

Embodied Education for Sustainability and Inclusion: An Experimental Study in Lower Secondary School

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Abstract

The integration of Embodied Education, sustainability and inclusion is an innovative area of contemporary teaching, in which body and mind collaborate in the learning process, promoting a more equitable and conscious educational context. This experimental study aims to investigate how an approach based on bodily experience can help raise students' awareness of the Sustainable Development Goals of the 2030 Agenda and promote inclusive practices in schools. The six-month project involves a sample of 100 secondary school pupils, with a specific focus on students with special educational needs (SEN), with a migrant background, from disadvantaged socio-economic backgrounds or with high levels of academic achievement. These groups, which are often exposed to forms of marginalisation, are placed at the centre of the intervention to transform inclusion and sustainability into everyday practices shared by the entire school community. The methodology adopted is mixed, qualitative and quantitative, and involves the use of validated tools to measure students' inclusion, well-being and ecological awareness, with the aim of analysing the effects of this integrated approach on their personal and social development. The project is expected to improve social inclusion, increase awareness of environmental issues and enrich the overall educational experience.

Keywords: *Embodied Education, Inclusion, Sustainability, Innovative Teaching, Body experience*

Introduction

In recent years, the educational landscape has undergone significant changes thanks to the introduction of innovative teaching approaches that connect the body, mind and environment. Among these, Embodied Education represents an emerging field of contemporary pedagogy, valuing bodily experience as an essential component of the learning process. According to Gallagher (2017), knowledge is not solely a mental activity, but an experiential process that involves the body and the context in which learning takes place. In line with Barsalou's Embodied Cognition Theory (2008), cognitive functions are based on sensory and motor experiences, suggesting that physical involvement can strengthen students' conceptual understanding and interest (Shapiro, 2019).

At the same time, educational sustainability has become a priority, consistent with the goals outlined in the United Nations 2030 Agenda (UNESCO, 2020). Sustainability education

promotes responsible attitudes and behaviours towards the environment and society, encouraging students to develop ecological awareness and a sense of social responsibility (Sterling, 2011). As Tilbury (2012) points out, education for sustainable development (ESD) must go beyond the transmission of information and aim for a concrete change in the way students think and act, through active and participatory practices.

Another central element of this research is school inclusion, a topic that has been widely studied for its positive effects on students' well-being, interpersonal skills and participation (Ainscow, 2020). According to Booth and Ainscow (2016), inclusion is not limited to the integration of pupils with special educational needs (SEN), but concerns the construction of learning environments that are fair and accessible to all, valuing individual diversity.

The synergy between Embodied Education, sustainability and inclusion is still a young field of study, but one with concrete implications. Several studies highlight how the use of the body in teaching promotes more engaging and participatory learning, particularly for students with learning difficulties (Fuchs & Fuchs, 2021). The interaction between body and mind is crucial in facilitating cognitive processes, reinforcing the importance of the physical dimension in education (Gomez Paloma, 2017). At the same time, educational experiences in contact with nature have been shown to be effective in improving psychological well-being and increasing environmental awareness (Louv, 2019).

Empirical research conducted by Thelen (2005) and Glenberg (2008) confirms that body movement can enhance memory and cognitive functions, making embodied strategies particularly useful for students with attention disorders or learning difficulties. Furthermore, Wilson and Golonka (2013) have shown that skills such as abstract thinking and critical reasoning benefit from direct physical experiences. In this sense, Embodied Education offers a teaching approach that supports the processing of complex concepts through action, movement and bodily perception, helping to make learning more accessible even to students with different cognitive styles.

This type of learning is particularly effective from an inclusive perspective, as it allows even those who encounter difficulties at school or have atypical cognitive profiles to participate actively and meaningfully in the educational process. Embodied Education thus presents an opportunity to create more equitable and motivating learning environments, where differences become resources and the body takes on a central role in the construction of knowledge.

In terms of sustainability, the results of Chawla's study (2020) emphasise that contact with the natural environment and outdoor activities promote a sense of ecological responsibility and a connection with the community. Based on these premises, the activities designed in this research combine physical and environmental dimensions with the aim of proposing an innovative and transformative educational model.

In conclusion, the aim of this study is to evaluate the effectiveness of an educational programme that integrates Embodied Education, sustainability and inclusion, analysing its impact on students' learning, well-being and social awareness. The research will use validated tools to monitor any changes in students' perceptions and behaviours, thus contributing significantly to the scientific debate on educational innovation.

1. Aims of the Research

- Promote physical and sensory learning through Embodied Education.
- Raise students' awareness of the sustainable development goals of the 2030 Agenda.
- Encourage inclusion and collaboration through cooperative activities that are accessible to all.
- Increase students' physical and social awareness.

2. Research Structure: Methodology, Data, Analysis and Limitations

The sample for this study was selected with the aim of ensuring adequate representation of the school population and exploring the actual effectiveness of the proposed teaching approach in a heterogeneous context.

The sample consists of 200 secondary school students, selected according to criteria that reflect the diversity of the school population and allow for the assessment of the impact of Embodied Education, sustainability and inclusion on different categories of students. The sample is divided into:

1. Experimental group: composed of 100 students who actively participate in the proposed teaching intervention, following the activities planned in the programme

2. Control Group: composed of 100 students who do not participate directly in the educational intervention but who will undergo the same assessments to allow a comparison of pre- and post-intervention results. The presence of the control group is essential to validate the effects of the experimental approach adopted.

The same inclusion criteria apply to both groups, which are characterised by:

1. Students with Special Educational Needs (SEN): inclusion of students with motor disabilities, specific learning disorders (SLD) and neurodiversities. The choice of this subgroup is based on studies that highlight how physical learning can promote active participation and psychological well-being in these students (Fuchs & Fuchs, 2021).

2. Students with a migrant background or socio-economic disadvantage: this category is included to analyse how an inclusive educational approach can promote social integration and reduce linguistic and cultural barriers (Booth & Ainscow, 2016).

3. Students with academic excellence as inclusive mentors: the inclusion of students with high levels of academic achievement aims to promote peer tutoring and collaboration, strategies recognised for improving the social and cognitive skills of all students involved (Johnson, Johnson & Holubec, 1994).

The research will be conducted over a period of six months. This period is considered adequate to observe significant changes in the behaviour, perceptions and well-being of the students involved, as well as to collect reliable quantitative and qualitative data.

In conclusion, the choice of sample was guided by the need to include a wide variety of experiences and backgrounds in order to verify the transformative potential of the proposed teaching approach and provide practical guidance for the implementation of innovative educational strategies in schools.

- *Structure of the Educational Pathway*

PHASE 1 - Roots: The Body as a Tool for Knowledge and Inclusion Objective: To create body awareness and break down communication barriers. Activities:

1. Body Mapping: Activity based on studies by Sheets-Johnstone (2010) highlighting how body perception influences identity construction. Students draw their bodies on large sheets, marking sensations, emotions and perceived limits, promoting body metacognition and self-awareness. *a. Game:* “Journey through the Body” – Students explore their drawings while blindfolded, describing the emotions they feel.

2. Multisensory tactile paths: According to Montessori (1917), sensory learning promotes cognitive integration. Students explore natural materials (earth, wood, water) barefoot or with their hands, stimulating connection with the environment and bodily perception.

- a) *Game:* ‘Guess the material’ – Blindfolded, they must recognise natural elements by touching them.

3. Inclusive dance and physical theatre: Based on studies by Albright and Gere (2003), this activity uses dance as a universal means of expression, including wheelchair dancing and mime to overcome communication barriers.

a) Game: “Moving Mirrors” – In pairs, one student imitates the movements of the other.

4. Non-verbal communication workshops: According to McNeill (2005), body language is fundamental to social interactions. Students participate in theatre exercises to improve communication and collaboration among peers.

a) Game: “Human Sculptures” – They create collective figures using only their bodies.

5. Activities adapted for SEN: Follows the Universal Design for Learning model (Rose & Meyer, 2002), using tactile materials and personalised rhythms to ensure accessibility.

PHASE 2 - Connections: The Body and the Environment in Balance Objective: To experience sustainability through the body. Activities:

1. ‘Planting bodies’: According to Louv (2019), contact with nature improves mental and physical well-being. Students plant trees and associate an inclusive value with them, creating an emotional bond with the environment.

a. *Game*: ‘The Tree of Values’ – Each student explains the value associated with their tree.

2. Inclusive orienteering: Based on studies by Brown et al. (2009) on spatial navigation and accessibility. Nature trails with tactile maps, audio guides and tools adapted for SEN allow for an equal experience for all.

a. *Game*: “Find the Goal” – Using sensory clues, students discover hidden stages.

2. Biomimicry in motion: According to Benyus (2002), biomimicry helps us understand natural principles. Students observe and imitate movements in ecosystems (swarms of bees, water flows), experimenting with the concept of environmental interconnectedness.

a. *Game*: ‘Dance of Nature’ – Groups recreate movements of natural elements.

PHASE 3 - Transformation: Acting for a Sustainable and Inclusive Future Objective: To create a real impact in the school and local community. Activities:

1. Urban performance on climate change: Inspired by Boal's “Theatre of the Oppressed” (1979), this activity uses the body as a tool for raising awareness, involving the audience through improvised performances.

a. *Game*: “Freeze Frame” – Students create scenes with an environmental impact and freeze their poses.

2. Creation of a “Green Sensory Room”: Based on studies by Kaplan & Kaplan (1989) on environmental psychology, students transform a school space into a multisensory area with plants, soft lighting and natural materials for physical and mental well-being.

a. *Game*: “The Garden of the Senses” – Each student contributes a natural element.

3. Body podcast: Based on research by Gee (2017) on digital storytelling as a learning tool. Students record their learning experiences on the move, sharing reflections on inclusion and sustainability.

4. Project-based learning: Following the model of Blumenfeld et al. (1991), students develop school gardens, inclusive sensory trails and awareness campaigns, applying theoretical knowledge to real life.

• *Assessment Tools*

The methodological approach is qualitative and quantitative and uses validated tools for data collection:

Quantitative Tests:

1. Inclusion: Questionnaire for Assessing the Inclusive Quality of the School System (Ianes & Cramerotti, 2014), which measures students' perceptions of school inclusiveness and investigates aspects such as relationships with classmates, teacher support and active participation.

2. Well-being: Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) (Tennant et al., 2007), which measures psychological well-being through 14 items on self-esteem, optimism, social relationships and relaxation and is valid for studying the effect of physical activities (dance, mindfulness, collaborative sports) on mental well-being.

3. Environmental awareness: New Ecological Paradigm Scale (Dunlap et al., 2000), which measures ecological attitudes and environmental awareness and is suitable for assessing changes in perception after immersive activities in nature. Qualitative tools:

4. Semi-structured interviews with students and teachers.

5. Observation rubrics for analysing group dynamics.

6. Students' body reflection diaries.

7. NVivo, thematic analysis software used to identify the main categories that emerged from the semi-structured interviews, rubrics and body reflection diaries.

3. Results

3.1. Quantitative results

To assess the actual effectiveness of the educational intervention based on Embodied Education, inclusion and sustainability, validated tests were administered to the experimental group and the control group before and after the intervention. The results are presented in the following tables.

Table 1: Quantitative results Experimental Group

	Before	After	Difference
Perceived Inclusion (Ianes & Cramerotti, 2014)	3.5/5	4.3/5	+0.8
Psychological well-being (WEMWBS, Tennant et al., 2007)	42/70	58/70	+16
Ecological Awareness (New Ecological Paradigm Scale, Dun- lap et al., 2000)	2.8/5	4.1/5	+1.3

The quantitative data reported in Table 1 show a significant improvement in all dimensions analysed after the implementation of the Eco-Body Lab project.

1. Perceived inclusion: The increase in the average score from 3.5 to 4.3 on a scale of 5 indicates that students have developed a greater perception of an inclusive school environment. This result can be attributed to the cooperative activities proposed, such as inclusive dance and physical theatre, which promoted positive interactions between students, breaking down communication and cultural barriers.

2. Psychological well-being: The 16-point improvement on the WEMWBS scale (from 42 to 58 out of 70) suggests a significant impact on students' emotions and psychophysical state. Involvement in activities based on Embodied Education, such as Body Mapping and mime, encouraged the expression of emotions and self-awareness, helping to reduce stress and increase self-esteem.

3. Ecological awareness: The average score on the New Ecological Paradigm Scale rose from 2.8 to 4.1 out of 5, indicating greater student engagement with sustainability issues. Experiential activities such as "Bodies that plant" and inclusive orienteering stimulated a deeper connection with nature, strengthening a sense of environmental responsibility.

Table 2: Quantitative results Control Group

	Before	After	Difference
Perceived Inclusion (Ianes & Cramerotti, 2014)	3.4/5	3.6/5	+0.2
Psychological well-being (WEMWBS, Tennant et al., 2007)	41/70	44/70	+3
Ecological Awareness (New Ecological Paradigm Scale, Dun- lap et al., 2000)	2.7/5	2.9/5	+0,2

The data show a significantly greater improvement in the experimental group than in the control group. These data confirm the significant positive impact of the approach adopted in the Eco-Body Lab project compared to traditional teaching methods used in the control group. In particular:

- Perceived inclusion: The experimental group recorded an increase of +0.8 points, compared to +0.2 in the control group, suggesting that physical and collaborative activities had a strong impact on the perception of inclusion.
- Psychological well-being: The increase of +16 points in the experimental group (compared to +3 in the control group) demonstrates the effectiveness of Embodied Education activities in promoting emotional and relational well-being.
- Ecological awareness: The improvement of +1.3 in the experimental group (compared to +0.2 in the control group) confirms the effectiveness of nature-based activities in promoting a sense of environmental responsibility.

In conclusion, the quantitative data support the effectiveness of the Eco-Body Lab project in improving students' psychological well-being, perception of inclusion and ecological awareness. These results suggest that integrating Embodied Education with sustainable and inclusive practices may represent an innovative teaching strategy for promoting a more equitable, participatory and globally-oriented school.

3.2. Qualitative results

To further investigate the impact of the intervention, semi-structured interviews were conducted with students and teachers, observation rubrics were used, and body reflection diaries were analysed.

Experimental Group:

1. Inclusion: Students reported greater collaboration and a reduction in communication barriers. One participant stated: 'During physical theatre, I learned to express myself without words, feeling part of the group.'
2. Well-being: Teachers noticed greater active participation and reduced stress in students, particularly those with SEN.
3. Ecological awareness: Students reported a greater connection with the environment, with expressions such as: 'Planting trees made me realise how connected we are to nature.'

Control Group:

1. Inclusion: The perception of inclusion remained almost unchanged, with neutral comments about the school environment.
2. Well-being: No significant change, with some students continuing to perceive school as a stressful place.
3. Environmental awareness: Limited impact on environmental habits, with little participation in environmental discussions.

The results demonstrate that the proposed teaching approach had a positive impact on inclusion, well-being and sustainability in the experimental group. Compared to the control group, the improvements were more pronounced, highlighting the effectiveness of Embodied Education in promoting more engaging and transformative learning. The integration of bodily and environmental practices proved to be a promising educational strategy for creating more inclusive and sustainable schools. The analysis of semi-structured interviews, body reflection diaries and observation rubrics highlighted numerous improvements only in participants belonging to the experimental group. For an in-depth evaluation, the transcripts were analysed thematically using NVivo software, identifying the main categories that emerged from the students' experience.

1. Empathy and collaboration: Body-based activities, such as inclusive dance and physical theatre, strengthened group dynamics and improved students' ability to understand others' emotions. As one participant reported: 'At first I was a bit sceptical, but then I realised that moving together with others made me feel part of the group. We learned to trust each other.' The reflection journals showed that 78% of students reported feeling more comfortable expressing emotions through their bodies and improving their communication skills. In addition, 65% reported that collaborative work improved their relationships with their peers.
2. Emotional engagement with nature: Activities such as "Bodies that plant" fostered a deeper connection with the environment. Ninety per cent of students said they wanted to continue caring for the tree they planted during the project. One teacher noted, 'It was incredible to see how the simple act of planting a tree evoked so much emotion and a sense of responsibility in the students. Some of them asked if they could plant more trees at home.' Analysis of the interviews revealed that physical interaction with nature increased ecological awareness and a sense of belonging to the community. 75% of students said they felt more aware of the importance of environmental sustainability.
3. Stress reduction and increased self-confidence: 75% of students reported greater confidence in their expressive abilities after the mime and body mapping activities. One student said: 'Before, I was embarrassed to speak in front of the class, but now I can express myself better even without words. I feel that my body can communicate more than I thought.' These results were confirmed by thematic analysis, which highlighted a reduction in social anxiety levels and an increase in personal confidence. In addition, 70% of students reported a perceived reduction in stress thanks to physical activity and body expression.
4. Inclusion and active participation: The embodied approach allowed for greater inclusion of students with SEN. The use of multisensory tools and the adaptation of activities ensured accessibility for all. One teacher observed: 'Children with SLD and neurodiversity participated actively, which is not always the case in other lessons. The physical activities removed many barriers.'

3.3. Thematic Analysis of Qualitative Data

The analysis conducted using NVivo identified the main themes emerging from the interviews and reflective diaries:

1. Inclusion (60%): greater participation of students with SEN and promotion of diversity.
2. Empathy and collaboration (30%): improvement in non-verbal communication and teamwork.
3. Connection with nature (25%): increased ecological awareness and sense of environmental responsibility.
4. Emotional well-being (20%): reduced stress, increased security and relaxation.
5. Body awareness (10%): improved perception of one's body as a means of expression.

The integration of Embodied Education, sustainability and inclusion has had a positive impact on students, promoting more engaging and transformative learning. The qualitative results

confirm the effectiveness of an educational approach based on bodily experience, suggesting new perspectives for a more inclusive and sustainable education.

4. Discussion

The analysis of the results obtained within the *Eco-Body Lab* project highlights the effectiveness of integrating Embodied Education, sustainability and inclusion in the context of lower secondary school. The quantitative and qualitative data collected, comparing the experimental group with the control group, clearly indicate that an educational approach based on bodily experience can have a positive impact on school inclusion, psychological well-being and environmental awareness among students.

1. Embodied Education and School Inclusion

The statistical results reveal a marked increase in the perception of inclusion among the students involved in the project. The experimental group recorded an increase in the average score from 3.5 to 4.3 on a scale of 5 according to the Questionnaire for the Assessment of the Inclusive Quality of the School System (Ianes & Cramerotti, 2014), while the control group showed a minimal increase of 0.2 points. This trend confirms the findings of Booth and Ainscow (2016) regarding the importance of inclusive and equitable educational environments. Physical activities such as inclusive dance and physical theatre played a central role in facilitating non-verbal expression and peer cooperation, helping to overcome obstacles related to linguistic or cognitive difficulties (McNeill, 2005). The interviews and observations carried out confirm the results that emerged: many students said they felt more confident and able to communicate emotions and moods through their bodies. As noted by Shapiro (2019), Embodied Education promotes the development of emotional and relational skills, which are fundamental for full participation in school.

2. Psychological

Wellbeing

According to data collected using the *Warwick-Edinburgh Mental Wellbeing Scale* (WEMWBS, Tennant et al., 2007), the experimental group showed an increase of 16 points in psychological wellbeing (from 42 to 58 out of 70), compared to an improvement of only 3 points in the control group. This result is consistent with Louv's research (2019), which indicates that outdoor activities and physical exercise can alleviate stress and improve self-esteem. Conscious bodily experiences, such as body mapping or multisensory trails, also increased body awareness, helping to reduce anxiety and insecurity (Sheets-Johnstone, 2010). The testimonials collected from students confirm this trend: many spoke of a decrease in school stress and an increased ability to manage emotions through movement. One teacher reported that students with learning difficulties appeared more relaxed and engaged, showing greater self-confidence during group activities.

3. Sustainability and Ecological Awareness

Another significant result concerns the growth of environmental awareness. The average score on the *New Ecological Paradigm Scale* (Dunlap et al., 2000) rose from 2.8 to 4.1 out of 5 for the experimental group, while for the control group the increase was minimal (+0.2). Activities such as "Bodies that Plant" and inclusive orienteering created opportunities to establish a direct and meaningful relationship with the natural environment, stimulating environmentally responsible behaviour. Chawla (2020) emphasises that physical contact with nature is crucial for the development of ecological awareness. The qualitative evidence collected confirms this dynamic: 90% of students expressed a desire to continue caring for the trees they planted, while 75% reported a greater sense of environmental responsibility. The interviews also revealed that the physical experience contributed to the development of a deep ecological

awareness. One participant said, “Touching the earth, planting a tree, feeling the wind on my skin made me realise how important it is to protect nature.” These observations reinforce Benyus' (2002) arguments about biomimicry as an educational tool capable of conveying ecological principles through the imitation of natural systems.

The experience of the *Eco-Body Lab* project suggests that adopting methodologies based on Embodied Education represents a promising approach to promoting a more inclusive, wellness-oriented and sustainability-focused school. With this in mind, there are plans to develop and validate an educational model inspired by the principles of Embodied Cognition, which values the body as an environment and tool for learning (Paloma, 2016). However, some operational challenges have emerged, such as the need for specific training for teaching staff and the adaptation of these practices to the school curricula currently in use (Fuchs & Fuchs, 2021). A further area of research concerns the analysis of the long-term effects of this approach. It will be essential to investigate how the observed benefits are maintained over time and whether these strategies can be extended to other school levels and educational contexts. Finally, the use of immersive technologies, such as virtual reality, could represent a new frontier for amplifying the impact of embodied experiences in learning (Gallagher, 2017). In summary, the project has highlighted how education that values the body and its relationship with the environment can have a positive impact on students' personal and social development, making a significant contribution to a more inclusive, participatory and globally-oriented school.

Conclusions

The results of this research confirm that the integration of Embodied Education, sustainability and school inclusion can represent an innovative teaching approach for building a more equitable, participatory and globally-oriented school. Both quantitative and qualitative analyses indicate that the intervention had significant positive effects on the psychological well-being, perception of inclusion and environmental awareness of the students involved.

The 0.8-point increase in the perception of school inclusion suggests that activities such as physical theatre and inclusive dance, based on movement and physical interaction, have fostered peer collaboration and reduced communication barriers. The 16-point increase in the Warwick-Edinburgh Mental Wellbeing Scale shows that physical activity helped improve students' self-awareness and expressive abilities, with positive effects on stress reduction and self-esteem. Ecological awareness also increased significantly (+1.3 points), thanks to immersive experiences in nature, such as inclusive orienteering and planting activities, which strengthened participants' sense of responsibility towards the environment. Body-mediated learning allowed for a more direct and deeper connection with the natural environment, demonstrating how interaction between education and the environment can enhance ecological awareness.

Three central themes emerged from the interviews and reflection diaries of the students: the strengthening of empathy and cooperation, the emotional impact of contact with nature, and stress reduction combined with greater self-confidence. Seventy-eight per cent of pupils said they felt more comfortable expressing emotions through body language, 90% expressed a desire to continue caring for the tree planted during the activities, and 75% reported an improvement in their confidence in communicating.

From a pedagogical point of view, these data confirm the value of Embodied Education as an effective tool for promoting transformative, experience-based learning. Physical activities not only facilitated conceptual understanding but also promoted a sense of belonging and inclusion among students with different experiences and backgrounds, helping to make the school a more accessible and equitable place.

The methodological approach adopted proved to be robust and replicable, laying the foundations for further applications in different educational contexts. Promoting a teaching model that recognises the body as a vehicle for knowledge, integrating the principles of sustainability and inclusion, can prove to be a useful strategy for combating phenomena such as early school leaving and improving the overall quality of education.

In conclusion, the Eco-Body Lab project has demonstrated that education focused on physicality and the relationship with the environment can produce concrete benefits in the psychophysical, social and ecological development of students. These results highlight the importance of systematically incorporating embodied practices into educational policies, promoting more active, inclusive and sustainable learning, in line with the objectives of the United Nations 2030 Agenda.

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