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Effectiveness of GBL in the Engagement, Motivation, and Satisfaction of 6th Grade Pupils: A Kahoot! Approach

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Abstract: In the modern day, educational demands necessitate student-centered instructional approaches at all levels of educational institutions. Through the integration of digital technology, these frameworks incorporate up-to-date teaching methods, encourage social engagement, and promote cultural values. Gamification in digital technologies assists in establishing an educational environment that is engaging, entertaining, personalized, and constantly available. This educational environment is based on digital learning resources and draws on stored human knowledge, articulating education by removing geographical and temporal boundaries. Kahoot! is a platform that allows the creation of and access to gamified assessment quizzes while integrating technology into the teaching and learning process. In this article, we present the results of a study based on a Kahoot! quiz used in a classroom with 27 6th-grade pupils in a Greek elementary school. Our objective is to determine the effectiveness of game-based learning by using Kahoot! as a supplementary element to traditional teaching methods. With the inclusion of a post-activity questionnaire for overall interest and motivation to learn while using Kahoot! and the Driscoll Questionnaire, we aim to explore the potential benefits of Kahoot! in the learning process, pupil engagement, and assessment. The analysis of the collected data from the questionnaire demonstrated a positive attitude toward Kahoot! as an alternative educational method and learning approach. It also revealed positive feedback on the motivation, enjoyment, sense of autonomy, creativity, and pupil interest in the learning process. In addition, the study indicated a moderate positive effect on pupils' understanding of the learning content and a slight inclination towards the technology-based, non-traditional approach compared to traditional teaching. Based on the findings, by fostering an encouraging and creative environment, we can improve pupil engagement and overall motivation while promoting autonomous learning through a game-based experience.

Keywords: game-based learning (GBL); gamification; Kahoot!; educational technology; student engagement; motivation

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1. Introduction

The concept of gamification is that the efforts we make towards achieving a goal can be motivating and keep us interested. Gamification, as defined by Deterding et al. [1], is the use of elements from the world of digital games to enhance user experience and engagement in services and applications that have no direct connection to games. However, it deserves mentioning that this word could be related to the utilization of games in general, as opposed to only digital games [1,2]. It is also essential to separate gamification from digital game learning since the former entails adopting game-like practices to enhance the experience, whilst the latter concentrates on developing genuine digital games and software with educational content. According to Glover [3], the concept of gamification frequently capitalizes on the intrinsic level of competitiveness that exists in most individuals

to direct them toward certain productive behaviors. This does not necessarily imply that it is an individualistic strategy since it could also be utilized to support collaborative and cooperative learning approaches.

The learner is encouraged to engage with the software and design their own method of learning. One of the most significant elements of digital educational games is feedback. Unlike traditional teaching, where negative feedback could discourage students, negative feedback in digital educational games is considered a developing aspect and is accepted with a positive attitude [3–5]. Losses in digital games are not regarded as definitive negative experiences, and the ultimate aim is not merely success or failure [1,2,4]. Students have the ability to confront obstacles and alter their strategy after failure by playing digital games. One such example and a major component of learning through games is the students' capacity to gain insight from their mistakes in an interactive manner [4,6,7]. Feedback can be delivered instantly after each player's actions or it can be aggregated, such as via a leaderboard that displays the performance of all game participants. Rapid and thorough feedback is more instructive for the player than a final appraisal of their performance [6,8,9].

Digital games with a plethora of features have enormous promise in the educational area. Their effective practice, however, necessitates careful planning and supervision. The instructor must carefully select the game's content, arrange it objectively, and incorporate its implementation into the teaching process [7,10,11]. The instructor plays an important role in guaranteeing the quality of learning and increasing student engagement. The educator must ensure that digital games are properly integrated into the teaching process by defining clear educational goals for the game, closely monitoring student progress during the game, and allowing for discussions and additional educational activities to achieve the educational goals. Furthermore, the effective use of digital games, when combined with other educational tools, is critical for the transferability and application of skills and information in a variety of fields [4,5,9,10].

This study aims to assess the efficiency of game-based learning, by using Kahoot! as a supplementary tool alongside traditional teaching techniques. By incorporating a post-activity survey, we attempt to investigate the general interest and motivation for learning with Kahoot!, and with the implementation of the Driscoll Questionnaire, we delve into the possible advantages of utilizing Kahoot! in the educational process in terms of student engagement and assessment. The article is structured as follows: Section 2 provides the relevant literature review on the effectiveness and motivation in game-based learning and Kahoot! applications in the learning process. In Section 3, we provide a detailed description of the methodology implemented in our preliminary study to develop a better understanding of students' learning process, satisfaction, motivation, and other significant factors, followed by an analysis and presentation of our findings in Section 4. Section 5 discusses and interprets the results of our study and identifies related limitations. Finally, we conclude and provide suggestions for future research.

2. Literature Review

2.1. Effectiveness and Motivation in Game-Based Learning

Game-based learning, as an innovative approach, has been shown to enhance student motivation, emotional engagement, and enjoyment in the learning process [12]. Certain research has examined a range of game components and information feedback as a common set of crucial factors for understanding how Digital Game-Based Learning (DGBL) systems are effective in improving learners' academic achievements and their willingness to persist with these systems [12].

Currently, there is an increasing use of technological applications, particularly multimedia courseware, in modern education. Researchers in the field of education focus on how these technologies have led to innovative teaching and learning methods. The integration of information and communication technologies (ICTs) in education has opened the door to multimedia technology and digital games as alternative instructional tools [13].

There is a research project called DigiGEMs that uses sample lessons from interactive multimedia courseware. Hwa [14] explores the advantages of multimedia technology and the benefits of digital game-based learning and emphasizes the significance of digital games as a valuable resource for teaching mathematics. The study investigates whether young learners have a positive attitude toward learning mathematical concepts. DigiGEMs is designed for primary school children aged 7 to 9, offering an engaging way to practice mathematical thinking skills. The research findings support the hypothesis that digital game-based learning is more effective than traditional classroom-based learning for acquiring mathematical knowledge. The paper encourages further research into digital game-based learning environments for various subjects and the dynamic integration of multimedia objects and digital games to optimize the teaching and learning processes [14].

Hartt et al. [15] focus on assessing the effectiveness of game-based learning in the context of planning education. Their paper specifically investigates how gamification influences planning students' perception of learning, engagement, and teamwork. The research involved delivering two lectures in an undergraduate planning course using different teaching methods: one traditional lecture-style and one game-based approach. Student feedback was collected through an online questionnaire and interviews. The results indicate that students preferred and were more engaged with the game-based lecture. In conclusion, the study suggests that gamification is well-suited for planning education.

The results of All et al. [16] study offer a more detailed perspective on previously established best practices for control groups in the topic of learning gaming efficiency. Firstly, it suggests that incorporating an educational activity in control groups may not always be beneficial and should be based on whether researchers are evaluating absolute or relative effectiveness. Additionally, maintaining an equal amount of instructional time between experimental and control groups might not align with the time efficiency objectives of Digital Game-Based Learning (DGBL). Secondly, the research identifies certain factors unrelated to the intervention that can compromise internal validity. These include issues, such as unsuccessful randomization, which can be addressed through blocked randomization, and pretest effects, which can be mitigated by using carefully piloted parallel versions of tests. Lastly, the study introduces new indicators for assessing motivation and efficiency outcomes in a self-paced distance learning context. It suggests that researchers should expand their focus to include motivation not only during and after the training but also motivation to initiate the learning process. Additionally, the time required to complete the training should be considered alongside the time needed for learners to follow up on their learning.

Liu et al. [17], in another study in the field of game-based learning, conducted a semi-experimental design with a pretest-posttest approach involving a control group. The research population consisted of 256,836 first-grade elementary students during the 2016–2017 academic year. A purposive method was used to select 60 students (32 males and 28 females), who were then randomly assigned to either the control or experimental group. Both groups underwent a pretest. In the experimental group, students were exposed to Misha and Kosha Game-Based Learning, while the control group received traditional teaching methods. The Inventory of School Motivation (ISM) questionnaire, known for its reliability ($\alpha = 0.84$), was used as the measurement tool. The findings underscore the importance of incorporating computer-based games into elementary education, emphasizing the need to integrate them into teachers' daily lesson plans. These outcomes have significant implications for educators, instructional and game designers, as well as researchers, offering insights from the perspectives of implementation, design, and research.

Sun et al. [18] investigated teacher scaffolding in digital game-based learning for primary mathematics classrooms and its impact on students' perceptions of learning within a digitally scaffolded game. The research involved 141 primary school students and four mathematics teachers. Qualitative data were collected through classroom observations and student interviews. The results revealed two key scaffolding strategies: whole-class and one-to-one scaffolding. Both of these approaches played a significant role in shaping

students' learning experiences and their perceptions of mathematics when using digital games in primary education.

2.2. Kahoot! and Online Questionnaires in the Learning Process

A platform that is worth mentioning is Kahoot!. It is a widely used game-based learning platform that serves as a tool for reviewing students' knowledge, conducting formative assessments, and offering a break from conventional classroom activities. It ranks among the most popular game-based learning platforms, with 70 million monthly active unique users and being utilized by 50% of K-12 students in the United States. Despite its release in 2013, numerous studies have explored the impact of Kahoot! in educational settings. However, in most cases, there has been no comprehensive analysis of the collective findings from these studies [19].

Wang and Tahir [20] made a comprehensive literature review consisting of 93 studies, which revealed that Kahoot! can have a positive impact on various aspects of education, including learning performance, classroom dynamics, students' and teachers' attitudes, and the reduction of student anxiety. However, there are instances where Kahoot! shows little or no effect. Students face challenges related to technical issues, such as unreliable internet connections, difficulty reading questions and answers on a projected screen, inability to change answers after submission, time pressure for answering questions, insufficient time to respond, fear of losing, and difficulties catching up if an incorrect answer has been given. Teachers also encounter challenges, including setting the appropriate difficulty level of questions and answers, network connectivity problems, scoring methods that encourage quick answers at the expense of thoughtful reflection, some students guessing without careful consideration, students struggling with the experience of failing a quiz, and some teachers finding it challenging to effectively implement the technology.

Licorish et al. [21] carried out their study in a New Zealand university in which Information Systems Strategy and Governance course students were given some Kahoot! quizzes. The study observed that Kahoot! provided students with increased opportunities for engagement with the instructor, peers, and course content. Students found Kahoot! to be a captivating and timely tool, especially during longer lectures, allowing for reflection and class discussion. The results indicate that Kahoot! motivated students to actively participate and foster interaction in the classroom. Students acknowledged the positive impact of Kahoot! on their knowledge and skill acquisition. They attributed increased attention, focus, interaction, and engagement to their enhanced learning experience in the course.

Tan Ai Lin et al. [22] conducted a study at a public university in Malaysia. Undergraduate students were exposed to Kahoot!, a game-based learning platform, during their weekly lectures over a semester. These students were enrolled in the English for the Media course, which covers both theoretical and practical aspects of media language. Survey data collected from 51 respondents revealed that students found Kahoot! to be beneficial in several ways. It was found to be effective in motivating and engaging students, as well as in fostering and reinforcing learning in both the theoretical and practical dimensions of the course. Additionally, the questionnaire developed by the researchers, consisting of 33 items, demonstrated high internal consistency and reliability, making it a valuable tool for future studies.

Martins et al. [23] explore the use of Kahoot! as an educational tool in the teaching and learning process for high school students, particularly in the field of computer science. The study adopted an exploratory, descriptive, and bibliographic approach and involved 34 students from the technical course in computer science for the Internet at the Federal Institute of Goiás (FIG). Students participated in activities facilitated by Kahoot! And subsequently completed a questionnaire using a GoogleDocs form. The results indicate that using Kahoot! As a learning platform led to improvements in students' understanding of concepts. It achieved this in an enjoyable, engaging, motivating, and interesting manner, which enhanced the learning experience.

Curto Prieto et al. [24] present the outcomes of an investigation into the application of Kahoot! With secondary education students in the subjects of mathematics, biology and geology, and physics and chemistry during the 2017/2018 academic year. The study evaluated the students' perception of the tool and its impact on their learning process. The results were notably positive, underscoring the potential benefits of incorporating online questionnaires such as Kahoot! In classroom settings. Researchers used as an evaluation method an online questionnaire that had two types of questions: short answer, in which the students had to answer a concise and specific question, and multiple-choice answer, in which students had to choose the appropriate answer among the options proposed by the teacher.

In [25], a qualitative descriptive approach was used along with a quasi-experimental method to assess the effectiveness of using the online game Kahoot! In enhancing student motivation to learn chemistry. The study focused on class X students from a private secondary school, Pusaka 1 Jakarta, with a random sample of 40 students selected from the entire class. The results demonstrated the effectiveness of utilizing Kahoot! In boosting student motivation to learn chemistry. Various indicators of motivation to learn, including the intention to succeed in learning, the recognition of the need to learn, having aspirations, appreciating the subject matter, and showing dedication to studies, exhibited different percentages of increased motivation [25]. The use of this platform in order to help students answer question points was evaluated in another example in which students had to independently solve problems and utilize their mobile phones to provide answers during class, this time for the course of physics [26].

Jones et al. [27] attempted to evaluate the effectiveness of gamification in an Advanced Placement Biology (AP biology) classroom, using the online game 'Kahoot!' as a supplement to traditional teacher-centered learning. The study also aimed to determine the impact of 'Kahoot!' on student engagement and their overall learning experience in the context of biology. The research involved a presentation on the topic of transcription and translation delivered to a group of high school AP Biology students (n = 18, including 18 female students). Following the presentation, students participated in a 'Kahoot!' game, where they answered 15 questions within a time limit of twenty seconds for each question. Both students and the teacher completed a post-activity survey to gauge their interest and satisfaction with the learning experience. The results highlight the potential of this platform as a gamified assessment tool that actively engages students in the learning process. In this case, it effectively facilitated the understanding of the topic of transcription and translation by making learning enjoyable and exciting.

3. Research Methodology

3.1. Kahoot! Overview

Kahoot! Is a digital tool for online assessment. It allows teachers to design free quizzes that can be accessible from any computer or mobile device over the web. Pupils' response rates are recorded, providing teachers with important data for evaluation. Kahoot! Includes a range of quiz format options, such as quizzes, surveys, or challenges, allowing the instructor to tailor the assessment to the course and curriculum [24,28,29]. Quizzes are the most popular and most common form of Kahoot! Utilization. The Kahoot! Quiz consists of a sequence of questions with two to four alternative answers for each question, providing pupils the ability to select an answer within a time restriction. Each response is distinguished from the others by its own color and shape. Teachers are able to develop their own quizzes as well as use and adapt questions generated by colleagues. When a Kahoot! Quiz is created, users are given a game code, also known as the "game pin" to input in the first field, while the second section is filled with their own names [20,27,30]. The quiz is ready to start after all participants have logged in. It is important to be aware that the sequence of the questions is altered each time to avoid memorizing the colors or shapes if the same quiz is used again in the future [31].

The use and Integration of Kahoot! into the educational process as an alternative or complementary teaching method, instead of a traditional teacher-centered setting, allows pupils to demonstrate their knowledge and skills in an alternative and fun way, increasing their interest. Through the introduction and presentation of new educational material, Kahoot! allows for more effective understanding and information retention. For the purposes of this study, Kahoot! was used in teaching a new subject, which introduced the technology and applications of eye-tracking. The gamification elements, the display of the best scores per question, animations, sound and interaction through mobile devices assist pupils in understanding and learning new material within a relaxed and collaborative environment while also offering detailed assessment data on each player and each question [24,27,31].

3.2. Experimental Design and Procedure

The lecture titled "Introduction to Eye-tracking" was given to the pupils of a 6th grade class of Arsakeio (Arsakeia—Tositseia Schools) private schools in Greece as part of the "Information and Communication Technologies" course. The class consisted of a total of 27 pupils, of which 16 were girls (59.3%) and 11 were boys (40.7%). The lecture introduced the pupils to basic concepts about the functioning of the human eye and how the evolution of technology allows us to explore human visual behavior and cognitive processes using modern technological applications. The presentation was made using Microsoft PowerPoint software and a projector, a first-of-its-kind experience for the pupils on this course and provided pupils with their first exposure to technology-based presentations. All the necessary information required to answer the questions that followed in the "Kahoot!" game was covered in the presentation, offering a complete understanding of the subject. The presentation was a successful opportunity for the pupils to familiarize themselves with technology and science while enhancing their interest in learning.

There was a blended research method. Since this study employed as participants children of a younger age, there was a need to demonstrate the platform and its use to them through a presentation. This initial phase was designed to ensure that participants fully understood the platform and its functions. After the presentation of Kahoot!, the researchers responsible for carrying out the study provided the link to the Kahoot! platform (https://kahoot.it/, accessed on 13 June 2023) so that pupils could access the game. Pupils used this link and entered the game by filling in the game code and an anonymous personal ID of their choice. This anonymity allows pupils to participate in the game without the stress of expecting an outcome, giving them the freedom to enjoy the game and perform to the best of their ability. This creates a seamless environment that allows pupils to delve into the game without the stress of competition, encouraging participation and learning.

More specifically, the pupils were given 15 multiple-choice questions, and for each, they had 20 s to answer while a countdown was visible on the central screen that displayed the questions [27]. The questions were structured to test the knowledge gained by the pupils during the presentation, key concepts, and definitions, and, therefore, the specific length was considered appropriate. At the end of the 20 s, the game presents the correct answer displyed to the pupils, the number of pupils who chose the correct answer, and award points to those who answered correctly, thus creating a ranking among the pupils. If pupils had difficulty with a question, that is, when more than half of the pupils answered incorrectly, an explanation followed as to why that particular answer was correct, and then the researchers moved on to the next question.

At the end of the game, there was a post-experiment composite questionnaire. In the first part of the questionnaire, pupils were asked to answer a series of questions about their overall interest and motivation to learn while using Kahoot! [27], a 7-item questionnaire, which included questions regarding enjoyment ("How much did you enjoy today's lesson and activity?"), better understanding of the taught material ("Did this lesson and activity help you to better understand the topic?"), and overall impression of this type of gamified assessment ("Did you enjoy this style of learning more than a traditional lecture class?"). Moreover, we included the Driscoll Questionnaire [24], which measures

students' satisfaction with the use of tools in the teaching and learning process, a 12-item questionnaire with specific statements about their learning process ("I have improved my learning process"), students' self-assessment ("I see more possibilities to show what I have learned"), and self-evaluation ("I have been able to self-evaluate my learning process"). All items were measured on a "1–5" Likert scale, with the exception of two "Yes" or "No" questions. These questions helped researchers assess pupil performance understand whether the content of the presentation and the game were successfully delivered and improve any future educational activities (Appendix A).

4. Data Analysis

During this phase, we evaluate the data collected during the educational activity and evaluate the pupils' achievements, understanding of key concepts, and educational results. Additionally, we examine the game's effectiveness as a teaching tool within the learning process. We examine how pupils grasp and learn information using this method, as well as the impact of educational materials and activities on their learning journey. Our objective is to evaluate the effectiveness of instruction and draw conclusions to enhance future educational endeavors. Table 1 presents the descriptive statistics on overall interest and motivation to learn while using Kahoot!, Table 2 presents the number of pupils' responses and the percentage of "Yes" or "No" answers to questions asked on the post-experiment questionnaire, and Table 3 presents the results of the Driscoll Questionnaire of pupils' satisfaction with the use of tools in the teaching and learning process.

Table 1. Descriptive statistics on overall interest and motivation to learn while using Kahoot!.

Questions (N = 27)	Min	Max	Mean	SD	Range
Q1. On a scale of 1–5 (1 being not enjoying it and 5 being thoroughly enjoying it), how much did you enjoy today's lesson and activity?	2	5	4.30	0.775	3
Q2. On a scale of 1–5 (1 being knew nothing about the topic and 5 being complete mastery), how well did you understand the topic before today?	1	5	2.30	1436	4
Q3a. If YES, on a scale of 1–5 (1 being not at all and 5 being very well) how well do you feel you know the topic at hand (Introduction to Eye-tracking) now?	2	5	3.81	0.786	3
Q4. On a scale of 1–5 (1 being not at all and 5 being a lot), how much did Kahoot! game help you understand the material?	2	5	3.93	0.874	3
Q6. On a scale of 1–5 (1 being not at all and 5 being I love it!), how much do you normally enjoy a traditional lecture class?	1	5	2.81	1331	4

As far as the overall interest and motivation questions are concerned, the mean score for Q1 was 4.30 (SD = 0.775, range = 2–5). The results indicate that, on average, pupils reported a high level of enjoyment, with responses ranging from a minimum of 2 to a maximum of 5. These findings suggest that while some pupils found the lesson enjoyable, there is room for improvement to enhance overall enjoyment. For Q2, the mean score was 2.30 (SD = 1.436, range = 1–5). The standard deviation (SD) was relatively moderate, indicating significant variability in pupils' perceived pre-lesson understanding. The range of responses extended from a min of 1 to a max of 5, demonstrating a wide spectrum of initial comprehension levels among the pupils. In the case of Q3a, the mean score was 3.81 (SD = 0.786, range = 2–5). This question focused on knowledge acquisition for the topic of "Introduction to Eye-tracking" after the presentation. The results suggest that, on average, pupils reported an improvement in their understanding. For Q4, the mean score was 3.93 (SD = 0.874, range = 2–5). This question assessed the effectiveness of Kahoot! game in aiding pupils' understanding of the instructional material. The results indicate that

while the majority of pupils perceived it as beneficial, there was variability in the degree of help provided by the game. Finally, Q6, which measured how much pupils typically enjoy traditional lecture classes on a scale from 1 to 5, had a mean score of 2.81 (SD = 1.331, range = 1–5). The results demonstrate a significant range of enjoyment levels. On average, pupils reported a moderate level of enjoyment in traditional lecture classes, suggesting that some pupils enjoy traditional lectures more than others.

Table 2. Students' responses and percentages of the "Yes" or "No" Questions.

Questions	Yes (%)	No (%)
Q3. Did this lesson and activity help you to better understand the topic?	26 (96.3%)	1 (3.7%)
Q5. Did you enjoy this style of learning more than a traditional lecture class?	24 (88.9%)	3 (11.1%)

In terms of the "Yes" or "No" questions, Table 2 provides the relevant information on the pupils' learning experiences. In response to Q3, whether the presentation helped pupils better understand the lesson, a substantial number of pupils reported improved understanding (96.3%). This overwhelmingly positive feedback demonstrates the success of the session's educational approach. It indicates that the combination of the presentation and Kahoot! game significantly improved pupils' understanding.

Similarly, 88.9% of pupils preferred the method of learning presented during this session over their typical class lecture when responding to question Q5. This suggests that the methodology utilized in this session was more enjoyable and engaging for the pupils than the traditional teaching style. This reaction implies that introducing interactive features, such as Kahoot! game could potentially enhance pupils' overall perspective of the learning experience. These findings emphasize the need to create future educational activities with pupils' enjoyment and participation in perspective.

Table 3. Descriptive statistics of students' satisfaction with the use of tools in the teaching and learning process.

Driscoll Questionnaire Variables (N-27)	Min	Max	Mean	SD	Range
DQ1. My learning results have increased	1	5	3.59	0.888	4
DQ2. I had fun while learning	1	5	3.78	1155	4
DQ3. My learning has been more autonomous	2	5	3.30	1031	3
DQ4. I have improved my learning process	1	5	3.63	1391	4
DQ5. I have worked more on my oral or written expression	1	5	3.07	1492	4
DQ6. I have increased my creativity	2	5	3.70	1103	3
DQ7. I have increased my motivation	1	5	3.44	1121	4
DQ8. I think learning is more active and experiential	1	5	3.44	1188	4
DQ9. I see more possibilities to show what I have learned	1	5	3.85	1027	4
DQ10. I have more possibilities to work at my own pace	2	5	3.70	0.993	3
DQ11. I have had the facility to access the materials and contents	1	5	3.59	1185	4
DQ12. I have been able to self-evaluate my learning process	1	5	3.63	1079	4

As far as the Driscoll Questionnaire results are concerned, the mean score for DQ1 was 3.59 (SD = 0.888, range = 1–5). The results show that, on average, pupils reported a moderate increase in their learning results. For DQ2, the mean score was 3.78 (SD = 1.155, range = 1–5). The results indicate that, on average, pupils reported high levels of enjoyment during the learning process, with responses varying from a min of 1 to a max of 5. In the case of DQ3,

the mean score was 3.30 (SD = 1.031, range = 2–5). This question focused on the perceived level of autonomy in learning. The results suggest that, on average, pupils reported a moderate increase in autonomous learning. For DQ4, the mean score was 3.63 (SD = 1.391, range = 1–5). On average, pupils reported a moderate to high increase in their learning process. DQ5 had a mean score of 3.07 (SD = 1.492, range = 1–5). On average, pupils reported a moderate increase in working on their oral or written expression, with responses ranging from a min of 1 to a max of 5. DQ6, which evaluated the increase in creativity, had a mean score of 3.70 (SD = 1.103, range = 2–5), indicating a high increase in creativity. DQ7, which assessed the increase in motivation, had a mean score of 3.44 (SD = 1.121, range = 1–5), indicating that, on average, pupils reported a moderate increase in motivation. For DQ8, the mean score was 3.44 (SD = 1.188, range = 1–5). The results show that pupils reported that they believed learning to be more active and experiential, with responses ranging from a min of 1 to a max of 5. DQ9 had a mean score of 3.85 (SD = 1.027, range = 1–5). On average, pupils reported that they had more possibilities to demonstrate what they had learned. In the case of DQ10, the mean score was 3.70 (SD = 0.993, range = 2–5). The results suggest that, on average, pupils reported having more possibilities to work at their own pace. For DQ11, the mean score was 3.59 (SD = 1.185, range = 1–5), which demonstrated that, on average, pupils reported moderate ease of access. Finally, DQ12, which assessed the ability to self-evaluate the learning process, had a mean score of 3.63 (SD = 1.079, range = 1–5). The results indicate that pupils reported having the ability to self-evaluate their learning process.

5. Discussion

It is considered essential for the educational process to adapt to the demands of the times and meet the expectations of both teachers and pupils as time progresses. The current study attempted to highlight key insights on pupils' perceptions of the given lecture and the effectiveness of the instructional materials employed. Such findings could serve to improve future instructional efforts.

In regard to the general interest and motivation for learning while using Kahoot! questions, questions Q1–Q4 provide us with a wide range of valuable information that instructors can utilize and include in their educational activities in the future. Regarding Q1 (enjoyment of today's lesson and activity), it is critical to recognize the entertainment factor in the educational process. Greater knowledge and integration of recreational influences increases pupil assimilation of educational content since it is directly related to their overall involvement and motivation. A higher score on this question suggests that the learning experience was more advantageous. Additionally, the question Q3a (topic understanding after the lesson) assesses how well pupils estimate they comprehend the topic following the lesson. It is critical to determine if the educational approaches effectively improve the understanding of pupils. The initial indications reveal that we succeeded in achieving our objective in terms of pupils' knowledge acquisition since 96.3% of pupils demonstrated an improved knowledge of the learning content in combination with question Q3. In Q4 (effectiveness of Kahoot! game in understanding), assessing the effectiveness of Kahoot! game is critical since it has a direct impact on the learning process. A higher score demonstrates that the game is an effective tool for learning [24,27,29]. These questions address the core elements of interest and motivation in the learning process, making them essential for improving the educational experience, but they also provide guidelines to incorporate in future research to design more efficient educational material and to integrate modern technology into the educational process [25,27,30,32].

Overall, the findings from the Driscoll Questionnaire provide us with a comprehensive view of the complexity and impact of the game-based educational processes on pupils. Not only do they present a significant improvement in the educational results, i.e., the understanding of the lesson, but they also foster other important aspects of the learning process, such as entertainment, motivation, creativity, and practical skills [15,22,24,27]. The findings enabled us to investigate the fundamental aspects of game-based learning and highlight important details for educators. The findings indicate that including gamifica-

tion elements is an instructional strategy that could encourage and promote engagement whilst simultaneously improving productivity among pupils. Questions DQ1–DQ4 place particular emphasis on the learning outcome, where data related to pupils' perceived learning outcomes, the enjoyment factor in learning, the promotion of autonomous learning, enhancements in learning processes, increased motivation, and the provision of opportunities for experiential, active learning. They provide us the opportunity to determine the educational techniques that work best in relation to the efficiency of the pupils, to identify alternative educational teaching methods, and establish new strategies for the teachers to improve their approach to optimize pupil success. It is also important to emphasize the pupils' attitudes towards the educational process and their willingness to actively participate in the educational process. By creating a favorable and creative environment, we grant children alternative ways to express their educational needs and, at the same time, improve their overall experience. With game-based learning, we allow the pupils to operate autonomously and give them the feeling that they have control over their learning process, nurturing self-directed learning. Of particular interest is question DQ9, regarding opportunities for demonstration, where the importance of giving pupils the opportunity to assess their understanding and promoting holistic learning becomes clear. The understanding of the pupils' needs to demonstrate their knowledge allows the design of assessment methods that are aligned with the learning objectives and, more significantly, in cases where we want to showcase an active and experimental educational process, emphasizing practical and hands-on experiences. These aspects collectively demonstrate the positive impact of the instructional approach on pupils' overall learning experiences, emphasizing the value of fostering both academic achievement and the joy of learning [12,17,27].

As anticipated, younger children reacted with overall positive responses about technology-based presentations and the perceived level of entertainment or interest in a game. This highlights how easily children adapt to technology-based presentations and the potential for altering perceptions through interactive educational tools. It emphasizes the fact that pupils were able to comprehend key instructional topics, demonstrating that an educational tool does not have to be strictly academic or use traditional teaching methods, but it can be a pleasurable experience. It reinforces the idea that an educational tool while imparting knowledge, can also offer an enjoyable and engaging learning experience. As this was a preliminary study, the primary goal of the questionnaire presented to the pupils was to uncover insights and explore the influence of the game-based elements on pupils' perceptions and preferences. Notably, a significant proportion of pupils expressed a preference for the game-based approach of Kahoot!, as opposed to the traditional teaching approaches, while they were open to accepting playful elements into their learning experiences.

Our findings verify previous research conclusions regarding pupils' varying inclinations about their learning experiences, as our study emphasizes the importance of how alternative instructional methods can satisfy different learning styles and preferences. The results from the post-activity questionnaire regarding the enjoyment factor showcased moderate levels of satisfaction, as the lesson can be enjoyable in this approach but not to an absolute degree. As far as creativity and overall motivation are concerned, pupils reported a positive influence on how well they understood the lesson's topic, indicating a beneficial outcome on both elevated creativity levels and easiness to understand the topic. In general, from the pupils' responses we can conclude that there is an understanding of the supplementary material and how it can be supported in the learning process. In terms of traditional versus modern teaching methods, a significant proportion of pupils enjoyed the newly introduced method of teaching as they reported the session as being more enjoyable and engaging than the traditional way. The answers of pupils regarding the matters of autonomy in learning, increase in the working pace, and learning process were moderate to high. Although game-based elements can assist in increasing learning outcomes and promote self-directed learning, integrating new teaching methods with the assistance of technology needs to be carefully examined and implemented in the learning process to provide the outmost effectiveness and successful outcomes.

Overall, it can be inferred that the study setting indeed offers significantly improved motivation, enjoyment, sense of autonomy, creativity, and pupil interest in the learning procedure. In addition, the study indicated a moderately positive effect on pupils' understanding of the learning content and a slight preference towards the technology-based, non-traditional approach compared to traditional teaching.

6. Conclusions

The objective of this study was to evaluate the effectiveness of game-based learning, employing Kahoot! as an additional element to traditional teaching methods. Through the implementation of a post-activity survey, referring to overall interest and motivation in learning with Kahoot! and in addition to deploying the Driscoll Questionnaire, this paper seeks to investigate and uncover the potential educational benefits of Kahoot!. The focus of the study was to understand how Kahoot! influences student engagement and assessment in the learning process. The main findings showed overall satisfaction with the use of the tool by the pupils as it assisted them in the learning process and made it more entertaining. The study highlights the need to understand and incorporate techniques of game-based learning, such as Kahoot!, in order to provide pupils with the ability to better demonstrate their learning results.

In light of the fact that this is a preliminary study, the scope and applicability of the findings require careful consideration. Although the feedback that we acquired about the Kahoot! learning process was significantly positive, we plan to add quantitative results on the difference in the pupils' pre- and post-learning assessment in the future. Furthermore, given our research included a class of 6th-grade pupils, we are interested in continuing our efforts to broaden the sample with additional classes or even explore any differences that could arise with the implementation of Kahoot! in other subject areas that are part of the typical curriculum, such as mathematics and physics. Moreover, a larger sample will allow us to formulate a control group and reach quantitative and comparative conclusions.

Educational institution researchers strive to uncover new methods of learning and promote motivation. It is critical in today's setting for the educational systems to adapt in response to evolving demands and to satisfy the increasing requirements for pupils' active engagement with the learning materials. The goal was to shed light on how pupils assess the efficiency of alternative, game-based instructional materials and obtain significant insights that could impact and improve future teaching initiatives by utilizing Kahoot!, a game-based platform for evaluating students' learning and knowledge acquisition.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Research Ethics Committee (REC) of the University of Patras (application no. 14045, date of approval 26 August 2022) for studies involving humans. The committee reviewed the research protocol and concluded that it does not contravene the applicable legislation and complies with the standard acceptable rules of ethics in research and of research integrity as to the content and mode of conduct of the research.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Appendix A

Overall Interest and Motivation to Learn While Using Kahoot! (7-Item)	
Q1. On a scale of 1–5 (1 being not enjoying it and 5 being thoroughly enjoying it), how much did you enjoy today's lesson and activity? Q2. On a scale of 1–5 (1 being knew nothing about the topic and 5 being complete mastery), how well did you understand the topic before today? Q3. Did this lesson and activity help you to better understand the topic? Q3a. If YES, on a scale of 1–5 (1 being not at all and 5 being very well) how well do you feel you know the topic at hand (Introduction to Eye-tracking) now? Q4. On a scale of 1–5 (1 being not at all and 5 being a lot), how much did the Kahoot! game help you understand the material? Q5. Did you enjoy this style of learning more than a traditional lecture class? Q6. On a scale of 1–5 (1 being not at all and 5 being I love it!), how much do you normally enjoy a traditional lecture class?	Jones et al. [27]
Driscoll Questionnaire: Students' Satisfaction with the Use of the Tool in the Teaching and Learning Processes (12-Item) 1–5 Scale (Totally in Disagreement—Totally in Agreement)	
DQ1. My learning results have increased DQ2. I had fun while learning DQ3. My learning has been more autonomous DQ4. I have improved my learning process DQ5. I have worked more on my oral or written expression DQ6. I have increased my creativity DQ7. I have increased my motivation DQ8. I think learning is more active and experiential DQ9. I see more possibilities to show what I have learned DQ10. I have more possibilities to work at my own pace DQ11. I have had the facility to access the materials and contents DQ12. I have been able to self-evaluate my learning process	Curto Prieto et al. [24]

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