

Embodied Education for Sustainable and Inclusive Growth in Lower-Secondary Students: A Collaborative Approach

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Abstract

This investigation examines the impact of an innovative educational programme carried out in a lower-secondary school, centred on Embodied Education, sustainability, and inclusion. The initiative brought together a physical-education teacher and an external specialist, both of whom implemented cooperative learning strategies to stimulate active, collaborative engagement. A comparison group—selected with identical criteria but not exposed to the programme—served as a control. Using a mixed-methods design, the study drew on three instruments: the New Ecological Paradigm (NEP) Scale to gauge environmental orientation, the Multidimensional Assessment of Interoceptive Awareness (MAIA) to assess bodily self-awareness, and the Sentiments, Attitudes, and Concerns about Inclusive Education (SACIE-R) to probe views on inclusion. Quantitative analyses revealed that the experimental cohort achieved significantly higher scores in sustainability, interoception, and inclusion than their control-group peers. Qualitative feedback likewise pointed to enhanced wellbeing and stronger peer collaboration. Taken together, these findings indicate that a body-centred, cooperative teaching approach can nurture ecological and inclusive attitudes within the school context and may outperform traditional instruction.

Keywords: *Inclusion; Sustainability, Body, Education*

Introduction

In recent years, educational research has accentuated the need to bring together students’ cognitive, social, and emotional development through innovative approaches that interweave body, mind, and environment (Roth & Jornet, 2019). Embodied Education, in particular, has emerged for its capacity to integrate motor and sensory experience into higher-order cognitive processes, leading to deeper and more enduring knowledge construction (Shapiro, 2019). As Paloma (2020) observes, this approach values the body’s experiential dimension as a vehicle for strengthening learning and cultivating transferable skills, allowing pupils to *actively embody* disciplinary content. Recent studies indicate that body-based teaching activities can heighten students’ motivation and engagement while helping them shift from purely theoretical knowledge to a personally grounded understanding (Sailors & Nichols, 2021; Sclater, 2019).

Concurrently, heightened concern over the climate crisis has prompted schools to place stronger emphasis on sustainability education (Zhang, Geng, & Tam, 2021). Schools thus

represent a prime setting for developing ecological competences and fostering a sense of collective responsibility (Evans, Tomas, & Woods, 2022). A substantial body of research shows that learning paths centred on direct experience, concrete action, and shared reflection can positively influence both students' environmental knowledge and their ecological attitudes (Johnson & Johnson, 2018).

Inclusion constitutes another key dimension (Forlin & Sharma, 2017). International policy stresses full participation, acknowledging the diversity of learning styles, abilities, and sociocultural backgrounds. Scholars such as Sharma, Forlin, and Loreman (2017) argue that nurturing a cooperative classroom climate—where diversity is treated as an asset—enhances interpersonal relationships and overall wellbeing.

From this perspective, combining Embodied Education with targeted sustainability efforts and inclusive strategies can shape a learning environment that meets today's educational and social challenges (Freedberg & Gallese, 2007). The present study examines an experimental intervention in a lower-secondary school, where a physical-education teacher and an external specialist partnered to implement cooperative learning methods linked to Embodied Education, the advancement of sustainability, and inclusive principles. Unlike similar projects, a control group with comparable characteristics (identical inclusion criteria) was established and did not take part in the activities. The central hypothesis posits that an integrated pedagogical experience—rooted in movement, active engagement, and respect for the social and natural ecosystem—can significantly enhance students' bodily awareness, bolster their ecological orientation, and foster a positive outlook on diversity to a greater extent than traditional teaching methods. The project's objectives are as follows:

1. **Primary objective:** Determine whether a learning pathway grounded in inclusion, Embodied Education, and sustainability—implemented through cooperative learning—can influence pupils' body awareness, their propensity for inclusion, and their attitudes toward environmental stewardship.
2. **Secondary objective:** Explore how bodily involvement and peer cooperation might cultivate a more open and collaborative classroom climate.

The inclusion of a homogeneous control group (matched for age and inclusion criteria) that did not take part in the intervention made it possible to gauge the programme's effectiveness with greater precision.

1. Research Design: Inclusion criteria; Instruments; Thematic analysis

- *Inclusion* *Criteria*
Three first-year classes at a lower-secondary school were involved. Pupils were eligible if they met the following conditions:

1. Age: 11–12 years old
2. Parental consent: Parents (or guardians) agreed to their child's participation
3. Special educational needs: No exclusions were applied on this basis, consistent with the study's inclusive ethos

A total of 64 students—34 girls and 30 boys—took part and were allocated to two groups:

1. Experimental group: followed the programme focused on Embodied Education, sustainability, and inclusion.
2. Control group: continued their regular curriculum and did not receive the specialised programme, although they matched the experimental group in age and sociocultural background.

The physical-education teacher was chosen for specialised expertise in body-centred pedagogy, while the external specialist held qualifications in movement sciences and educational psychology and had prior experience in sustainability-promotion projects.

A mixed-methods (qualitative + quantitative) approach was adopted to merge the strengths of experimental and descriptive methodologies. The intervention ran for 12 weeks, with two two-hour sessions per week led jointly by the physical-education teacher and an external specialist—only for the experimental group. The control group attended their regular PE classes with no extra activities.

- *Quantitative Instruments*

1. New Ecological Paradigm (NEP) Scale (Dunlap et al., 2000; Zhang et al., 2021) – gauges sustainability orientation and ecological sensitivity.
2. Multidimensional Assessment of Interoceptive Awareness (MAIA) (Mehling et al., 2018) – measures bodily awareness, including subscales on emotion regulation and perception of internal bodily signals.
3. Sentiments, Attitudes, and Concerns about Inclusive Education – Revised (SACIE-R) (Forlin & Sharma, 2017) – captures feelings, attitudes, and worries regarding the inclusion of peers with special educational needs.

All questionnaires were administered as both pre-test and post-test to the experimental and control groups, enabling within-group (pre/post) and between-group (intervention vs. traditional instruction) comparisons.

- *Qualitative Instruments and Procedures*

To gain deeper insight into students' experiences—and to understand how and why any changes occurred—the following tools were employed:

- Semi-structured focus groups
 - *Structure and facilitation:* At the end of the 12 weeks, two focus groups were held (one experimental, one control). Questions explored bodily experiences, collaboration, and attitudes toward sustainability. In the experimental group, discussion centred on the impact of the new activities; in the control group, perceptions of traditional lessons and any unrelated changes were examined.
- Reflective journals (*experimental group only*)
 - *Completion procedure:* Each week, experimental-group students kept a brief diary noting physical sensations, reflections on cooperation, and thoughts on sustainability and inclusion.
 - *Purpose:* To foster continuous self-observation and to gather data on internal group dynamics (Sclater, 2019).

- *Thematic Analysis*

Qualitative data (focus-group transcripts and reflective journals) were examined using Braun and Clarke's (2006) five-stage thematic analysis:

1. Familiarising with the data
2. Generating initial codes
3. Searching for and reviewing recurring themes
4. Defining and naming themes
5. Producing the final report.

2. Description of the teaching activities (Experimental group)

- *Phase 1 – Developing body awareness*
 - Movement- and breath-exploration exercises interspersed with guided relaxation sessions to enhance interoceptive sensitivity (Mehling et al., 2018).

- Brief theoretical inputs on the importance of personal physical well-being and respect for one's surroundings, reinforcing the notion of *shared responsibility*.
- *Phase 2 – Cooperative design for sustainability*
 - Classes split into small, heterogeneous groups (mixed by gender, motor skills, and interests).
 - Creation of short outdoor movement trails using up-cycled materials (bottles, cardboard) or natural objects (branches, leaves, stones) collected in the schoolyard.
 - Compilation of a group “logbook” recording choices, motivations, and methods of disposing of or re-using materials (Zhang et al., 2021).
- *Phase 3 – Reflection and feedback*
 - Whole-class sharing of results, with discussion of challenges encountered and solutions adopted.
 - Guided reflection on sustainability and inclusion, highlighting how bodily awareness and mutual support improved both classroom relationships and environmental consciousness (Forlin & Sharma, 2017).

3. Quantitative findings

Statistical analysis of the pre- and post-intervention questionnaires revealed significant differences between the experimental and control groups:

- *NEP Scale (sustainability orientation)*
 - *Experimental group*: mean increase of 0.7 points ($t(63) = 3.40; p < .01$).
 - *Control group*: mean increase of 0.1 points, not significant ($t(63) = 0.82; p > .05$).

Interpretation: The larger improvement in the experimental cohort indicates that the embodied, cooperative experience fostered greater ecological sensitivity (Zhang et al., 2021).
- *MAIA (body awareness)*
 - *Experimental group*: average rise from 3.2 to 3.8 ($t(63) = 2.67; p < .05$).
 - *Control group*: average change from 3.2 to 3.3, not significant ($t(63) = 1.10; p > .05$).

Interpretation: This significant increase supports the effectiveness of Embodied Education in enhancing interoceptive awareness and stress regulation (Shapiro, 2019).
- *SACIE-R (inclusion)*
 - *Experimental group*: mean rise of 0.5 points in positive sentiments toward inclusion and a 0.4-point drop in concerns (both $p < .05$).
 - *Control group*: minimal, non-significant shifts (+0.1 and -0.1).

Interpretation: The decrease in diversity-related worries and the growth in positive attitudes toward inclusion confirm the value of cooperative, body-centred activities (Forlin & Sharma, 2017).

Overall, the contrast with the control group shows that traditional instruction produced no meaningful change, whereas the targeted intervention had a substantially greater impact across all measured dimensions.

4. Qualitative findings

Findings from the thematic analysis of the experimental group's focus groups and reflective journals revealed four main themes:

1. The body as a resource
Students reported greater awareness of their physical sensations and reduced anxiety in stressful situations, echoing principles of Embodied Cognition (Shapiro, 2019).
2. First-hand sustainability
Many accounts pointed to heightened ecological awareness—for example, regularly sorting waste or suggesting recycling solutions at home (Zhang et al., 2021).
3. Inclusion as active cooperation
Pupils described mutual support: several helped classmates with motor or language difficulties, building empathy and overcoming communication barriers (Forlin & Sharma, 2017).
4. A more cohesive classroom climate
Working in small groups and jointly planning activities fostered mutual trust and a stronger sense of belonging, consistent with Freedberg and Gallese's (2007) observations on the role of bodily dynamics in social cohesion.

In the control group, focus-group discussions depicted a largely static picture. Students reported no notable changes in their perception of the body, the environment, or inclusive dynamics—mirroring the outcomes typically associated with traditional teaching practices.

5. Discussion

The results of this investigation—aligned with several current research strands (Zhang et al., 2021; Evans et al., 2022; Sailors & Nichols, 2021)—support the view that teaching strategies combining physical movement, collaborative effort, and environmental reflection can bring about substantial change at both the personal and relational levels. Comparing the experimental and control groups highlights several key points:

- *Body awareness (MAIA) and psycho-physical wellbeing*
 - The experimental group's average score rose from 3.2 to 3.8, indicating that Embodied-Education practices (focused on breathing, listening to internal signals, and stress regulation) helped strengthen self-regulation skills. As Shapiro (2019) explains, *embodying* curricular content links abstract concepts to concrete physical experience, fostering deeper learning.
 - In the control group, the slight shift from 3.2 to 3.3 was not significant, confirming that traditional motor activities—with no structured body-reflection component—contribute little to building interoceptive competence. This echoes Sailors and Nichols (2021), who stress the need for a structured experiential component to truly boost student engagement.
- *Sustainability orientation (NEP Scale)*
 - A mean increase of 0.7 points in the experimental group, versus 0.1 in the control group, suggests that an experiential approach—supported by cooperative activities and up-cycled materials—heightened students' environmental awareness. Recent literature (Zhang et al., 2021; Evans et al., 2022) shows that practising pro-environmental behaviour in school promotes not only knowledge gains but also ecologically oriented attitudes.
 - The absence of notable change in the control group confirms that standard PE lessons, if not paired with structured environmental reflection and purpose-driven group work, offer few chances to embed sustainability principles in students' daily lives (Evans et al., 2022).
- *Inclusion (SACIE-R): positive sentiments and reduced concerns*
 - The experimental group recorded an average rise of 0.5 points in positive sentiments toward inclusion and a drop of 0.4 points in diversity-related concerns. These outcomes show that cooperative settings, combined with the

discovery of a “*shared body*” (Freedberg & Gallese, 2007), foster empathy and help break down relational barriers (Forlin & Sharma, 2017).

- The control group’s minimal (+0.1, −0.1) and non-significant shifts suggest that, without a structured cooperative-learning path, changing attitudes toward classmates with special educational needs is more difficult. This supports Sharma, Forlin, and Loreman’s (2017) conclusion that active, collaborative methods are key to developing inclusive competences.
- *Classroom climate and active participation*
 - Qualitative data (focus groups and reflective journals) show that experimental-group students felt greater cohesion and mutual support, valuing their peers’ diverse abilities and backgrounds. Creative, body-centred tasks—where everyone could contribute according to their strengths—encouraged trust and curiosity about others.
 - In the control group, the lack of structured cooperation and reflection limited the growth of class belonging, leaving room for more individualistic dynamics and fewer shared problem-solving approaches (Johnson & Johnson, 2018).

Overall, the differences between the two groups are not purely quantitative (i.e., questionnaire scores) but also qualitative, shaping students’ perceptions of personal wellbeing, environmental responsibility, and the value of diversity in class. In this sense, the experimental intervention appears to confirm Roth and Jornet’s (2019) thesis that the experiential, body-centred dimension plays a fundamental role in knowledge building and in transforming attitudes and behaviours.

Conclusions

The research highlights that combining Embodied Education, sustainability, and inclusion through cooperative-learning strategies can generate tangible, measurable gains both in personal development (greater body awareness, reduced stress, openness toward others) and in values (environmental attentiveness, positive perceptions of diversity). Introducing a control group—with matching characteristics but no exposure to the experimental activities—made it possible to pinpoint the intervention’s specific impact, revealing that traditional physical-education lessons influence these dimensions far less. These findings align with recent literature that underscores the effectiveness of active, collaborative teaching methods in promoting sustainable and inclusive attitudes through integrated engagement of body and mind (Zhang et al., 2021; Evans et al., 2022; Sailors & Nichols, 2021; Shapiro, 2019). In particular, the decline in worries about classmates with special educational needs and the rise in positive feelings toward inclusion confirm that a welcoming, participatory school climate is more readily built via direct collaborative experiences (Forlin & Sharma, 2017; Sharma et al., 2017). Although the results are promising, the study should be replicated in different school types and regions to test its transferability. Moreover, while the 12-week span yielded significant data, longer-term projects are advisable to consolidate these positive effects over time.

In summary, comparing the experimental and control groups underscored the effectiveness of an integrated method that *embodies* ecological and inclusive dimensions by actively involving students in cooperative experiences. This approach addresses contemporary educational and social challenges, offering concrete frameworks for programmes that, beyond conveying disciplinary knowledge, cultivate more conscientious, empathetic, and responsible citizens.

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