

Improving student wellbeing and learning through serious games and active breaks

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Abstract

In a context where education requires innovative approaches to maintain students' attention and increase their engagement, active breaks and Serious Games emerge as effective tools to improve well-being and learning. Active breaks, short physical or cognitive intervals, reduce mental fatigue and increase concentration (Pastor-Vicedo et al., 2024; Masini et al., 2023). Serious Games, on the other hand, promote the acquisition of academic and socio-emotional skills through interactive and engaging learning (Papoutsis, Drigas & Skianis, 2022; Mulcahy & Zainuddin, 2021). Recent studies show that both tools improve motivation, reduce learning anxiety and enhance metacognitive skills (Papanastasiou & Drigas, 2017; Flogie et al., 2020). The integration of these tools into teaching can transform the entire educational experience, making it more dynamic and effective. This study explores their impact on teaching, highlighting how to optimize the learning process and student well-being.

Keywords: Active breaks; Serious Games; Student Well-being; Cognitive engagement; Learning anxiety; Metacognitive skills

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Introduction

In today's educational landscape, learning is no longer based on the simple transmission of information but requires innovative approaches to maintain student engagement. An effective strategy is the use of active breaks, short intervals that are not necessarily linked to the content of the lessons. These breaks improve the cognitive abilities and general well-being of teachers and students. The literature highlights how active breaks can relieve mental fatigue,

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increase concentration and stimulate creativity in student (Pastor-Vicedo et al., 2024; Masini et al., 2023; Infantes-Paniagua et al., 2021)

A systematic review by Esposito et al. (2024) explored different interventions aimed at improving students' well-being also through digital tools. This study revealed that active breaks can improve both psychological health and academic performance.

Furthermore, Cavioni, Conte, and Ornaghi (2024) investigated the impact of active breaks within schools and highlighted how they significantly reduce stress while increasing motivation for both teachers and students.

Active breaks not only improve learning skills, but also support students' emotional well-being, a topic that is becoming increasingly central to education.

Another emerging tool in the educational field aimed at enhancing student well-being is the use of Serious Games. These games, created for educational or therapeutic purposes, provide an interactive learning experience that engages students and relieves the stress often associated with traditional teaching methods.

Serious Games not only help in improving academic skills but also aid in developing socio-emotional competencies. For instance, a literature review by Papoutsis, Drigas, and Skianis (2022) showed that Serious Games can enhance emotional intelligence and support students' psychological well-being.

Research by Arias-Calderón, Castro, and Gayol (2022) indicates that integrating Serious Games into education can increase student engagement and promote a sense of well-being, especially during distance learning.

Additionally, a study by Mulcahy and Zainuddin (2021) examined how gamification and Serious Games can boost student well-being, suggesting that integrating these technologies into educational settings can lead to increased satisfaction and motivation to learn.

Thus, implementing Serious Games can be an effective approach to lessen cognitive load and enhance student well-being, transforming learning into a more engaging and fulfilling experience.

This paper will explore the impact of active breaks and Serious Games in education, focusing on their positive effects on student well-being and aiming to outline the most effective strategies for enhancing learning quality through innovative techniques.

Literature review

Student wellbeing plays a critical role in their academic success and overall learning experience. A state of wellbeing that encompasses not only physical

wellbeing, but also emotional and social wellbeing can lead to greater motivation and engagement. Research shows that students who feel emotionally supported and mentally balanced are more likely to develop resilience, sustain their attention and process new information effectively (OECD, 2015). In addition, strategies to promote wellbeing, such as introducing mindfulness practices and social interaction into learning environments, can reduce stress, improve mood and promote a more fertile atmosphere for knowledge retention and skill acquisition.

In this context, serious games and active breaks are proving to be powerful educational tools that not only facilitate the development of soft skills, but also contribute to students' emotional and physical well-being.

Serious games are referred to as entertaining tools with a purpose of education, where players cultivate their knowledge and practice their skills through overcoming numerous hindrances during gaming. Players' performances are scored during the gaming process (Juan et al., 2017).

If players succeed in overcoming a challenge, they will receive rewards such as points, progress, and improved skills. Educational aspects can be integrated into gameplay, allowing players to subconsciously absorb knowledge while playing. One reason why serious games are effective in education may be their impact on learners' moods. Gaming, as a form of entertainment, significantly influences emotions such as sadness, happiness, and anger.

When a serious game is effective, it is noticeable because it creates a positive mood and encourages players to continue playing, leading to greater interest in the gameplay, as well as better academic performance.

Kiili (2010) identified several patterns and categorized them into different groups. Below is a summary of how these categories address key educational aspects that game designers should consider when creating serious games.

- Integration patterns: These describe solutions that align game elements with learning objectives in a meaningful pedagogical way. The combination of educational goals and gameplay forms the foundation of the game and often introduces constraints that shape the entire design process.
- Cognition patterns: These refer to strategies that encourage players' reflective and metacognitive processes, enhancing the elaboration of content through gameplay experiences. Ketamo and Kiili (2010) highlight the significance of cognitive feedback in educational games, which aims to capture players' attention, direct it toward essential content, and promote reflection on their experiences and strategies. Research indicates that the quicker players recognize and accurately interpret cognitive feedback, the better they perform in the game.
- Presentation patterns: These focus on ensuring that players process information effectively. Users need to extract relevant information from the

game world, identify the most significant elements, and integrate them into a coherent understanding. This can be a complex task, as the game environment is dynamic, and crucial information may only be available for a limited time. Managing working memory is vital, but excessive cognitive load can impede learning. Therefore, game designers should consider the cognitive impact of each visual element and utilize graphical effects to emphasize key information. Studies have shown that players often perceive information differently and may overlook important details during gameplay.

- Social interaction and teaching patterns are closely tied to cognitive processes and outline methods that enhance learning through social activities and cooperative game dynamics. These patterns extend beyond direct interactions within the game to include strategies that support debriefing sessions. Specifically, teaching patterns equip educators with tools to observe, assess, and engage actively in the gaming experience. Educational games could incorporate sophisticated diagnostic tools that summarize player behavior, enabling teachers to pinpoint key challenges and manage student groups with varying skill levels. Offering pedagogical support to teachers may be crucial for the broader acceptance of serious games.
- Engagement patterns provide strategies to ensure that the overall gaming experience is meaningful and motivating for players, fostering deeper involvement in the learning process.

Serious games, which is sometimes used as a generic term, include different types of educational games that are used in different sectors such as: training, rehabilitation, marketing and social improvement.

The term serious games has been defined by Zyda (2005) as follows:

«Serious game: a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives».

Marsh (2011) describes serious games as a continuum that extends from games with a specific purpose to experiential environments designed for learning. In many cases, serious game applications use technologies typical of video games, but do not always include traditional gameplay elements. These applications, which lack classic game features, fall into the category of virtual environments and digital media. In this context, serious games are distinguished by their goal of training, education or teaching, effectively balancing entertainment and learning.

Serious games, as technology-enabled digital learning environments, are designed with a developmental approach to support education (Marsh, 2011).

Active breaks are short and can be repeated throughout the day, making them adaptable to the needs of children, teachers, and the educational context. Scheduling active breaks within the school day does not disrupt or interfere with curricular requirements; they align with the school's teaching schedule, especially when designed with flexibility and appropriate motivation by teachers (Calella et al., 2020). Finally, active breaks help to relieve and declutter children's minds from the high cognitive effort required by academic activities, promoting better focus on subsequent tasks (Kibbe et al., 2011).

Active breaks are a methodology that integrates perfectly with teaching and disciplinary activities. They can be carried out within your own classroom but not only any other internal and external space can accommodate them, and, in relation to the moments and needs expressed by both students and teachers, we find activating, concentration or relaxing breaks.

In this way, the fatigue caused by sitting for a long time is well counteracted, but above all, learning processes are optimized, and school daily life is transformed into an example of a lifestyle attentive to health and daily well-being, significantly improving the classroom climate.

Play, Pause, Learn: Unlocking the Benefits of Serious Games and Active Breaks

In the last decade, there has been an exponential increase in the use of educational technologies and a very rapid growth of serious games.

As a result of the growth of the application of technology in education, a more in-depth evaluation of the impact of serious games on learning is needed, in fact further research is still ongoing.

The design and application of serious games in education also requires a review of the literature that would allow these professionals to increase the level of their practice.

Play is considered to be a common activity and an excellent experience for children, adolescents and adults. According to Rieber et al. (1998), play comprises an intense learning experience in which the participants voluntarily invest a lot of time, energy and commitment, while concurrently deriving great enjoyment from the overall experience.

Additionally, gaming plays a significant role in facilitating learning for individuals at all stages of life and serves as an effective, impressive, and valuable method to improve the learning experience (Tsai et al., 2012). Nowadays, play in the form of digital games is gaining ground and popularity.

The increase in the amount of time spent playing games by children, adolescents and adults can explain and justify the increase in digital games popularity (Papastergiou, 2009; Erhel&Jamet, 2013).

The factors that drive people to play games and spend long hours playing them are fun and entertainment. However, what really promotes learning and keeps motivation and concentration high are the effective educational principles and approaches incorporated into game design. Digital games not only provide immersive experiences and interactive learning environments but also promote collaboration and the development of soft skills. These characteristics have contributed to their increase in popularity and use in recent years.

Today, digital games have evolved beyond simple entertainment and are a social, technological and cultural force. Their influence reaches a wide range of sectors, including creative industries, businesses, government institutions and academia. As a result, research has intensified to explore their potential and how they can be effectively integrated into different contexts, with the aim of exploring educational and training benefits. Different from entertaining games, serious games are designed for an education rather than an entertaining purpose (Nazry&Romano, 2017).

The term “serious game” was first introduced in 1968 by Clark Abt, who used it as the title of his book. According to his definition they are games having an explicit and carefully thought-out educational purpose and not intended to be played primarily for amusement. This does not mean that serious games are not or should not be entertaining».

The use of serious games fosters active learning by encouraging critical thinking, discussion, and problem-solving, making it an effective strategy for enhancing the skills needed in the future.

Incorporating serious games into active breaks can significantly boost engagement and cognitive advantages, offering learners opportunities for dynamic recovery while also reinforcing essential concepts.

Active Breaks (AB) consist of short (5-15 min), moderate-to-vigorous physical activity (PA) in the classroom supervised while both prepared and supervised by a teacher trained for this purpose, performed during or between school-lesson blocks. They are a great tip to interrupt long sitting times at school (Dallolio et al., 2022).

Furthermore, the literature highlights that active breaks help students reconnect with the joy of movement and reach the minimum physical activity threshold for health indicated by the WHO (2020).

ABs have also been shown to affect concentration, selective attention and classroom behavior (Dallolio et al., 2022).

Integrating serious games as a tool for active breaks offers multiple benefits, both in terms of learning and well-being. Unlike passive pauses, which may

lead to disengagement, serious games provide a structured yet playful way to sustain cognitive activation while allowing for mental recovery.

By incorporating elements of problem-solving, collaboration, and decision-making, these games foster engagement and motivation, helping learners consolidate knowledge in an interactive and low-pressure environment. Additionally, the physical and cognitive stimulation provided by game-based active breaks can enhance focus, reduce mental fatigue, and improve overall retention of information.

This approach aligns with research highlighting the importance of movement and active learning in optimizing cognitive performance, making serious games an effective strategy for promoting both academic success and well-being.

Serious Games and Active Breaks for Reducing Anxiety and Enhancing Metacognitive Skills

One particular form of performance anxiety that manifests itself in educational environments and has the potential to seriously impact students' academic experiences is learning anxiety. Cognitive, emotional and physical symptoms such as difficulty concentrating, fear of failure, low self-esteem, rapid heartbeat and sweating are its hallmarks (Zeidner, 2007).

Excessive academic pressure and less inclusive teaching approaches, which are among the environmental variables, can increase anxiety, which is particularly prevalent among high school and college students (Putwain & Daly, 2014).

The consequences of learning anxiety are reflected not only in academic performance, but also in the ability to develop metacognitive skills, i.e. those skills that enable students to reflect on their learning, plan effective strategies and monitor their progress (Flavell, 1979).

Students with high levels of anxiety tend to avoid complex situations, resulting in less stimulating learning experiences and limiting their ability to self-regulate (Eysenck et al., 2007).

Serious games, i.e. games designed not only for entertainment but also for educational, social or awareness purposes, are emerging as an effective solution to combat learning anxiety and promote metacognitive growth. These tools provide an interactive and engaging environment that allows students to actively learn without the pressure of traditional assessments. Indeed, recent studies show that the use of serious games reduces anxiety, increases motivation and improves self-regulation in learning (Papanastasiou & Drigas, 2017).

For example, research on math learning has shown that educational games based on real-world problems improve critical thinking and reduce stress levels during school activities (Flogie et al., 2020). In addition, the integration of gamified elements into learning platforms has had a positive impact on students' ability to self-regulate their learning and improve their confidence in their skills, knowledge and competencies (Mitsea et al., 2022).

Serious games allow players to reflect on their strategies and develop alternative solutions when faced with an obstacle, which is why they are able to activate metacognitive processes in students. This approach is also particularly useful for students with disabilities or learning difficulties as it provides them with a safe and motivating environment in which they can experiment without fear of external judgement (Papoutsi et al., 2022).

It is therefore clear that the use of serious games as a teaching tool can be an innovative and effective strategy for reducing anxiety and promoting the development of metacognitive skills. However, in order to achieve significant results, it is essential to integrate these tools into a structured pedagogical framework that includes teacher support and personalized assessment strategies.

The literature also shows that active breaks can be integrated into the curriculum to improve metacognitive skills, reduce mental fatigue and increase students' attention and motivation (Sorrentino et al., 2024).

For example, a study was conducted in elementary schools that showed that active breaks improve executive functions and significantly reduce anxiety when learning math, a phenomenon that can affect performance in this subject (Di Martino et al., 2024).

In addition, Bonilla (2024) has highlighted how active breaks based on physical activity promote better brain oxygenation and the regulation of neurotransmitters involved in stress management, thus helping to improve psychophysical well-being and prevent school burnout.

Schools that have implemented active breaks programs have seen an improvement in school climate and a reduction in behavioral problems related to anxiety and emotional tension (Peta, 2024).

Based on the scientific findings cited above, it is essential to incorporate active breaks into the school day in order to promote a healthier and more effective learning environment.

In this context, serious games can be an excellent form of active break. They offer students a moment of respite from traditional classroom activities without interrupting the learning process. The interactive and engaging approach of these tools not only helps to reduce learning anxiety but also stimulates cognitive and metacognitive functions in a fun way. The integration of serious games as an active break tool allows students to relax, stay motivated and

consolidate the knowledge they have acquired, turning break time into an effective and regenerating learning opportunity.

Conclusions

The inclusion of active breaks and serious games in educational contexts represents a way to improve student well-being and learning outcomes.

The research reviewed has shown that active breaks relieve stress, increase engagement and concentration, and foster a positive climate in the classroom (Dallolio et al., 2022; Sorrentino et al., 2024).

At the same time, serious games provide an engaging and interactive learning experience that supports the development of transversal skills (Papoutsi, Drigas, and Skianis, 2022; Mulcahy and Zainuddin, 2021).

The combination of active breaks and serious games therefore offers a new strategy to reduce learning anxiety and improve metacognitive skills in educational contexts.

Studies suggest that these interventions contribute to stress reduction and improved self-regulation, especially for students struggling with academic pressure (Papanastasiou and Drigas, 2017; Flogie, Aberšek, and Kordigel Aberšek, 2020). The ability of serious games to create a motivating learning environment makes them particularly attractive and effective also for students with learning difficulties, helping to promote confidence and cognitive resilience (Papoutsi et al., 2022).

Future research should investigate how to optimize the integration of these tools in different educational contexts, taking into account factors such as age, subject and learning environment. Further studies are also needed to assess the long-term effects of active breaks and serious games on academic performance and emotional well-being.

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