European Journal of Special Education Research
ISSN: 2501 - 2428
ISSN-L: 2501 - 2428
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejse.v10i3.5319 Volume 10 | Issue 3 | 2024

PLAYFUL ACTIVITIES FOR TEACHING SUSTAINABILITY IN PRIMARY SCHOOL THROUGH EDUCATION 5.0

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Abstract:
There has been ample debate about the necessity of departing from content-based educational models to pave the way for an education system that fosters the formation of students as critical citizens actively engaged in shaping society. This study aimed to develop a sequence of playful activities articulating sustainability concepts for primary school students within an Education 5.0 framework. The research was conducted in a public school in São Paulo State, Brazil. The results indicated that the proposed sequence of playful activities served as an effective tool for the teaching–learning of sustainability concepts and, more importantly, prompted reflections on the need for and relevance of socio-environmental awareness in daily life.

Keywords: Education 5.0, elementary education, playfulness, socioenvironmental awareness, sustainability

1. Introduction

The school environment is the major promoter of student learning in contemporary society. In our increasingly globalized world, it is imperative to acknowledge the impact of digital information and communication technologies (DICT) in educational settings. These technological resources encourage modern learning practices, and schools serve as the primary diffusers of teaching and learning processes (Muzira and Bondai, 2020). However, it is also important to consider some negative changes experienced by our contemporary society, such as the excessive consumption of goods and services and the resulting unbridled exploitation of natural resources, waste generation, environmental (air, water, and soil) pollution, and climate change, among others. Therefore, it is imperative to foster discussions on how to achieve technological development in a

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sustainable manner, without compromising the well-being of future generations (Silva, 2021).

Learning proposals have evolved concomitantly with digital technologies, embracing Education 5.0 as a cornerstone of human development. Consequently, there is a need to rethink school practices to achieve alignment with new forms of work, relationships, communication, and consumption. These practices should foster the development of citizens capable of engaging critically and ethically with societal issues, particularly concerning sustainable consumption (Silva *et al.*, 2022).

This study focuses on Education 5.0 and its importance in the teaching–learning process. Education 5.0 offers several advantages. However, its application requires that teachers effectively apply technological methodologies. Teachers need to familiarize themselves with technological resources and exploit their potential to the fullest, combining content and technology in a rational way. This approach enables students to acquire the necessary knowledge to tackle the challenges that arise throughout their educational journey. Education 5.0 is associated with a more humane learning process. It contributes to the development of social and emotional skills that help mitigate environmental impacts, preserving health and safety for a fairer world (Melo *et al.*, 2021). As described by Flôr *et al*. (2020), Education 5.0 is an educational ecosystem characterized by protagonism and innovation. It encompasses the following five dimensions: (i) technical skills that support the development of potential innovators, (ii) interpersonal skills, (iii) creative learning environments, (iv) shared and collaborative protagonism, and (v) socially responsible behavior based on acquired skills and abilities.

The term "sustainability" was used in the 1987 United Nations (UN) report to describe a development approach that addresses present needs without compromising the ability of future generations to meet their own needs. Achieving sustainable development requires a set of interrelated actions that encompass the environmental, political, social, and economic spheres of society; that is, it is a collective endeavor, rather than the responsibility of a single individual or government. Aligned with this perspective, education requires a broader focus on the transmission of concepts. The teaching–learning process should provide students with the ability to interpret the world, natural phenomena, and the associated impacts on the social context and the planet as a whole (Silva *et al.*, 2022).

In Brazil, the National Common Curriculum Base serves as a guiding tool for the development of teaching premises and essential skills. These guidelines state that the theme "Environment (Environmental Education)" should be approached in a transdisciplinary manner throughout the student's school life. Thus, the content must be integrated into the school's political–pedagogical project with the aim of promoting environmental conservation and sustainability by transforming our relationship with the environment (Brazil, 2018). In the Brazilian education system, socio-environmental education is divided into two axes, namely environmental education and education for consumption. This division facilitates guiding students toward critical reflections on environmental problems and potential solutions, including issues related to unrestrained consumption and its impact on natural resources (Brazil, 2018). Other laws and

guidelines that form the basis of Brazilian education also mandate the inclusion of socio-environmental education as part of the school curriculum, such as Law on Brazilian Education Guidelines and Bases and the National Curricular Parameters. However, in practice, socio-environmental education is limited to isolated and sporadic practices in most Brazilian schools, mostly taking place on commemorative dates. Lima and Pato (2021) argued that, while this type of initiative significantly contributes to integrating the socio-environmental theme into the school environment, it remains limited and superficial, hindering more profound critical reflections on the subject in the classroom.

In view of the foregoing, this study aimed to develop a sequence of playful activities for students attending the seventh grade of a public primary school in São Paulo State, Brazil. The proposed activities articulate sustainability concepts through investigative actions within an Education 5.0 framework.

2. Approach to Education 5.0

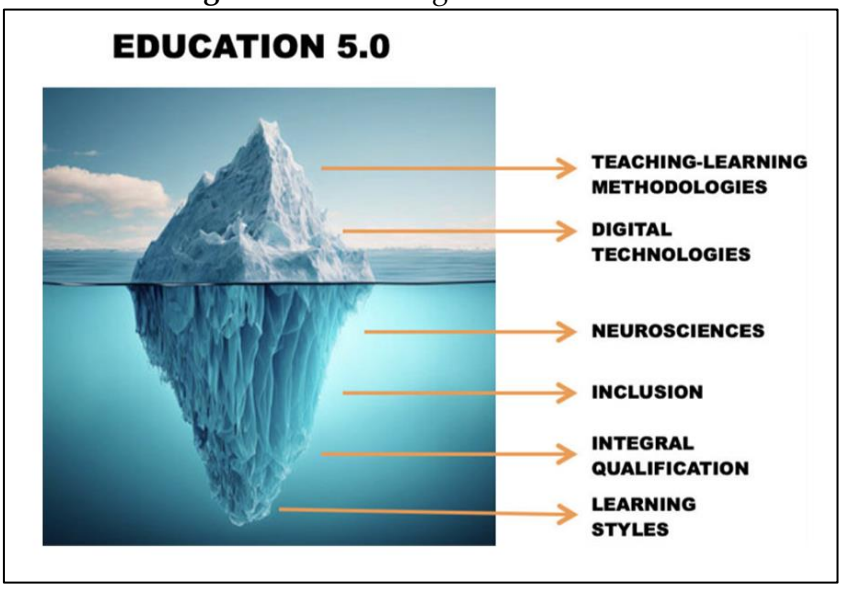
Education 5.0 is an evolution of Education 4.0. Originating in Japan, the concept refers to the use of technologies for the benefit of humans, with humans at the center of innovation and technological transformation. Thus, Education 5.0 is a curricular framework that meets the needs of students in the twenty-first century. It is based on artificial intelligence and digital technology to provide students with intelligent learning (Rahim, 2021).

Education 5.0 is characterized by skills and competencies. Competence is a combination of skills, knowledge, and attitudes, which are fundamental for good performance at work. Socio-emotional competencies can be characterized as soft skills. They represent an important qualitative pillar of human development that is crucial for personal and professional life and highly valued at work. The essence of socio-emotional competence is based on communication, problem-solving, emotion management, teamwork, diversity, empathy, and ethics.

Education 5.0 is a comprehensive educational approach that incorporates digital technologies and artificial intelligence into contexts where students are active, creative, critical, and reflective. It takes into account students' interests, difficulties, and potentials, aiming at developing skills necessary for living in the twenty-first century. Figure 1 depicts an analogy of Education 5.0 using an iceberg model. There is no hierarchy between visible and non-visible elements, as all are important in the educational context.

Figure 1 depicts the direct relationship between Education 5.0 and digital technologies. With the implementation of remote teaching, digital technologies have gained more space in the teaching–learning process, a positive aspect. However, in many situations, the use of digital technologies is limited to the transfer of school content. That is, these technologies are used solely to make contents available to students, not infrequently seen in a traditional context of reproduction.

Figure 1: Structuring of Education 5.0



Source: The authors (2024).

The reality is similar in face-to-face classes. Digital technologies are utilized in closed practices, in which the finality could be achieved with or without any other technology. According to Borba *et al.* (2015), such practices constitute a domesticated use of digital technologies. An example is the use of technology by the teacher to prepare a presentation, which is then reproduced by the student. This practice is quite common, but, although rich in technology, it does not enhance the teaching–learning process, which is the objective of using digital technologies.

Active methodologies, which were an essential part of Education 4.0, continue to occupy a prominent place in Education 5.0. According to Moran (2018), active methodologies are teaching strategies focused on the effective participation of students in the construction of the various stages of the learning process. The traditional model, where a teacher stands at the front of the room to transmit knowledge while students sit individually, one behind the other, to listen and repeat, is altered (Ferrarini *et al*., 2019). This understanding presupposes learning in an active way, which involves the mental attitude of seeking, researching, reflecting, relating, processing, understanding, thinking, elaborating, and articulating what has been learned. In line with this view, van de Walle (2009) stated that learning is an individual process, different for each student, related to their active effort and degree of involvement. Currently, students belong to a generation that exhibits diverse ways of organizing, expressing themselves, and relating. They require teachers and school spaces that accommodate these differences, stimulating their development and respecting their individualities (Welter *et al*., 2020).

The use of digital technologies is a continuous process in society, driven by the challenges inherent to the COVID-19 pandemic. It is important that students use technologies in a healthy and productive way, aiming toward the good of all in a complex and unequal society. This implies the formation of citizens to live in harmony, being ethical and responsible, using technologies with wisdom and humanity, thereby

contributing to a more inclusive, ethical, productive society, where rights are guaranteed and humanity is respected (Felcher & Folmer, 2021b).

3. Material and Methods

The research adopted a case study approach (Prodanov and Freitas, 2013). Two seventh-grade classes from a public primary school participated in the activities, totaling 45 students. A qualitative approach was adopted to analyze a sequence of activities to articulate sustainability concepts from the perspective of Education 5.0 (Gil, 2018). The sequence of ludic activities was carried out over 12 weeks. Recycled materials such as various types of papers, sunflower seeds, Chromebooks, and the school's internet network were used. A meeting was held with the school management team to present the study plan and obtain consent for the execution of the proposed schedule of activities.

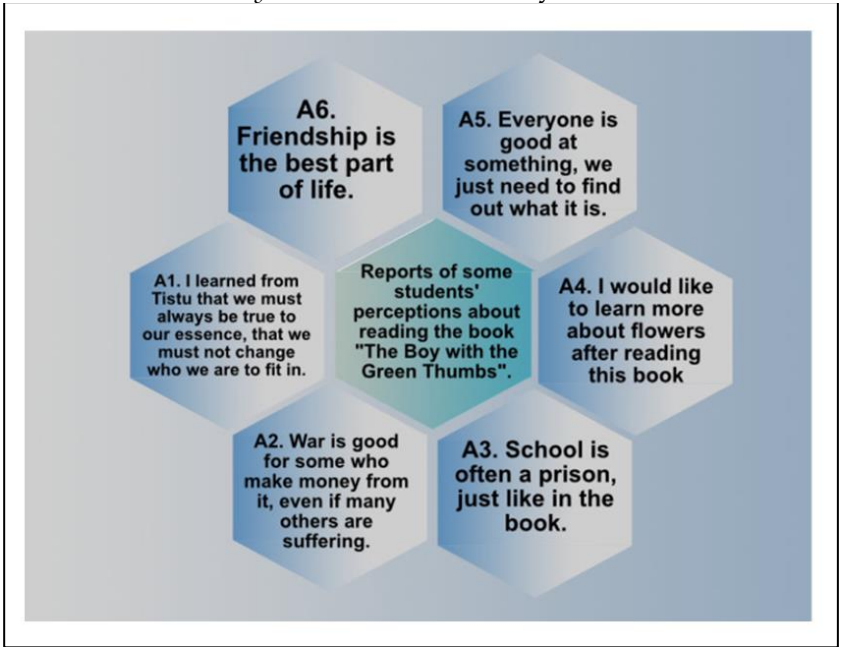
The didactic portion of the project comprised a series of playful activities, as described below.

1) Shared reading of the book *Tistou, The Boy with Green Thumbs* by Maurice Druon. The book tells the story of Tistou, a boy who does not fit in at school. After being placed in a new education system, he discovers that he has a hidden gift: everything he touches turns into flowers. The narrative facilitates discussions on various topics, such as socio-environmental awareness and socio-emotional skills.
2) Brainstorming session to assess students' previous knowledge using the Mentimeter app. Mentimeter anonymously collects data in real time, supporting data analysis and discussion, among other possibilities [19].
3) Creation of a virtual presentation on Brazilian biomes entitled "Change the world with a touch." Students are tasked with researching native species and curiosities about the Amazon, Cerrado, Caatinga, Atlantic Forest, Pantanal, and Pampa and creating a virtual presentation using Google Sites.
4) Seed paper workshop. Students use discarded school papers and sunflower seeds to craft recycled seed papers.
5) Workshops for creating virtual presentations showcasing the project, exhibition of presentations, and distribution of recycled seed papers to the school community.

4. Results and Discussion

Initially, the teacher held a conversation with students about the work to be undertaken, its stages, and objectives. Subsequently, shared reading of the book *Tistou, The Boy with Green Thumb*s by Maurice Druon was carried out. The book was chosen as part of the school's reading program and was to be worked on in all subjects at some point during the school year. A chapter of the book was read at the beginning of each class. Then, a brief discussion about the content was held, focusing on socio-environmental and socio-emotional aspects. Figure 2 presents transcripts of the reports of some students.

Figure 2: Students' perceptions about the book *Tistou, The Boy with Green Thumb*s by Maurice Druon



After this stage, a brief assessment of students' prior knowledge of sustainability was carried out through brainstorming. According to Buchele *et al*. (2017), brainstorming is a method of generating spontaneous ideas within a group of people. With this activity, it was possible to record students' initial perceptions about environmental protection, using the question "Why should we preserve the environment?" Table 1 lists the responses of students during the classroom intervention regarding the importance of environmental preservation.

Table 1: Students' responses during brainstorming to the question "Why do we need to preserve the environment?"

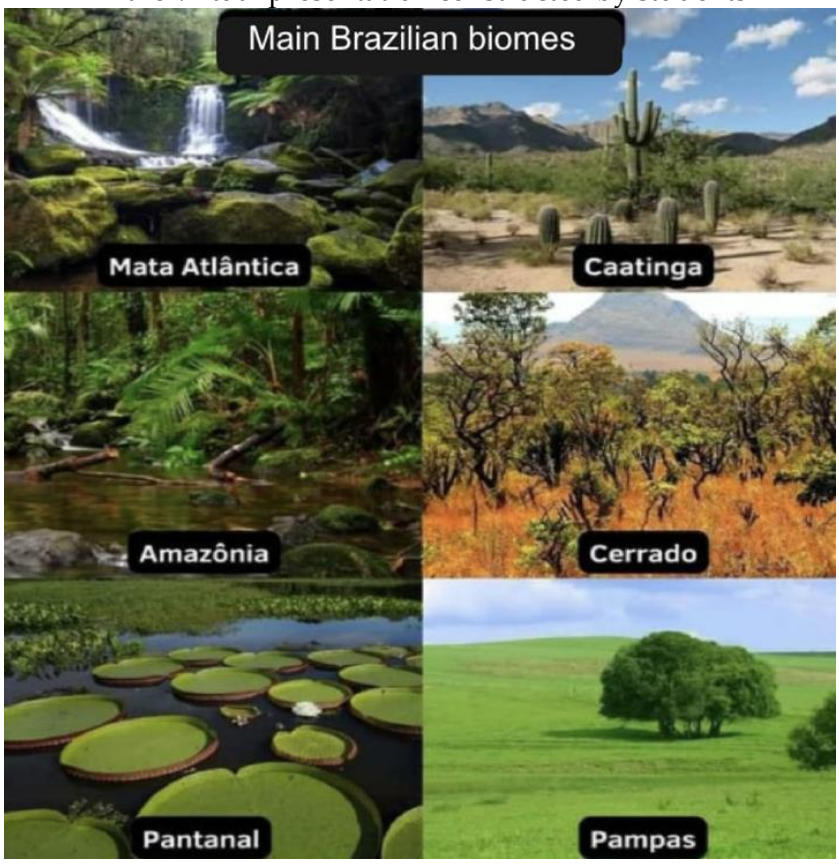
Student responses		
For the trees	Global warming	For future generations
For people not to die	The Indigenous peoples	Not cause fires
Because garbage is bad	Nature gives oxygen	Trees
To not pollute	We must recycle	It is important
Natural resources	Because of the food	The trees
Because it gives us food	Not run out of oxygen	Because of the trees
Because nature is beautiful	We take away our food	We need to live
Because nature is good	To have balance	Nature has animals
To protect health	Because it is our home	So that animals do not die
For people to survive	The animals	For water
To not cause pollution	Because of the car	Because of food
For the people who live there	To not have problems	Animals
Nature gives food	There is no other Earth	The water
To not have global warming	Because trees photosynthesize	

A large number of students demonstrated having prior knowledge on the subject; however, it was noted that such knowledge was superficial and often based on common sense. Environmental preservation was associated with survival, tree species, and pollution. Thus, students' concepts about environmental preservation were insipient, necessitating more exposure to related subjects for a comprehensive understanding of this relevant topic.

The next stage consisted of the collaborative construction of a virtual presentation on Brazilian biomes, namely the Amazon, Cerrado, Caatinga, Atlantic Forest, Pantanal, and Pampa. The aim was to build a garden for each biome, relating to the theme of the book. The teacher divided classes into groups, considering the potentialities and difficulties of each student, so that they could interact, share, and socialize with each other. Each group was responsible for researching, selecting some native species and curiosities about the biome, and relating the information to the book or a socio-emotional aspect deemed relevant in the activities.

At this stage, many students asked for help, given that they were not familiar with technological aspects, such as searching for reliable sources and setting up the website. Figures 3 and 4 depict some of the work developed by students during class.

Figure 3: Proposal of the Amazon Garden (based on the image) in the virtual presentation constructed by students



Source: https://florestamaisamazonia.org.br

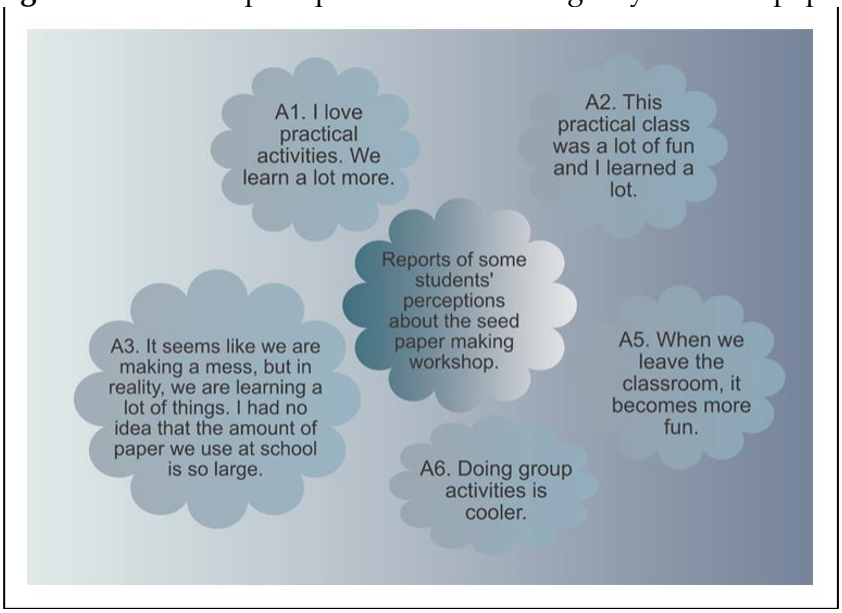
Figure 4: Proposal of native species in the virtual presentation constructed by students

Source: https://www.legadoverde.com.br

It became evident the need to conduct activities to help students develop their autonomy, creativity, and critical sense and ensure that they have basic knowledge about technology use. Although educational legislation underscores the need for and importance of such practices, it is evident that many young people, inserted in the digital world through social networks, have little mastery over digital tools, not having knowledge of how to search for reliable information.

The penultimate stage consisted of a workshop for the production of recycled seed paper. The students collected discarded papers at the school for one week and then followed a guide on how to make recycled seed paper, handed out by the teacher. Sunflower seeds were used because of the plant's symbolism of resilience and hope. Figure 5 depicts transcripts of students' opinions about the activity.

Figure 5: Students' perceptions about making recycled seed paper



In the last stage, students exhibited their presentation to the school community and distributed the recycled seed papers. This activity represented a festive moment of integration between the school and families. This stage was crucial for students' learning, according to Education 5.0, as it allowed them to develop socio-emotional skills and competencies related to communication, emotion management, and self-esteem. The workshop translated into a moment of learning for students, families, and the entire school community. It also promoted social integration of the school and parents and stimulated students' self-esteem, reducing inequalities and ensuring the right to learn.

5. Conclusion

During the development of activities, there were some unforeseen events related to the organizational structure and students' lack of familiarity with technological equipment. The proposed activities require intense mobilization within the school, which might hinder the execution and motivation for this type of activity by school managers and teachers. However, the dynamism and organization of the didactic sequence, as well as the involvement of the work with practical and playful activities, allowed students to overcome adverse situations. It can be concluded that the proposed playful activities stimulate students to learn about the topic. The results may support the promotion of learning within the perspective of Education 5.0. This educational proposal also allowed working on socio-emotional skills and further developing concepts about the studied topic.

The current study can serve as a foundation for future initiatives aimed at enhancing the quality of education on sustainability and information technology in primary education. Future studies should focus on the development and implementation of playful activities within the Education 5.0 framework, centered on sustainability themes combined with other curriculum subjects.

Conflict of Interest Statement

The authors declare no conflicts of interest.

Acknowledgements

The authors thank the Graduate Program in Science Educational Projects (PPGPE) at the Lorena School of Engineering, University of São Paulo, for the opportunity to conduct this study.

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