than as a coherent learning area (Beddoes et al., 2014).

Preparedness was also framed in relation to general teaching concerns such as context and management, with responses including *"In the sports ground… inside the classroom"* and *"the discipline of the learners is a bit tricky when doing physical education."* In some cases, PE was subsumed within broader wellbeing or life skills practices, as reflected in the comment, *"We implement the Wellness to Life activities that not only focus on physical education but include emotions and discussion, giving learners an overall experience."* Together, these responses suggest that preparedness is often conceptualised through generic teaching lenses, reinforcing the risk that PE is sustained as activity or engagement rather than as a content-rich and pedagogically coherent learning area.

From a sustainability perspective, this alignment is significant. Practices that fit comfortably within teachers' existing pedagogical repertoires are more easily integrated into daily routines and are therefore more likely to be sustained over time (Kirk, 2013).

PERCEIVED UNPREPAREDNESS AS A SUSTAINABILITY RISK

Areas of unpreparedness clustered around inclusive and adapted PE, assessment of physical development, lesson planning, and specific movement domains. These findings mirror the international literature, which highlights that generalist teachers often feel least prepared for aspects of PE that require specialised pedagogical knowledge or adaptation (Morgan & Bourke, 2008).

Inclusive PE emerged as a particularly significant concern. The CAPS curriculum identifies teachers as key support structures in implementing inclusive, diversified and well-managed PE programs

(DBE, 2011); however, many of the pre-service teachers expressed uncertainty about implementation, with one noting a need for *"more specific and practical training on how to effectively adapt physical education for children with diverse needs,"* while others highlighted concerns such as needing *"more preparation in adjusting my lessons to fit more inclusive children, like children with disabilities."* Similarly, limited confidence in assessment was evident, as reflected in the comment, *"I would benefit from more training on how to systematically assess their progress using clear criteria"*. This uncertainty highlights gaps in teachers' assessment literacy, where initial teacher education programmes limit their ability to make informed decisions about learners' physical performance in PE (Bradford, 2021). This weakens PE's pedagogical legitimacy and increases its vulnerability within curriculum contexts that prioritise assessment and accountability (Penney et al., 2009). Participants also reveal uncertainty about planning, lesson design, and pedagogical structure. As one participant noted, *" I know all the concepts that need to be developed in children, but I don't know exactly how the best way to teach or develop them is."* This distinction reflects a lack of pedagogical content knowledge, where knowing *what* should be taught does not necessarily translate into knowing *how* to teach it (Shulman, 1986).

CONCLUSION

Only 37 of the 96 participants provided qualitative responses to the single open-ended question: *Identify one area where you feel well-prepared to teach physical education and one area where you feel you might need more preparation;* therefore, the findings cannot be generalised. However, rather than being viewed solely as a methodological limitation, this limited engagement may signal the marginal status of PE within teacher education and pre-service teachers' uncertainty or lack of confidence in articulating preparedness in South Africa. Taken together, the findings suggest that what pre-service teachers feel prepared to teach becomes what is sustained in practice, while aspects of PE perceived as complex or under-supported remain vulnerable. From a sustainability perspective, PE cannot be sustained if teachers do not feel professionally equipped to teach it.

Reimagining sustainable PE in the South African FP therefore requires targeted strengthening of initial teacher education, particularly in relation to inclusive practice, assessment literacy, and pedagogical planning. Addressing these gaps demands systemic change that positions PE as a core pedagogical responsibility rather than an optional or intuitive classroom activity. As Tsangaridou et al. (2021) argue, understanding the practices teachers employ in PE enables teacher educators to provide more meaningful support that enhances children's learning experiences. This is particularly important given evidence that quality PE makes a vital and unique contribution to learners' education and that healthy children are better able to learn (Beddoes et al., 2014).

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

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Keywords : meaningful physical education; active school travel; youth engagement; qualitative research; belonging

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.

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BULLYING IN PHYSICAL EDUCATION CLASSES AS A SOCIAL SUSTAINABILITY ISSUE: TEACHERS' PERSPECTIVES

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Keywords : Physical education; Social sustainability; Teachers; Bullying; learning environment

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ABSTRACT

Bullying is an increasingly prevalent phenomenon in our society, and physical education (PE) classes are no exception, appearing even as a context conducive to its occurrence, particularly when inclusive and supportive learning conditions are not fully ensured. However, the perception of this phenomenon by PE teachers remains little studied, despite its implications for classroom climate and students' well-being. The primary aim of this study is therefore to examine how these teachers perceive bullying in their classes.

To this end, semi-structured interviews were conducted with 36 secondary school PE teachers. They were asked to describe a recent experience of bullying that occurred during their classes and to answer a series of questions about the factors that might explain the perpetrators' behavior.

The results indicate that teasing plays a central role, with bullying occurring in the majority of cases during class. Motives related to physical appearance and motor skills often appear to justify such behaviors. These findings highlight the importance of pedagogical differentiation as well as the need to develop interventions that encourage bystander engagement when confronted with bullying as a key condition for promoting social sustainability in physical education learning environments.

INTRODUCTION

While education for sustainable development has largely focused on environmental issues, the social dimension of sustainability remains comparatively underexplored, particularly in physical education (Baena-Morales et al., 2023; Royet et al., 2024). Bullying is a widespread phenomenon that can occur in various contexts, such as at work, at school, or during leisure activities. According to Olweus (1994), a behavior can be classified as bullying when it meets three criteria: it is repeated, deliberately intended to harm someone, and involves a power imbalance between the aggressor and the victim. Bullying can also be categorized based on its forms: physical, verbal, relational, and cyberbullying (Van Noorden et al., 2015). Studies on school bullying show that certain environments or periods of schooling are particularly conducive to the emergence of this phenomenon. Galand (2021a) notably highlights that the transition from primary to secondary school is a particularly "critical" period in terms of bullying. Certain subjects, such as physical education (PE), are, for their part, contexts that favor the emergence of bullying. Secondary school victims reported significantly higher rates of bullying occurring in the gymnasium and locker rooms (Vaillancourt et al., 2010). This can be explained, in part, by factors that are difficult to control. For example, locker rooms are frequently described as "bullying zones," mainly due to the lack of adult supervision. Teachers' reluctance to oversee this space is explained by child protection requirements and the taboos associated with observing partially undressed children (Green & Mierzwinski, 2025). Moreover, PE classes involve multiple simultaneous activities across spaces of varying size and layout, making it difficult for teachers to monitor all student behaviors. This limited supervision can contribute to the emergence of inappropriate behaviours such as bullying (Cothran & Kulinna, 2014). On the other hand, certain more easily controllable factors, such as teachers' instructional practices, can influence the emergence of bullying. For example, highly competitive approaches tend to increase students' aggressiveness (Méndez, Ruiz-Esteban & Ortega, 2019), whereas a more open and less authoritarian teaching style, incorporating activities with adjustable levels of difficulty, helps reduce such behaviors (Benítez-Sillero et al., 2024).

From a broader educational perspective, bullying in physical education can also be understood as an issue of social sustainability, as it undermines equity, inclusion and students' well-being within learning environments. In this context, equity refers to ensuring fair learning conditions adapted to students' diverse abilities and characteristics, inclusion to active participation and a sense of belonging for all, and well-being to students' physical, emotional and social safety during learning (UNESCO, 2015). Socially sustainable education relies on safe and supportive contexts that foster long-term engagement and participation for all students (Baena-Morales et al., 2023; Royet et al., 2025). Students who are victims exhibit high levels of demotivation, whereas those less affected maintain a more self-determined motivation (Murillo-Moraño et al., 2025). In the long term, negative experiences in PE, amplified by a negativity bias, can reduce their willingness to engage in physical activity (Ladwig, Vazou & Ekkekakis, 2018). Wei, Richards, and Graber (2024) highlight that research has primarily focused on classroom teachers' responses to bullying, while little is known about how physical education teachers perceive these situations. From a social sustainability perspective, identifying how bullying manifests in PE is essential to better understand the conditions and mechanisms that may

weaken the social climate and the long-term quality of learning environments. This general aim will therefore be explored through three research questions:

- Question 1: What are the most frequently observed forms of bullying in PE according to teachers?
- Question 2: In which settings do these bullying incidents occur?
- Question 3: What reasons or factors do teachers identify as underlying the occurrence of bullying in PE?

METHODS

This study adopts a mixed-methods approach, combining qualitative and quantitative methods, and is based on semi-structured individual interviews. The qualitative component, centered on the analysis of critical incidents, allows for the exploration of the first and second research questions. The quantitative component relies on a questionnaire using a frequency scale, aimed at addressing the third research question. This study was approved by the University Hospital-Faculty Ethics Committee of Liège (file reference: 2024-223). The procedures for obtaining informed consent and ensuring anonymity were rigorously followed.

PARTICIPANTS

A convenience sample was recruited using various information dissemination strategies, including emails, social media, and word of mouth. A total of 253 teachers were invited to participate in the interviews, of whom 65 agreed. To be eligible, PE teachers had to work in secondary education and have at least one year of experience with first-year secondary students. Among the 65 volunteers, 15 did not meet the eligibility criteria, and 14 withdrew. The final sample therefore consisted of 36 teachers (Figure 1).

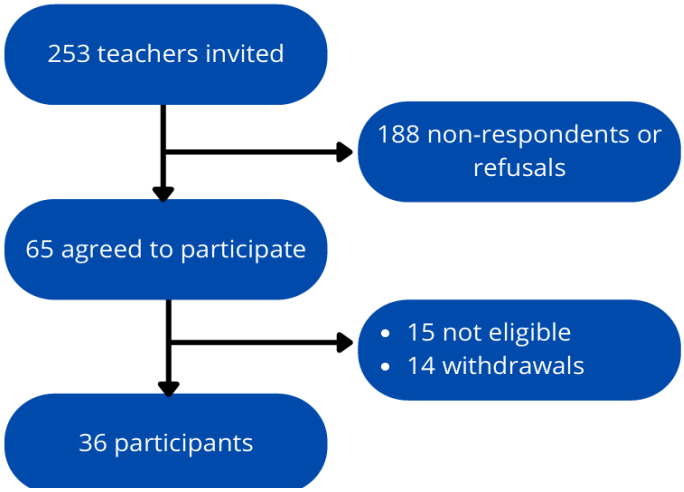

Figure 1 : Flowchart of the convenience sample selection

The sample consisted of 24 men and 12 women, aged 25 to 60 years (mean = 40 years). The teachers came from various schools in the French-speaking regions of Belgium, including the provinces of Liège, Luxembourg, Namur,

and Hainaut. Their experience with first-year secondary students ranged from 1 to 33 years, with a mean of 14 years.

DATA COLLECTION METHODS

Semi-structured interviews were conducted using an interview guide divided into three sections: demographic information, critical incidents in PE, and teachers' perceptions of bullying motives. These interviews were conducted either online using Microsoft Teams or in person. The interviews began with the collection of demographic information, such as age, years of experience teaching first-year secondary students, and the school in which the participants worked.

Subsequently, the definition of bullying proposed by Olweus (1994) was presented to the teachers. Based on this definition, they were asked to describe a critical incident. More specifically, teachers were asked to recall a recent situation in which they had observed one of their students being a victim of bullying during a PE class. They were invited to describe this event in as much detail as possible, specifying what happened, how the situation unfolded, who was present, where the incident took place, and when it occurred.

Finally, teachers' perceptions of bullying motives were assessed by asking whether they had ever witnessed bullying for any of the following five reasons: (1) atypical gender expression, (2) gender-nonconforming ways of moving, (3) poorer motor skills, (4) physical appearance, and (5) having a multiethnic background. Responses were recorded using a frequency scale ranging from 0 (never) to 4 (almost daily) (Kokkonen, Gråstén, & Kokkonen, 2024).

DATA ANALYSIS

Once the interviews were conducted, they were transcribed using the artificial intelligence software "TurboScribe". Each transcription was then carefully reviewed to correct any potential errors. Next, an Excel file was created with two sheets: one dedicated to qualitative analyses and the other to quantitative analyses.

For the qualitative data, a deductive approach was used, meaning that the categories were defined prior to analysis. Regarding forms of bullying, the categories were based on the classification by Van Noorden et al. (2015): physical, verbal, and relational, with theft added as an additional category. For the location of bullying, three contexts were identified: the locker rooms, PE class, and the route between the locker rooms and the class. The analysis focused on the occurrence of categories, that is, the number of times each category was mentioned by the teachers. The reliability of the categories was assessed using inter-rater and intra-rater measures and was confirmed. Quantitative data were analyzed using descriptive statistics, focusing on means and standard deviations.

RESULTS

FORMS AND LOCATIONS OF BULLYING: QUALITATIVE DATA

Of the 36 teachers interviewed, 33 (91.6%) reported a critical incident that occurred during a PE class. Regarding the forms of bullying, it should be noted that a single critical incident could involve multiple types of bullying. From this perspective, the different forms were recorded for a total of 46 citations. For example, Teacher 24 highlights verbal, physical, and relational bullying at the same time, stating: "Then we come to physical intimidation: pushing, hurting (…) and insulting. (…) Almost every class has a WhatsApp or Telegram group; the person we want to intimidate is excluded, then reintegrated into the group only to be insulted."

Verbal bullying was the most frequently reported type by teachers (59% of mentions), followed by relational bullying, which accounted for about a quarter of mentions (26%). Physical bullying (11%) and theft (4%) were reported much less frequently (Figure 2).

The location of bullying was mentioned 30 times. It is important to note that a single teacher could report multiple locations for the same incident (e.g., both in the locker rooms and during the PE class). Among these mentions, 21 incidents (70%) occurred during the PE class, 8 incidents (27%) in the locker rooms, and one teacher (3%) reported the route between the locker rooms and the gym as a location of bullying.

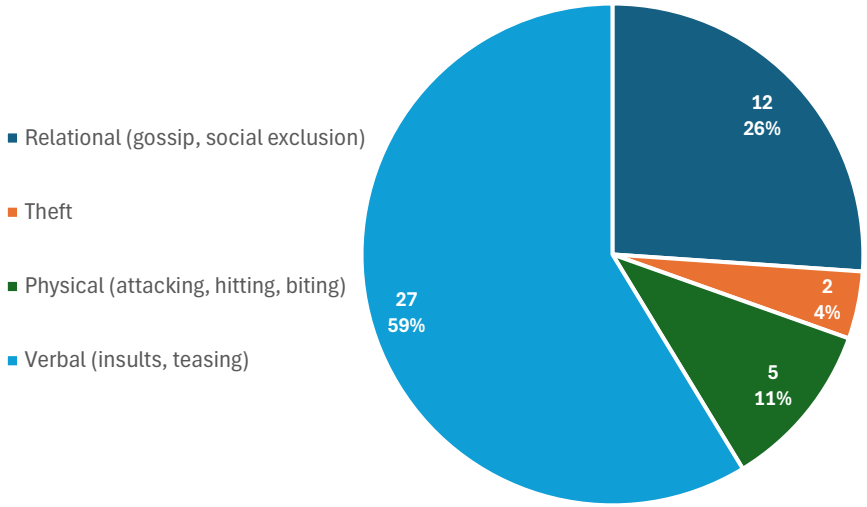

Figure 2 : Distribution of bullying forms by number of mentions

MOTIVES FOR BULLYING: QUANTITATIVE DATA

Table 1 presents the frequency of bullying motives reported by teachers. It appears that students' poorer motor skills (2.5 ± 1.21) and physical appearance (2.3 ± 1.07) are the primary factors contributing to bullying in PE. Gender and ethnicity do not appear to be primary factors contributing to bullying in PE.

TABLE 1 : FREQUENCY OF BULLYING MOTIVES IN PE

Motives for Bullying	Mean (0-4) +/- SD
Atypical gender expression	1,4 (+/- 1,02)
Gender-nonconforming ways of moving	1,4 (+/- 0,96)
Poorer motor skills	2,5 (+/- 1,21)
Physical appearance	2,3 (+/- 1,07)
Having a multiethnic background	1,7 (+/- 1,07)

DISCUSSION

Bullying manifests itself in various contexts, and the classroom is no exception. More than 90% of teachers report having witnessed a recent incident of harassment in their class. According to a study conducted by Gano-Overway (2013) among approximately 12-year-old youth in the United States, 28% of students report being victims of bullying in PE classes, while 15% acknowledge being perpetrators. Reducing this phenomenon is likely to have both immediate and lasting effects. Lower levels of victimization in PE are indeed associated with higher self-determined motivation in this subject (Murillo-Moraño et al., 2025). Such motivation supports students' engagement and stimulates their daily physical activity at school, while also promoting the acquisition of skills and knowledge essential for maintaining physical activity outside of school (Vasconcellos et al., 2020). In the long term, bullying in PE constitutes a particularly salient negative emotional experience that can become durably embedded in students' memory. Memories associated with shame, humiliation, or social exclusion remain especially prominent and may subsequently influence decisions to participate in physical activity (Ladwig, Vazou & Ekkekakis, 2018), whereas positive affective experiences have a favorable impact on future participation in physical activity across the lifespan (Feil et al., 2025). In addition, a deteriorated social climate limits the achievement of pedagogical objectives and may generate frustration and professional strain among teachers (Taylor et al., 2009). Addressing bullying is therefore not only a matter of student protection, but also a condition for maintaining meaningful and sustainable teaching environments (Wei & Graber, 2023). The form of bullying most frequently reported by teachers is teasing, highlighting the role of the immediate pedagogical environment in shaping social interactions. This observation can be linked to the most commonly cited motives for bullying, namely criticism related to perceived poor motor skills and physical appearance. Many authors emphasize that bullying often originates in the perception of difference in others (Galand, 2021b). According to Borowiec et al. (2022), overweight students are more likely to be victims of verbal bullying, particularly because PE exposes their bodies and physical abilities to the scrutiny of others. This observation highlights the importance of pedagogical differentiation in the prevention of bullying (Benítez-Sillero et al., 2024). In this context, differentiation refers to designing flexible learning situations that provide multiple entry points, adjustable levels of difficulty, and reduced reliance on public comparison. Such an approach is consistent with Universal Design for Learning (UDL) principles, which aim to remove barriers and ensure accessibility and meaningful participation for all students (Priyadharsini & Mary, 2024).

PE classes appear to be the place where bullying occurs most frequently, while the locker rooms come in second, accounting for about one-third of the reports. In either case, the setup of PE classes makes it difficult to monitor all student behaviors, especially since students often try to conceal their actions from teachers (Cothran & Kulinna, 2014). In locker rooms, the lack of adult supervision exacerbates this issue (Green & Mierzwinski, 2025). This highlights the crucial role of student bystanders. However, the literature shows that, when faced with bullying situations, bystanders often tend to remain passive (Tolmatcheff, Galand, & Roskam, 2018). From this perspective, pedagogical differentiation and bystander-oriented interventions appear essential to support socially sustainable PE environments that promote equity and participation (Royet et al., 2024, 2025).

PERSPECTIVES AND CONCLUSION

This study highlights the importance of teasing, particularly those targeting students' physical appearance and motor skills. For practitioners, these findings emphasize the need to adapt learning activities to each student's level in order to prevent bullying.

The study also shows that bullying is particularly prevalent during PE classes, with more than 90% of teachers reporting having recently witnessed at least one incident. Our discussion also points to the difficulties teachers face in monitoring and intervening in all student behaviors during class. It is therefore essential for researchers to develop interventions that promote bystander engagement and support. For educators and trainers, it is equally crucial to provide tools that facilitate communication between students and teachers and strengthen educational actions not only for bullying prevention, but also for fostering social sustainability in PE settings (Royet et al., 2024). PE can provide an effective setting for implementing bullying prevention programs (Rico-González et al., 2025).

These findings call for a shift toward a more socially sustainable vision of PE. Such an approach requires moving from reactive responses to preventive and systemic strategies aimed at creating inclusive, safe and equitable learning environments that support all students' participation and well-being. Based on the findings of this study, three priority areas form a practical blueprint for action to prevent bullying and support the development of socially sustainable PE (Table 2).

Table 2 : A practical blueprint for action toward socially sustainable PE based on the study finding

Study finding	Sustainability issue	Priority for practice
Teasing frequently targets motor skills and physical appearance	Negative peer comparison and student vulnerability	*Inclusive pedagogical design (UDL-informed): provide multiple entry points, flexible levels of difficulty, and minimize public comparison*
Most incidents occur during PE lessons or in less supervised moments (locker rooms)	Difficulty detecting and preventing emerging situations	*Proactive management of learning situations: anticipate sensitive contexts and create conditions that support a safe and respectful social climate.*
Bullying frequently takes verbal and relational forms (e.g., teasing, exclusion) within peer interactions	Risk of a deteriorated social climate and reduced sense of safety for some students	*Bystander and climate work: establish explicit norms for respectful interactions and encourage students to adopt supportive and prosocial responses*

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