PRÁTICAS EDUCATIVAS, MEMÓRIAS E ORALIDADES

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Impacts of excessive use of technologies in Education

ARTICLE

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Abstract
The growing use of technology in schools is something that concerns education bodies and educators. According to the Program for International Student Assessment (PISA), the percentage of distracted Brazilian students reaches 80% (Brazil, 2022). Studies in the area of mental health, such as Andrade (2023) and Cereja (2018), associate the excessive use of technologies with the emergence and worsening of anxious symptoms. In this context, this article aims to address learning problems associated with the excessive use of technologies in education. The advantages of technology in education are presented and the negative impacts of using too much electronic devices and digital tools on cognitive skills, students' mental health and classroom dynamics are discussed. It is expected to contribute to promoting a more conscious and balanced use of technologies in educational environments.
Keywords: Learning. Information and Communication Technology. Mental Health.

Impactos do Uso Excessivo de Tecnologias na Educação

Resumo
O crescente uso de tecnologia nas escolas é algo que preocupa os órgãos responsáveis pela educação e educadores. De acordo com o Programme for International Student Assessment (PISA), programa Internacional de Avaliação de Estudantes, o percentual de estudantes brasileiros distraídos chega a 80% (Brasil, 2022). Estudos na área da saúde mental, como os de Andrade (2023) e Cereja (2018), associam o uso demasiado das tecnologias ao surgimento e agravamento de sintomas ansiosos. Neste contexto, este trabalho tem por objetivo abordar os problemas de aprendizagem associados ao uso excessivo de tecnologias na educação. São apresentadas as vantagens da tecnologia na educação e discutidos os impactos negativos do uso demasiado de dispositivos eletrônicos e ferramentas digitais nas habilidades cognitivas, na saúde mental dos estudantes e na dinâmica das salas de aula. Espera-se contribuir para a promoção do uso mais consciente e equilibrado das tecnologias em ambientes educacionais.
Palavras-chave: Aprendizagem. Tecnologia da Informação e Comunicação. Saúde Mental.

1 Introduction

The growing adoption of technologies in education indicates a global trend towards integrating digital innovation into the educational environment. This phenomenon is driven by a number of factors that recognize the potential of technologies to transform the way we teach and learn.

Technology in education promotes accessibility through online platforms and distance learning courses. Digital materials enable students to access quality content regardless of their geographical location. Technology enables the personalization of learning, in which teaching is adapted to the individual needs of students. Adaptive learning tools use algorithms to personalize the pace and style of teaching, providing a more effective and personalized learning experience. The use of interactive technologies can also provide greater student engagement, such as educational games, virtual reality and simulations, making the learning process more engaging. This helps maintain student interest and promotes a more practical and applied approach to teaching. Collaboration tools facilitate interaction between students and teachers in different parts of the world. This promotes the exchange of knowledge, perspectives and cultures, enriching the educational experience.

All these factors show how the adoption of technologies in education is not only a response to modern demands, but also an opportunity to redefine and improve the educational experience as a whole. However, a study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) questions the compulsory use of digital resources in the classroom. According to Unesco (2023), although technological tools help in education, the cost of equal access to devices, apps and the internet is very high, which makes social inequality even more evident. Another point highlighted by the study is that technology products evolve so quickly, being changed on average every 36 months, which makes it difficult to assess the impact on learning.

In this context, the aim of this work is to address the learning problems associated with the excessive use of technology in education and, in this way, to reflect on how the

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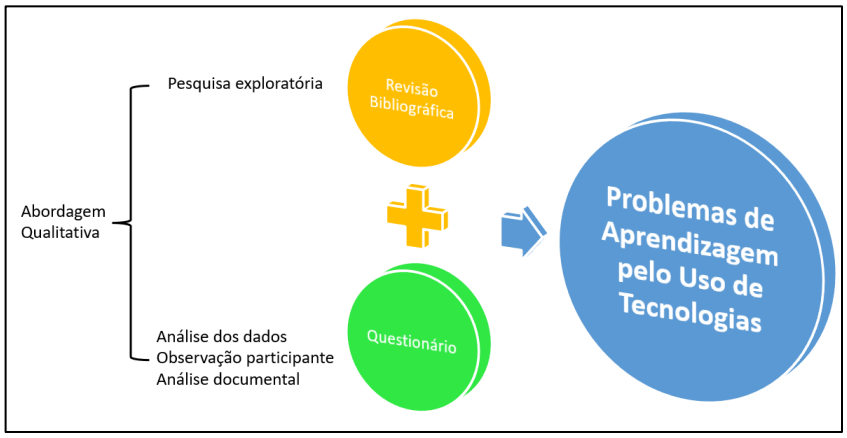
intensive use of platforms and devices can have a negative impact on education and student learning. Faced with the inevitable advance of technology in education, it is hoped to contribute to the issue of coexistence and interaction between students and educators when mediated by technologies, without these compromising their individual capacities.

2 Methodology

This study was carried out by means of a literature review using relevant sources. The research can be classified as exploratory, with a predominantly qualitative approach, and was based on a questionnaire applied to an undergraduate class. The questionnaire data was analyzed using sources of evidence such as participant observation and document analysis, as shown in Figure 1.

Figure 1 – Research Method



Source: Authors

The theoretical framework of this work includes studies by authors who highlight the advantages of technologies in education, as well as the impacts of inappropriate use, as shown in Table 1.

Table 1 – Opportunities and challenges of technology in education

Technologies in education	Authors
Advantages	Lobo (2015); Souza (2021); Brasil (2023); Bacich (2015); Tori (2017); World Economic Forum (2023).
Impacts of overuse on learning	Andrade *et al.* (2023), Cereja (2018), Younes *et al* (2016); Hooks (2021); Nguyen *et al.* (2022); Brasil (2022); Unesco (2023).

Source: Authors

The questionnaire is a research method widely used in various study contexts. According to Gil (2022), this technique aims to find out about opinions, beliefs, feelings, interests, expectations and situations experienced. Thus, in order to better understand the student's perspective on the use of technology in the academic environment, an 11-question questionnaire was drawn up and applied to an undergraduate technology course class in the second semester of 2023. A total of 39 responses were obtained and the structure of the questionnaire can be seen in Table 2.

Table 2 - Structure of the Survey Questionnaire

Nº	Question	Answer option
1	How old are you?	• Under 18 • 18-21 years • 22-25 years • 26 years and over
2	Which educational technology applications or platforms do you use for your studies?	• Google • Pacote Office • BlackBoard • Teams • Moodle • ChatGPT • Others
3	On a scale of 1 to 5, how often do you use electronic devices (e.g. smartphones, tablets, computers) for learning or study purposes? (1 being I don't use them at all and 5 being I always use them)	Scale from 1 to 5
4	Do you believe that excessive use of technology in education can harm your learning?	Yes/No
5	What are the main challenges you face when using technology in education?	• I'm easily distracted • I spend more time online • I stop interacting in person • I stop paying attention in class • Other

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6	Do you think technology in education improves or hinders your concentration?	• I think it improves • I think it hinders • Indifferent • Other
7	On a scale of 1 to 5, do you feel that the use of technology in education affects your ability to communicate effectively with your classmates and teachers? (1 being totally affected and 5 being not affected)	Scale from 1 to 5
8	How do you balance the use of technology in education with other offline activities?	• Reading books • With crafts • With sports activities • Other
9	Do you believe that technology in education is essential for learning today, or could it be reduced without damaging the quality of education?	• I believe it's not essential • I believe it is essential and does not harm • I believe it is essential, but could be reduced • I don't know
10	Have you ever sought help or guidance to deal with learning problems related to the excessive use of technology in education?	Yes/No
11	What suggestions do you have for improving the integration of technology in education, while maintaining the right balance between online and offline?	Dissertation

Source: Authors

3 Advantages of educational technologies

For Lobo (2015), the use of technology as an educational tool is a fact; the question to be debated is how to use these new technologies efficiently and profitably. For this author, the use of these tools does not guarantee success, but when used well, they can greatly assist the learning process. Souza (2021) highlights connectivist assumptions as an alternative for improving cognitive skills through the use of technological resources, perceiving networked learning as a training proposal for today's students. In this way, the adoption of technology in education offers advantages that can positively transform the teaching and learning process.

Digital accessibility is one of the main advantages that technology brings to education. According to the Ministry of Management and Innovation in Services, digital accessibility is the elimination of barriers in Internet systems, which must be designed so

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that all people can perceive, understand, navigate and interact effectively with the pages (Brazil, 2023). This concept, applied to education, refers to ensuring that all people, regardless of their physical or cognitive abilities, have equal access to online educational resources and digital technologies. This is a fundamental factor in promoting inclusion and providing equitable learning opportunities for all students.

Computer resources make it possible to tailor content to the needs of students, which represents a significant advantage in the learning process. According to Bacich (2015), through the personalization of teaching, learning does not necessarily have to happen in a linear way, but can occur in parallel, according to the needs and aspirations of those who learn.

New technologies have made significant contributions to making teaching more interactive and attractive. Tori (2017) points out that interactive technologies, such as virtual and augmented reality resources, can increase students' sense of closeness, which leads to greater engagement in their studies.

The internet, combined with digital systems and resources, enables students and teachers anywhere in the world to create collaborative groups capable of transmitting information, exchanging experiences and working together on a study. The *Wiki* resource, for example, makes it possible to add and edit a collection of web pages and can be developed collaboratively, where everyone can edit it, or individually, where each person will have their own Wiki to edit.

By becoming part of the school routine, technological resources help prepare students for the job market. According to the World Economic Forum, in its report "The Future of Jobs 2023", most emerging professions are driven by technology (World Economic Forum, 2023). In this way, the importance of technology in education does not refer to specific areas such as exact sciences, humanities or biology, but becomes transversal between any field of study.

There are many advantages that digital tools bring to the learning process. When we think of pedagogical innovation, we refer to new technologies that offer new ways of

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communicating and relating to information. Table 3 consolidates the main advantages of the educational technologies mentioned.

Table 3 - Advantages of educational technologies

Advantages	Descrição
Digital Accessibility	Technology allows access to a variety of online educational resources, giving students the opportunity to learn with high-quality materials, regardless of their geographical location and physical or cognitive abilities.
Personalization of Learning	Adaptive learning tools and online platforms allow the personalization of educational content, adjusting to the individual needs of each student. This promotes more effective, student-centered learning.
Student Engagement	Interactive technologies such as educational games, virtual reality and simulations make the learning process more engaging. This helps to maintain students' interest, increasing their motivation to learn.
Global Collaboration	Virtual platforms and collaborative tools facilitate interaction between students and teachers, promoting collaboration on projects and discussions. This contributes to the development of social and teamwork skills.
Preparation for the Job Market	Integrating technologies into education prepares students for the job market, where digital skills are increasingly valued. This includes developing competencies relevant to the demands of the digital economy.
Pedagogical Innovation	Technology not only replicates traditional teaching methods, but also drives pedagogical innovation. Teachers have been exploring new approaches, such as flipped classrooms, project-based learning and online assessments, to better meet the needs of contemporary students.

Source: Authors

All these factors demonstrate how the adoption of technologies in education is not only a response to modern demands, but also an opportunity to redefine and improve the educational experience as a whole. However, it is essential that the use of digital tools has a pedagogical purpose and seeks to ensure that implementation is carried out in an ethical and sustainable manner.

4 Impacts of excessive use of technology on learning

The use of digital devices in educational contexts is widespread; however, their excessive use can compromise both the physical and mental health of students. A survey

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of university students and graduate professionals revealed that internet dependency was more than double among university students. In addition, it was found that 40% of students and 30% of graduates admitted to using the internet excessively, negatively affecting their daily activities. The study also indicated that internet addiction may be associated with the emergence and worsening of anxiety symptoms (Andrade *et al.*, 2023).

According to Cereja (2018), one hypothesis for the appearance of anxiety-related symptoms is that the excessive need for technology can intensify the feeling of helplessness, triggering or exacerbating the feeling of anxiety in those who use it frequently. The author related this dependence to the amount of highly stimulating content, which can generate a feeling of inability to assimilate all these stimuli.

The definition of what constitutes Internet Addiction (IAD) can vary depending on the symptoms one is trying to identify. As pointed out by Younes *et al*. (2016), the terms "problematic Internet use", "pathological Internet use" and "Internet addiction" are often used interchangeably in relation to IAD. According to studies, internet addiction is mainly characterized by the risk associated with abstinence from use, manifesting symptoms such as low planning capacity, tolerance, worry, compromised control and excessive time online.

These symptoms can have negative implications, especially when we consider university students, who face various demands related to educational activities that require productivity, focus and concentration. In this context, internet addiction can represent an additional challenge, compromising academic performance and the ability to meet educational demands effectively.

5 Results and Discussion

The use of technology in the classroom has the function of challenging and changing the way teachers and students think about pedagogical practice in relation to the teaching-learning process. This relationship has to do with the liberating practice of knowledge in the classroom, enabling the student to engage in the ability to understand the content. The teacher's role is to coordinate the technological means in the classroom as a

tool in the socio-emotional development of students and an integration of learning with technologies.

For Hooks (2021), the classroom should be an environment to encourage students to think, question, confront and exchange knowledge with teachers, a place of dialog between teacher and student. In this sense, the use of technology in the classroom makes learning more practical and encourages students to engage with their creativity. However, it has been observed that when there is no assertive targeting of technology in relation to the teaching program, a learning deficit can occur. In view of this concern, we sought to find out what the students' perception was.

A questionnaire was administered in class to an undergraduate technology course. Of the 39 respondents, 24 were aged between 18 and 21; 10 were aged between 22 and 25, and 5 students were over 26.

Among the tools most used by these students were Google's search engine; Blackboard's Virtual Learning Environment (VLE), which is the institutional platform of the Higher Education Institution (HEI); Microsoft's office suite and ChatGPT, an Artificial Intelligence (AI) program developed by OpenIA. It is interesting to note that 67% of students said they used ChatGPT. According to Nguyen *et al*. (2022), when using the resources of an AI system, it is necessary to beware of misleading information, to avoid compromising users' autonomy in developing independent thoughts and negatively affecting users' emotions and social well-being. For these authors, the complexity of AI requires a holistic and applicable set of ethical principles in the education sector.

Regarding the frequency of use of the tools, on a scale of 1 to 5, 79% indicated the highest level (5), 18% indicated level 4, and only one student reported that they use electronic devices little for study purposes, as shown in Graph 1. It is noteworthy that the majority of students (62%) believe that excessive use of technology in education does not harm learning. It is therefore important to promote the conscious and balanced use of technology. This concern was also pointed out by the International Student Assessment

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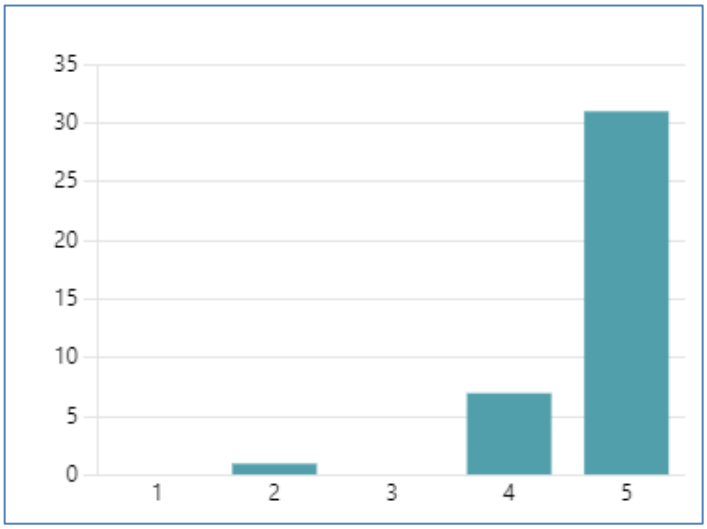
Program (PISA)[1], which reported that students who spent five to seven hours a day using smartphones and other devices scored lower on the tests than those who used these devices for just one hour a day (Brazil, 2022).

Graph 1 - Frequency of technology use



Source: Authors

Pisa 2022 found that 65% of the students interviewed admitted that they had been distracted in math classes by the use of cell phones and other devices. In Brazil, the percentage of distracted students reached 80%, as in other countries such as Argentina, Canada, Chile, Finland and New Zealand (Brazil, 2022). In the classroom survey applied in this study, students were asked about the main challenges faced when using technology in education, with multiple choice answer options (Graph 2). Of the 39 students, 24 said they were easily distracted by technological resources; 18 said they spent more time online;

[1] The Programme for International Student Assessment (Pisa) is an international comparative study carried out every three years by the Organization for Economic Cooperation and Development (OECD). Pisa provides information on the performance of students aged 15, the age at which compulsory basic education is supposed to be completed in most countries, linking data on their backgrounds and attitudes towards learning, and the main factors that shape their learning, both in and out of school (Brazil, 2022).

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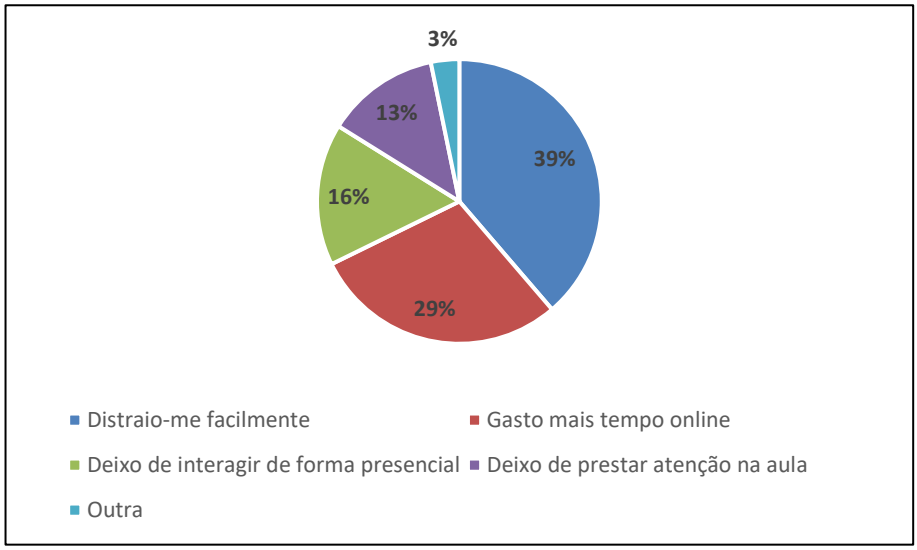
10 said they stopped interacting face-to-face; 8 said they stopped paying attention in class and only 2 said that technology was not a challenge.

Graph 2 - Challenges of using technology



Source: Authors

Although the majority of students perceive that they use technological resources a lot and consider that this interferes with attention in the classroom, when asked if excessive use of technology can harm learning, the majority (62%) said that it does not. Most students (56%) also think that the use of technology in education improves concentration, as can be seen in Graph 3.

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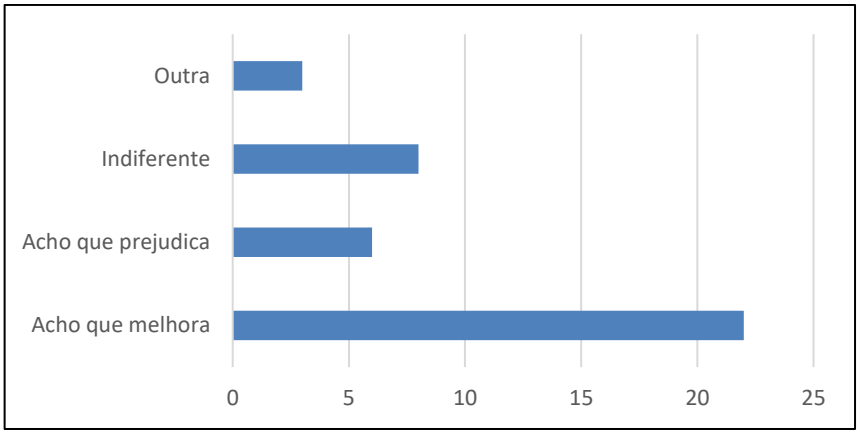
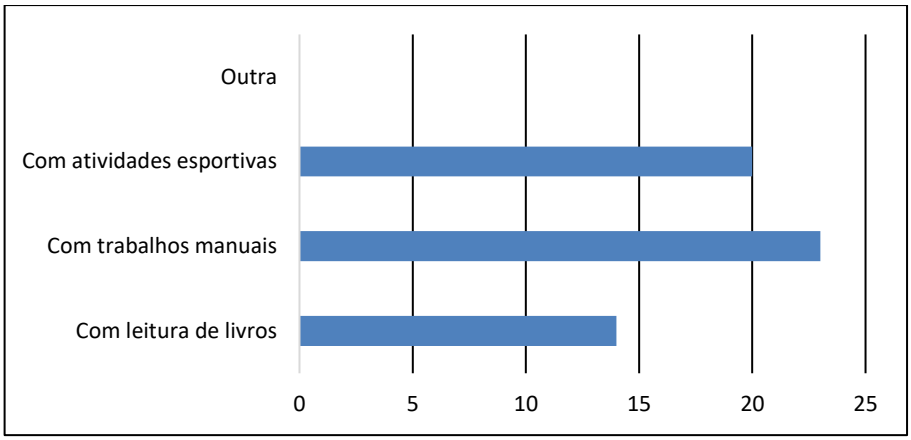
Graph 3 - Technology in education: does it improve or harm?



Source: Authors

Regarding the use of technology in education in relation to communication, student sentiment is favorable. On a scale of 1 to 5, the average was 3.14, indicating that students feel that the use of technology in education positively affects their ability to communicate effectively with their classmates and teachers. The survey also looked at whether students balance the use of technology in education with other offline activities, such as reading books, crafts and sports. The result was positive, as can be seen in Graph 4.

Graph 4 - Use of technology and other activities



Source: Authors

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The quality of education doesn't just depend on whether or not there is technology, but when applied in a balanced way it can significantly enrich the educational experience. This perception is also reflected in the class questioned, as the majority believe that the use of technology in education is essential.

However, according to Unesco (2023), it is necessary to be aware of the negative impacts on students' physical and mental well-being of overusing digital resources in the academic routine. In this study, 5 students said they had sought help to deal with learning problems related to the excessive use of technology in education. Thus, although technology is a valuable tool, its implementation must be planned and adapted to the specific needs of each educational context.

In view of the above, educators need to take action to prevent the misuse of technology in the classroom, such as:

- Planning of activities in accordance with the Course Pedagogical Project (PPC).
- Definition of clear rules on the use of technology in the classroom, highlighting when and how devices should be used.
- Encouraging face-to-face interaction through group activities, class discussions and collaborative projects.
- Use teaching methods that do not rely exclusively on technology, such as lectures, debates and crafts, to offer a balanced educational experience.
- Promote actions to develop an ethical awareness of the use of technology.

These are some suggestions that can be applied to encourage a more balanced learning environment, where technology doesn't dominate and thus ensures that students play a leading role.

6 Conclusions

This work sought to consider the use of technology in the learning process. Among the advantages that technology provides in the educational field, it was seen that accessibility is the highlight. Other equally relevant factors include the personalization of

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learning, greater student engagement, global collaboration, preparation for the job market, as well as representing a significant contribution to pedagogical innovation. However, research has also confirmed that overuse can compromise both the physical and mental health of students.

In view of this survey, it can be concluded that, when incorporating technologies into the classroom, it is necessary to align them with academic planning, in other words, to have a pedagogical purpose for their use, in order to really favor the student in their pedagogical process, without causing any harm. It is important to promote initiatives aimed at the conscious and balanced use of technology in the classroom. In addition, it is essential to encourage critical and reflective thinking in relation to the use of technologies, and educators need to set limits on the use of devices in the classroom.

In order to understand students' perceptions of this issue, a questionnaire was administered to just one class of students. Based on the results achieved, future work aims to refine the questions and expand the survey to include a larger number of students, in order to validate the actions suggested to curb the inappropriate use of technology.

In this way, we hope to contribute to studies on the use of technology in the classroom, promoting a sustainable learning environment.

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