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Gamified Learning in Education: How Online Quizzes like Kahoot Transform Classroom Dynamics †

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Abstract

Online quizzes, such as Kahoot, are innovative tools reshaping modern education by boosting student engagement, enhancing memory retention, and encouraging collaboration. This study explores their role as a modern extension of the Socratic Method, highlighting their ability to combat challenges like reduced attention spans, exam anxiety, and unhealthy competition. With real-time feedback and gamified elements, quizzes make learning interactive and enjoyable, breaking the monotony of lectures. While technical limitations like time constraints and over-reliance on digital tools are noted, the findings advocate a balanced approach. Online quizzes foster inclusivity, improve learning outcomes, and prepare students for a tech-driven future.

Keywords: online quizzes; Kahoot; student engagement; interactive learning; classroom pedagogy; digital learning; education

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1. A Change in the Youth's Cognitive Landscape and the Need to Revamp Educational Approaches

Over recent years with the advent of the digital age, various studies have supported the claim that human attention spans are decreasing. Microsoft's 2015 report shows that the average attention span dropped from 12 s in 2000 to 8 s in 2015, largely due to the rise in smartphones and social media [1]. Further research by Dr Gloria Marks in 2023 highlighted an even more dramatic reduction, showing that the average time people spend focused on a computer screen has decreased from 2.5 min two decades ago to just 47 s today [2]. This aligns with studies demonstrating that people now switch between devices, such as phones, tablets, and laptops, up to 21 times per hour, indicating shorter attention spans and a constant need for new stimuli [3]. Younger adults, particularly those aged 18–24, are most affected by this trend, with 77% admitting to reaching for their phones when not engaged, compared to just 10% of those aged 65 and older [3].

Additionally, studies tracking mobile usage by researchers at Pennsylvania State University and Stanford University reveal that people interact with their phones approximately 228 times a day, with each session lasting an average of 10 s [3]. A significant proportion of these interactions involve social media, which is designed to trigger the brain's dopamine response, reinforcing the habit of frequent, short-term engagement. This pattern extends to the workplace, where researchers have found that employees are interrupted every 11 min on average and can take up to 25 min to regain focus, reflecting how modern environments foster shorter attention spans [1].

Despite these findings, some experts argue that attention spans are not universally declining. Researchers at King's College London, in a 2022 report, indicated that while 49% of the UK public believes their attention spans have worsened, the evidence does not definitively support a significant decrease in overall attention capacity [4]. They suggest this perception may reflect the increasing complexity and demands of contemporary life, rather than an outright cognitive decline [4]. This complexity includes the necessity for rapid information processing in an age dominated by digital distractions. Similarly, Mark demonstrated that while the average attention span has reportedly dropped from 2.5 min in 2004 to 75 s in 2012, this may signify a cognitive shift toward multitasking rather than a complete collapse of focus [3].

This cognitive shift suggests that while individuals may struggle to maintain prolonged attention on a single task, they are simultaneously developing new skills that are adaptive to the modern digital environment. People today are required to engage with multiple sources of information simultaneously, and this has led to an enhanced ability to quickly switch between tasks and process information in short bursts. This multitasking is a response to the fast-paced and information-rich nature of modern life, where individuals must prioritize, filter, and act on rapidly incoming data from multiple sources. In many ways, this demonstrates a form of cognitive evolution, where the brain is adapting to handle more fragmented but efficient attention in an environment that demands rapid decision-making and processing.

While it is clear that digital technologies have contributed to a reduction in sustained, uninterrupted attention spans, this change is not entirely negative. It reflects a broader transformation in how people interact with their environment and information, marking a shift toward a multitasking-oriented form of cognitive engagement. Rather than seeing this as a simple decline in attention, some researchers suggest that it represents a more complex adaptation to the realities of the digital world [5]. In this sense, technology has not just shortened attention spans but also fostered a new kind of attentional flexibility, enabling individuals to thrive in a world that requires constant switching between tasks and rapid processing of information. Consequently, the narrative surrounding attention spans must account for both the challenges and opportunities presented by this evolving cognitive landscape. Understanding this new cognitive landscape is particularly important for students, whose attention spans have dramatically evolved due to increased interaction with the rapidly changing digital world.

The reduction in student attention spans challenges standard teaching methods. To engage and focus students, educational approaches must be re-evaluated. Contemporary students, known as "digital natives," digest information quickly and switch tasks frequently. These traits represent this generation's distinctive digital technology use, shaping their learning and cognitive development. Many researchers call this "continuous partial attention." It involves constantly examining one's environment for new and intriguing information.

Another challenge educators encounter is "The Lecturing Effect". It refers to the phenomenon wherein the ability to sustain concentration is compromised. This impairment carries considerable consequences for the overall learning process, potentially hindering the acquisition and retention of knowledge. Understanding this effect emphasizes the need for engaging and attentive teaching tactics for educators and students. The old lecture methodology is becoming outmoded as research indicates that students' reading attention spans decrease after 10–15 min [6]. This decline in attention calls into doubt the efficacy of extended lectures in teaching.

Recent neuroscience studies demonstrate that neuroplasticity helps the brain establish new data consumption routines. This adaptability shows how brain circuits change with stimuli and experiences. Neuroplasticity has changed attention and focus cognitive systems,

according to Loh and Kanai [7]. Changes imply that neuroplasticity can affect attention and focus systems, which is crucial. Consequently, the process of securing and sustaining attention requires the implementation of innovative strategies. It is essential to explore and develop new approaches that effectively capture and retain the interest of individuals in various contexts.

Given these shifts in cognitive processes, traditional educational methods may no longer be sufficient to engage students effectively. As neuroplasticity reshapes attention and learning patterns, educators must adopt tools that align with these evolving cognitive landscapes. One of the most impactful solutions lies in integrating technology into education, leveraging interactive and gamified approaches to sustain engagement and enhance learning outcomes.

2. Adoption of Technology in the Education Model

The prevalence of technology has induced behavioral modifications in students and introduced new opportunities and problems in educational delivery methods. With the widespread adoption of e-learning platforms, learning management systems and educational apps have enhanced access to educational opportunities, offering a new mode of learning. Educators are compelled to modify their pedagogical approaches for the effective utilization of these resources [8].

Although these tools offer quick access to previously inconceivable information, they also create challenges such as information overload and the necessity for critical evaluation skills. Pangrazio and Sefton-Green assert that digital literacy skills, akin to other critical thinking abilities, are essential for adapting to an information-saturated environment [9].

Currently, the educational curriculum contends with several online distractions. There will consistently be an increasing demand to develop more interesting and dynamic content to maintain students' active attention [10]. To tackle this issue an immediate and compelling necessity exists to modify the conventional education model. Freeman illustrates that active learning techniques can enhance student performance by as much as doubling it, especially among STEM students [11]. This signifies a transition from passive, didactic instruction to a more engaging and participatory learning experience.

Advances in educational technology and artificial intelligence are enabling highly personalized learning experiences. Holmes contends that these technologies can be tailored to unique student requirements and learning preferences, potentially reducing attention span issues [12]. Another study indicates that blended learning models provide a hybrid combination of in-person instruction supplemented by online elements, allowing for a wide range of benefits through the integration of technology and human contact [13].

The simultaneous issue of evolving cognitive capacity in students and the pervasive impact of technology demands a reform of the educational model. Amidst these changing realities, it is feasible to adapt educational methodologies to enhance student engagement, efficacy, and relevance in learning. Transformation is not only essential but also imperative to equip students to confront the problems and opportunities presented by the contemporary global economy in the 21st century.

It is necessary to maintain a balance between the implementation of new technologies and the adaptation of the current educational principles, which include the pursuit of lifelong learning, creativity, and critical thinking. India has come a long way in achieving this balance and adopting technology to complement its education system and practices. India's education landscape has evolved and transformed drastically in the 21st century, especially due to the exigencies brought by the COVID-19 pandemic.

3. Online Quizzes: The Anchor of Interactive and Efficient Learning

Historically, teaching methods have evolved from lecture-based instruction to interactive approaches, such as the Socratic Method, which encourages active participation [14]. However, with the advent of technology, classroom learning has evolved and a popular medium of technology in classrooms is the use of online/live quizzes. A survey suggests that 69% of educators have adopted the use of online quizzes in their classrooms, post the COVID-19 pandemic [15]. Quizzes, the new face of the Socratic Method, have been widely popular due to the ease of use and interactive nature of teaching [16]. However, there has been a lot of debate about the positive and negative consequences of employing technology in classroom teaching. The need to assess the impact of the use of technology, specifically online quizzes, in classroom pedagogy becomes imperative.

3.1. The Curious Case of Low Attention Span

The attention span of a student ranges anywhere from 10 min to 52 min [17]. This becomes problematic when classes are often scheduled for 120 min to 180 min in total. In such scenarios, the use of online quizzes, with audiovisual stimuli, can help engage the brain and reduce the stress faced in a long-duration lecture [17].

Quizzes can also help in improving concentration. *Harvard Medical School* has conducted studies that show that students' focus often gets fogged up due to information overload [18]. Using quizzes in classes can give some respite to students from a monotonous school environment as they act as a change in the routine pedagogical activity [19]. Furthermore, studies show that students focus more attention when the targeted information serves as corrective feedback [20]. Given that live quizzes use objective questioning and provide results in live time, students are provided feedback instantaneously. As such, students become more attentive when their focus is driven towards what they are doing right or wrong [21].

Research on enhancing attention spans in educational settings has explored various technological and cognitive interventions beyond online quizzes. Studies highlight that Interactive and Immersive Technologies (IITs), such as Mixed Reality (MR), Augmented Reality (AR), and Virtual Reality (VR), foster a more mindful state compared to traditional 2D images and videos, as observed in a scoping review by Barton et al. [22]. These immersive tools create cognitive challenges that improve attention through mechanisms related to engagement and flow. Similarly, cognitive training applications like Tali Train, ALK-T01, and Neurotracker have demonstrated promise in sustaining attention, although research remains limited in scope.

Further, Virtual Reality-based cognitive training programs have been particularly effective in improving attention in children and adolescents with behavioral challenges, including ADHD. Another widely recognized intervention is the use of Personal Response Systems (PRS) in classroom environments. Nearpod, a digital learning platform, has been found to sustain student engagement by integrating interactive elements that encourage a competitive yet collaborative learning experience [23].

Alternative cognitive training approaches have also been explored. The Cogmed working memory training program, a digital tool designed to enhance working memory and attention, has demonstrated significant benefits in reducing inattention in daily life. However, broader "brain-training" software programs, including Lumosity, Cognifit, and Posit Science, have shown mixed results, with some studies questioning their long-term efficacy in improving cognitive function [24]. Additionally, studies have examined music therapy as a means to improve attention, with some programs showing promising outcomes in sustaining focus during learning activities [24].

Innovative tools such as robotic educational agents have also been employed to boost engagement. A study on behavioral strategies in student engagement revealed that students solved exercises more quickly when guided by robotic agents, demonstrating the potential of AI-driven learning tools. These interventions, though varied, collectively underscore the significance of technology-driven solutions in addressing attention span challenges in modern education.

While there are plenty of opposing claims on how using quizzes can be distractive, the Harvard Derek Bok Center for Teaching and Learning advocates for a digitally inclusive classroom. They maintain the position that "the presence of electronic devices in the classroom is not, in and of itself, the problem. Rather, it's the way we incorporate electronic devices" into classrooms [25]. We are not meant for multitasking [26]. To reduce cognitive load, educators should use quizzes wisely in a way that would reduce academic stress and promote effective learning.

3.2. Testing Credibility of Quizzes

It is a universal fact that not everyone is a great test-taker. The majority of students suffer from anxiety before and on the day of the exam. Harvard Graduate School of Education research shows that standardized testing and high-stakes tests have real physical effects on students with surges and drops in cortisol levels—which has a direct effect on their cognitive development [27].

The use of online quizzes, on the other hand, has shown positive results; especially in enhancing summative-assessment performance [28]. Studies show that repeated quizzing of questions identical to those on the final exams can substantially enhance exam performance [28]. Additionally, regular quizzing on questions related to the exam, but addressing different aspects of the material, combined with detailed feedback, can still lead to consistent improvements in exam performance [28]. This is because regular online quizzes in classrooms act as practice or memory-retrieval tests that improve memory retention of topics [29]. A study by Kanas State University has proven that short practice tests, like online quizzes, can help improve memory retention of topics to a greater extent than restudying the whole material [29]. A literature review of these various studies indicates that online quizzes provide a more efficient way of revision than standard long-answer or essay-based examinations [24].

3.3. Reducing Toxic Competitiveness

Increasing the use of online quizzes to induce student participation can significantly reduce toxic competitiveness among peers due to positive interdependence and anonymity.

According to a study conducted in the United States of America, online quizzes conducted in group formats (where marks of a single device or individual are allotted to the whole group) envisaged higher "*promotive interaction*" as students are involved in "*clarifying information, providing opinions and arguing, and facilitating the group process*" and promoting "*each other's success*" [30]. This reflects a positive increase in interdependence and collaboration among students and therefore, a decrease in toxicity and individualism [30]. Thus, this new method is the technological rewiring of Deutsch's classical "*social interdependence theory*", where "*the way in which the goals in a situation are structured determines the interaction patterns among participants*" [30]. While this first factor focuses on intra-group dynamics, the second standpoint examines inter-group interactions. For the second factor, consider the personal account of an ex-student; *"Usually, self-doubt convinces me that the solution I have in mind is wrong. I can't take the risk, no matter how small of humiliating myself in front of 30 students and the teacher, knowing that if I answer incorrectly, all my peers will know that I was confident enough in my incompetent answer to volunteer. This constant feeling of shame will*

haunt me for the rest of the day, diverting me away from raising my hand again." [31]. Introducing anonymity in test-taking would tackle such situations and allow everyone to participate freely and openly. This theoretical assertion has been affirmed in practical scenarios by a study involving 186 university students [31]. The use of computer-motivated quizzes is, therefore, a solution. Nonetheless, the same study also warns of "*off-task (behaviour) and spam*" and thereby a "*less productive atmosphere*" [31]. Undoubtedly, aggressive behavior like trolling can appear in chat boxes due to anonymity.(This has been noticed in anonymity in online gaming platforms.) However, this can be controlled by resorting to platforms where the interactions between the groups remain regulated by the instructor, whilst keeping the participation in quizzes anonymous. Hence, positive interdependence and anonymity promote interactions and collaborations and negate fears of humiliation amongst other things. Thus, the medium of online quizzes can effectively put an end to both active and passive toxic competitiveness.

3.4. Enhanced and Engaging Learning Experience

Online quiz platforms have revolutionized the way assessments and learning activities are conducted, providing a range of tools that cater to both in-person and remote education. Platforms like Kahoot!, Quizizz, and Socrative engage students through interactive, game-like quizzes that foster competition and active participation. These tools have become widely adopted in classrooms for their ability to make learning fun and interactive, especially through live quizzes and multiplayer formats that keep students engaged. Apps like Kahoot use components of game-playing methods such as competition among players, scoring of points, etc. This method is known as gamification. The integration of gamification elements encourages students to participate and improves retention by making lessons more enjoyable.

In addition to boosting engagement, quiz platforms like Google Forms, Edmodo, and Moodle have become valuable tools for formative and summative assessments. These platforms allow teachers to create quizzes with multiple question types, providing real-time feedback and detailed performance reports. This functionality helps educators assess students' understanding and tailor instructions based on student progress. Many of these platforms, particularly during the shift to remote learning due to the COVID-19 pandemic, played a crucial role in helping teachers monitor student performance outside the physical classroom.

Moreover, platforms like Quizlet and Nearpod offer personalized learning experiences by adapting quizzes and activities to individual students' needs. The use of instant feedback, detailed analytics, and interactive lessons enables teachers to address specific learning gaps and adjust their teaching methods accordingly. These tools also support asynchronous learning, allowing students to practice at their own pace, which is especially useful in remote and hybrid learning environments.

Online quiz platforms have become essential in modern education by making learning more engaging, supporting formative assessments, and enabling data-driven instruction. They enhance both student motivation and teacher effectiveness by offering a flexible, interactive approach to learning and assessment, tailored to individual needs and scalable for a variety of educational contexts.

4. The Effectiveness of Kahoot Quizzes: A Survey of Our Students

The research included a survey of students who were a part of our courses this academic year. With 101 responses so far, the results are as follows.

The ability to sit through a 1 to 2 h class varies widely based on several factors. While 45% of respondents find it difficult, 44% do not, suggesting a near-even split in opinions.

Many note that the challenge can be mitigated by factors like breaks, the teaching style, and the subject matter. A well-timed break, especially one or two lasting 10–12 min, often makes the duration more manageable. Additionally, environmental conditions—such as a room temperature between 19 and 21 °C, adequate natural lighting, and the use of a microphone in larger classes—can also improve the experience. Ultimately, much depends on how engaging the professor is and how dynamic the material is presented; if the class is monotonous, staying focused becomes a challenge.

Live quizzes like Kahoot and Mentimeter have proven to be highly effective tools in classroom teaching. One student notes, "It is very helpful as it helps us remember the concepts of previous classes." These interactive quizzes are not only fun but also aid in revising and reinforcing concepts, helping students retain information from previous classes. One student shares, "It is a fun activity and it actually helps us to evaluate our understanding at the same time ensuring we are not embarrassed by it, as nobody knows your performance." They provide a non-intimidating way for students to evaluate their understanding, as their individual performance remains anonymous. Many students appreciate how the quizzes encourage attentiveness, stimulate competition, and break the monotony of traditional lectures. As one student mentions, "It makes me excited to learn and test the material, it's like a healthy class competition. Memory retention is also longer." By making learning more engaging, these quizzes create an interactive environment that promotes participation, even for students less comfortable with public speaking. One student says, "They were a great learning experience as they were engaging and helped us revise concepts without making us feel cold-called or unsure of our answers." Overall, live quizzes enhance the classroom experience by motivating students to focus, increasing retention, and creating a healthy, competitive atmosphere that boosts engagement. One student shares, "Once you win 1 or 2 times, you will have a drive to stay there. Lower ranks would not be wanted, so overall, I think it's a very smart way to engage students in simple yet fun things like this."

Quizzes have been an effective tool in helping students recap important points from the topics covered, with 92.2% of respondents agreeing that they were beneficial in this regard. Specifically, for students of Professors Akash Gupta, Harsh Mahaseth, and Arushi Bajpai, 74.5% expressed that they enjoyed the use of Kahoot quizzes in their classes. Furthermore, a significant majority (95.1%) indicated that they would be interested in taking another course with professors who incorporate quizzes into their teaching methods, highlighting the positive impact of this interactive approach on their overall learning experience.

The use of technology in classrooms is generally seen as highly effective and beneficial, but with a few considerations. Many students find tools like live quizzes, flashcards, and multimedia aids to be incredibly helpful for engagement, memory retention, and understanding complex topics. One student notes, "I feel like using quizzes and flashcards really comes in handy and would love more courses to inculcate such practices." Interactive elements such as Kahoot, presentations, and videos make learning more dynamic and cater to different types of learners by offering visual and auditory cues. One student mentions, "My personal experience with Kahoot has been more positive. Since it is in a game simulation, it becomes fun and exciting. It served as a refreshment of the important pointers related to every concept."

However, some emphasize the importance of balancing technology with traditional methods, such as handwritten notes and conventional teaching, to ensure a well-rounded educational experience. One student says, "Even though technology has drastically shaped the new experience of learning, the old school method should not be forgotten." Personalized tools like laptops for note-taking, animations, and visual aids further enhance the learning process, making it more efficient and less monotonous. As one student shares,

"Laptops to take notes, PPTs should be used." One student explains, "The role of technology in classrooms is evolving... the depiction of topics through animations and images results in better understanding due to our brains' ability of efficient engagement with visuals rather than text." "Showing short films and videos helps with retention." Technology also prepares students for a tech-driven future, fostering collaboration and critical thinking. Another student reflects, "Technology in classrooms enhances learning through personalized instruction, interactive tools, real-time feedback, and global access to resources. It encourages collaboration, critical thinking, and prepares students for a tech-driven future."

That said, the integration of technology requires thoughtful implementation. Teachers need to be well-versed in the tools they use to avoid technical issues that might disrupt the learning process. Additionally, there is some caution against over-reliance on technology, advocating for its balanced use alongside traditional teaching techniques. Overall, the consensus is that technology, when used mindfully, significantly enhances classroom engagement and learning outcomes. Technology has made classes more interactive and engaging for students. One student says, "Make the classes more interactive and fun, like how professors like Prof. Harsh Mahaseth, Prof. Arushi Bajpai, and Prof. Surabhi Bhandari do."

5. Conclusions

The use of online quizzes, particularly platforms like Kahoot, has proven to be an effective tool in modern classroom teaching, enhancing student engagement, improving retention, and reducing anxiety around traditional assessment methods. By integrating elements of gamification, online quizzes provide a refreshing, interactive alternative to conventional lectures, helping to maintain students' attention and motivation. The anonymous and collaborative nature of these tools supports a more inclusive classroom, where students can participate freely without fear of judgment or negative competitiveness. These benefits have led to notable improvements in attendance, punctuality, and student enthusiasm. However, challenges remain, including potential technical disruptions, time limitations that may hinder thoughtful responses, and the risk of over-dependence on digital tools. Some students report concerns about the fast-paced nature of quizzes and the difficulty of recovering from incorrect answers. To maximize the effectiveness of online quizzes, educators should be mindful of these factors and aim to balance digital tools with traditional teaching methods.

Online quizzes represent a valuable addition to classroom instruction, providing a flexible, engaging way to reinforce learning. When thoughtfully implemented, they foster a supportive learning environment where group success is prioritized alongside individual progress, equipping students with the skills needed in a tech-driven future. This balanced approach highlights the potential of online quizzes to transform classroom dynamics and improve learning outcomes.

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