computers

MDPI

Article

# Augmented Reality Escape Classroom Game for Deep and Meaningful English Language Learning

**Angeliki Voreopoulou [1,*], Stylianos Mystakidis [1,2,*] and Avgoustos Tsinakos [1]**

[1] Department of Computer Science, International Hellenic University, 65404 Kavala, Greece; tsinakos@cs.ihu.gr
[2] School of Natural Sciences, University of Patras, 26504 Rion, Greece
* Correspondence: agvoreo@cs.ihu.gr (A.V.); smystakidis@cs.ihu.gr (S.M.)

**Abstract:** A significant volume of literature has extensively reported on and presented the benefits of employing escape classroom games (ECGs), on one hand, and on augmented reality (AR) in English language learning, on the other. However, there is little evidence on how AR-powered ECGs can enhance deep and meaningful foreign language learning. Hence, this study presents the design, development and user evaluation of an innovative augmented reality escape classroom game created for teaching English as a foreign language (EFL). The game comprises an imaginative guided group tour around the Globe Theatre in London that is being disrupted by Shakespeare's ghost. The game was evaluated by following a qualitative research method that depicts the in-depth perspectives of ten in-service English language teachers. The data collection instruments included a 33-item questionnaire and semi-structured interviews. The findings suggest that this escape game is a suitable pedagogical tool for deep and meaningful language learning and that it can raise cultural awareness, while enhancing vocabulary retention and the development of receptive and productive skills in English. Students' motivation and satisfaction levels toward language learning are estimated to remain high due to the game's playful nature, its interactive elements, as well as the joyful atmosphere created through active communication, collaboration, creativity, critical thinking and peer work. This study provides guidelines and support for the design and development of similar augmented reality escape classroom games (ARECGs) to improve teaching practices and foreign language education.

**Keywords:** augmented reality; game-based learning; gamification; escape room games; deep and meaningful learning; English language; EFL/ESL

check for updates

**Citation:** Voreopoulou, A.; Mystakidis, S.; Tsinakos, A. Augmented Reality Escape Classroom Game for Deep and Meaningful English Language Learning. *Computers* **2024**, *13*, 24. https://doi.org/10.3390/computers13010024

Academic Editors: Fridolin Wild, Lisa Bowers and Eleni Mangina

Received: 13 December 2023
Revised: 5 January 2024
Accepted: 10 January 2024
Published: 16 January 2024

**Copyright:** © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

## 1. Introduction

Games have significantly contributed to people's social, emotional, cognitive and physical growth over the years and provide a framework within which players focus on having fun, while interacting with others and learning through a system of rules [1]. Although a game is difficult to define, there have been attempts, which have described it as a series of interesting choices or as a situation that excludes real life and immerses the player in a new, virtual world, also called a magic circle, run according to its own rules and, therefore, allowing the freedom of action within certain boundaries and restrictions [2].

Playing games is a natural way for children to learn about the world and how to interact within it. It has been considered by psychologists as a crucial factor for a child's cognitive growth and learning [3]. The exploitation of games in an educational context is, therefore, not a new conception as they promote experiences that let students learn by doing and encourage their active participation, while fostering their motivation and interest in the content. In the field of English language education, there is a great variety of games that language teachers have resorted to over the decades, ranging from sorting and information gap games to guessing, searching and matching games. There are also board games suitable for language learning, as well as role play games [4,5].

Today students, who have been frequently described as 'Digital Natives', think and process information quite differently. Their interest and engagement is hard to sustain to a high level through traditional methods and for this reason there is an urgent need for educational innovations and ideas that will have an impact on the learning experience, such as combining educational content in a game-based context [6,7]. In this vein, escape classroom games have been widely employed by K-12 teachers and foreign language educators as a tool for experiential, peer group, game-based learning. Escape classroom games (ECGs) not only offer an engaging and action-filled experience, but they promote collaboration, communication, creativity, critical thinking, problem solving, originality and leadership skills [8].

Recent advances in technology have also influenced the structure and development of escape classroom games. In particular, AR, which has already penetrated our lives due to the impact and affordability of smartphones, has made its first steps into the design and development of ECGs. Apparently, it seems that AR and ECGs are a perfect combination. AR carefully combines real-world objects and environments with virtual elements to create a semi-realistic world that skillfully entices learners through immersive adventures that require their participation in a series of challenges, based on an imaginary storyline [9]. These challenges usually include puzzles, riddles and the decoding of secret messages in a limited timeframe. Mobile devices with AR applications enrich the environment with augmentations and allow for a stronger effect on team building, communication and learning outcomes [10].

Although several researchers have experimented with using new technologies for educational escape rooms [11], there are not many developers involved in this process and not much research has been conducted either on how to create such ARECGs, or on their long-term impact on learners' progress and on teachers' perspectives toward them. Additionally, not all subject matters are being explored equally. For instance, there seems to be more literature on chemistry and science [12–16], and much less on history, social studies and language learning [17,18]. For this reason, the primary focus of this work is the design, development and evaluation of a novel ARECG for deep and meaningful English language learning, called 'LockED in ShakespeARe's Globe Theatre'.

## 2. Theoretical Background

### *2.1. Deep and Meaningful Learning*

Deep learning is defined by an innate interest in and active engagement with a discipline in an effort to understand its underlying principles and connect it with pre-existing ideas and knowledge [19]. The term "deep learning" derives from studies conducted by Craik and Lockhart [20], who studied the processing stages of cognitive tasks, and by Marton and Säljö [21], who investigated methodologies used when performing cognitive tasks. Their studies led to the conclusion that students who take a surface approach tend to store superficially isolated facts without delving deeper into them. On the other hand, students who undertake a deeper approach to their learning and try to connect new information with their existing knowledge and beliefs seem to [8] gain long lasting, beneficial learning [22]. In other words, when learners adopt deep learning techniques, they take charge of their education and they strive to understand the material and the learning process itself, connect it to prior knowledge and transform their inner self, as it can result in a profound alteration of what they already know [21]. Meaningful learning further rejoins the interrelated ideas of studying, learning and teaching [23]. According to Ausubel (1961), meaningful learning derives from deductive reasoning and when the new information is related to prior knowledge [24]. Learners are at the center of the learning process and teachers are the facilitators, who provide inquiry and problem-solving tasks that in turn enable learners to identify and analyze new concepts and connect them with existing ones. Educators, who endeavor to provide quality educational experiences to learners, should design and organize their lessons based on the following characteristics: active, constructive, intentional, authentic, cooperative, or relational [25]. The social aspect

of peer cooperation is of particular importance, as confirmed by activity theory [26]. The concepts of deep learning and meaningful learning have been used together under the term 'Deep Meaningful Learning' as they pose important similarities and they can uplift the traditional educational world, with direct implications on how to combine theory and practice for the learners' benefit [27–29].

### 2.2. Game-Based Learning and AR in Education

Deep meaningful learning can be promoted through playing games, as its underlying principles can be found in game-based learning (GBL). GBL refers to an environment where game activities and play include problem-solving scenarios and challenges that give players or learners a sense of accomplishment, while also enriching their knowledge and promoting skills acquisition [30,31]. AR, which enriches the real world with additional information in the form of digital elements like images, texts or videos by superimposing them on real objects [32], can have applications in all levels of education, including early childhood and primary education [33], as well as secondary and higher education [34,35]. Over the last two decades, attempts have been made to provide insights into the strengths of AR in regard to the pedagogy of teaching English as a foreign language. Recent research has closely examined the effect of AR on students' motivation and engagement and found that it was greatly increased [36]. Studies have also demonstrated that AR increased learning performance and positive attitudes towards language learning [37–39], as well as high levels of word retention and vocabulary development [40–43]. Another significant advantage of AR over any other educational tools is that it allows for authentic, meaningful communication and interaction among peers and their teachers in the target language, based on real-life situations [44].

The combination of AR and GBL can be unique and extremely beneficial for the learners, the teachers and the learning environments, given their distinctive features and affordances. Throughout the literature, motivation and enhancement of the learning experience seem to be the two key components of ARGBL, which eventually result in increased interaction, greater participation and better collaboration among the participants [45–47]. Additionally, improved learning performance and positive attitudes toward learning on behalf of the learners has been noted [48–53].

Escape rooms, a fresh and popular leisure activity, have influenced many creative teachers worldwide, who have easily adapted them for the purposes of their teaching practices. The combination of AR and educational escape games has brought about a new type of game that bears all the affordances of AR advanced technology, GBL and of trending educational escape games. Although there have already been a few studies that have examined the potential benefits of ARECGs in a variety of disciplines, ranging from astronomy [54], chemistry [12–14,16], science [15], cultural heritage [55,56], computer science [57] to its introduction to libraries [10], there seems to be gap in the literature regarding how AR combined with ECG can enhance deep and meaningful foreign language learning. "LockED in ShakespeARe's Globe Theatre" differs from related work and aspires to provide innovation in the field of ARECGs, because it is weaved around a storyline that combines language practice through reading, listening, note taking and deciphering messages. Thus, it offers a context for language use, making the learning process more meaningful and applicable. Additionally, the game's cooperative team play element and flexible post-game reflection and collaborative activities contribute to a learner-centered, immersive language learning experience, which also supports raising cultural awareness. Last, but not least, the integration of AR technology with a carefully chosen AR platform, ARTutor4, adds to the game's accessibility, being user friendly, both for educators and students without extensive IT skills.

The evaluation of an ARECG for deep and meaningful foreign language learning, especially designed for the needs and purposes of this study, was conducted, while taking into consideration in-service English language teachers' views and perceptions on the topic. In that view, this study strove to answer the following research questions:

1. What are in-service English language teachers' perspectives on ARECGs as a useful pedagogical tool that enhances deep and meaningful foreign language learning?
2. What are the benefits of an ARECG for students' foreign language learning development, according to teachers' perceptions?
3. To what degree does an ARECG increase students' motivation and satisfaction toward foreign language learning, according to the teachers' views?
4. To what extend are in-service English language teachers willing to use ARECGs in their future teaching practices?

## 3. Materials and Methods

### *3.1. Design of the AR Escape Room Game*

Based on the current literature and with the purpose of addressing any gaps, an ARECG called 'LockED in ShakespeARe's Globe Theatre' was designed and developed in the context of the MSc in Immersive Technologies at the International Hellenic University, a fully online postgraduate programme in the English language, focusing on innovation in education, training and game design. The main purpose of the escape room game was to promote deep meaningful learning and at the same time to improve the current curricula, to offer additional language practice to A2 CEFR level English language learners, to increase their cultural awareness and to integrate augmented reality and game-based learning in the context of the EFL. Figure 1 depicts the features and the stages of the ARECG, which were designed using the escapED framework. It specifically addresses teachers' interests and it applies to instructional design [58].

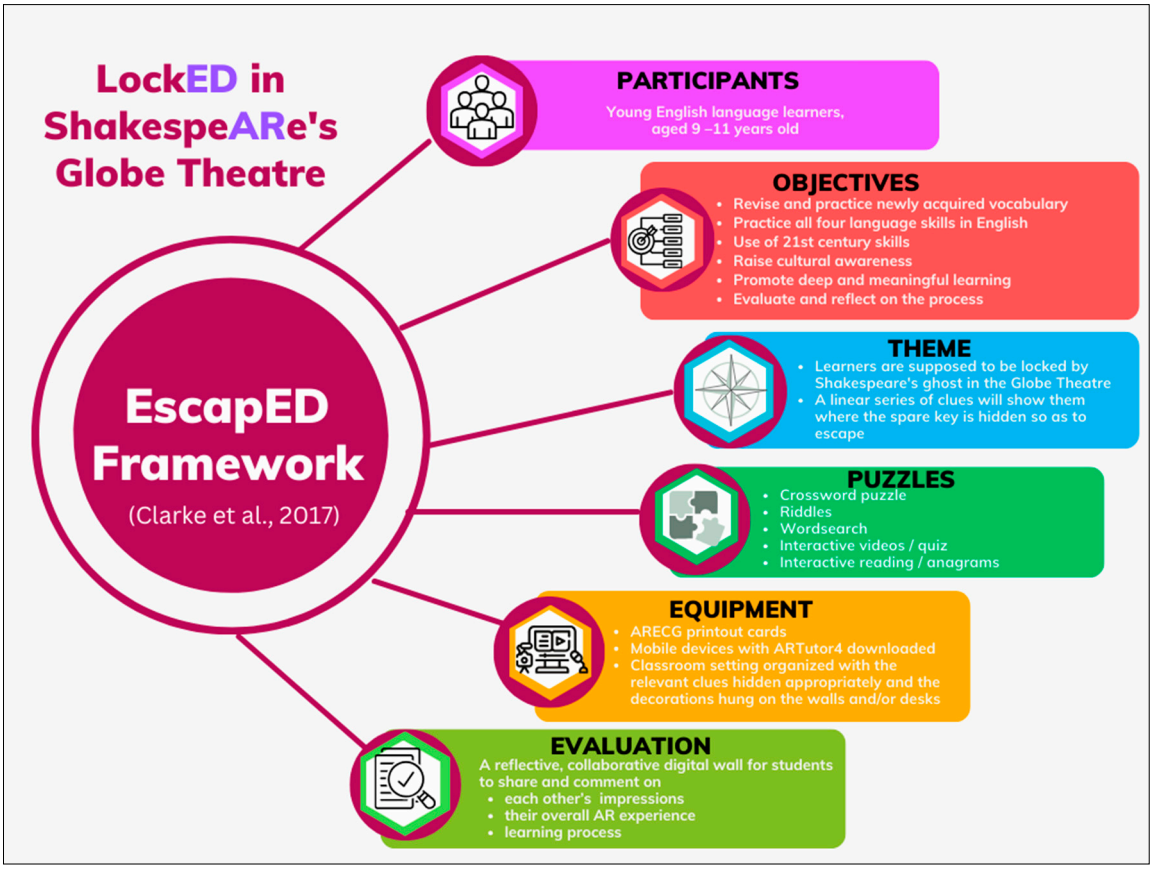


**Figure 1.** The escapED framework used for the purposes of 'LockED in ShakespeARe's Globe Theatre' [58].

As soon as the game participants were chosen, there was an emphasis on pinpointing the objectives of the game and the theme, which must be suitable for the learners' age group.

Following that, the types of puzzles were selected, so as to provide further opportunities for language practice and to help learners smoothly transit from one clue to the other. The game comprises of 15 cards, which are enriched with 16 augmentations that include images; interactive videos; auditory and interactive reading augmentations; language games like crosswords, word searches and riddles with puzzles; 3D models and links that contribute to both the game's overall evaluation and its flow. There is also a printed version of some half-written notes made by Shakespeare's ghost that the students have to fill in while listening to his talking avatar. The next step involved the choice of equipment, with a particular emphasis on choosing the most appropriate AR platform. ARTutor4 was selected, among other options, to build this educational intervention for A2 CEFR level school children for a number of reasons (Figure 2).

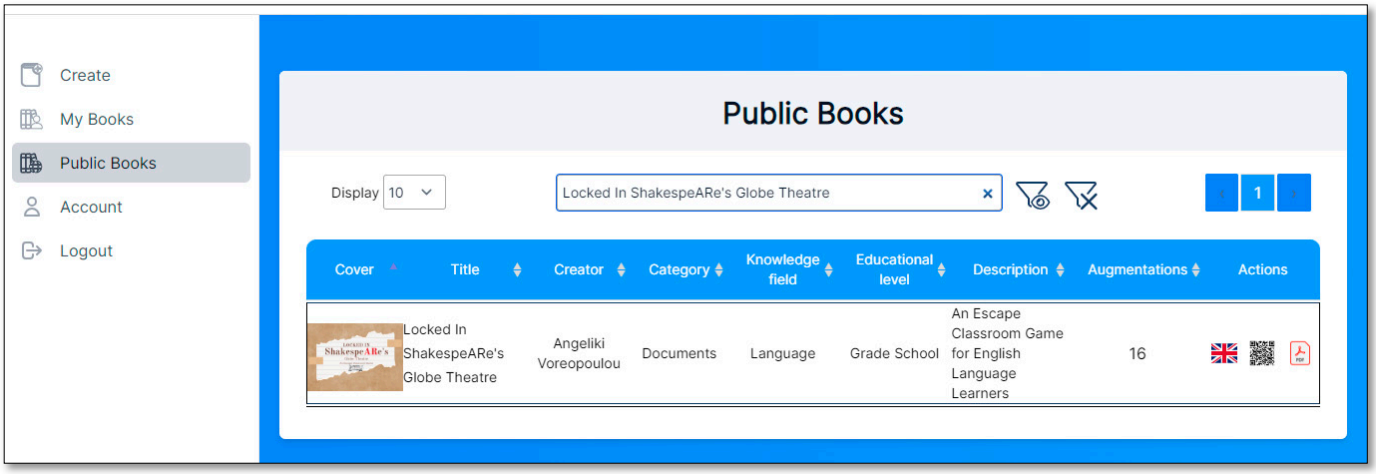


**Figure 2.** The ARECG on ARTutor4.

Firstly, it has a solid reputation among educators, and it has already accommodated numerous instructional interventions in a wide range of disciplines, as well as in the English language teaching (ELT) field. More specifically, ARTutor4 was recently employed for an educational intervention focusing on the improvement of students' critical digital skills in the Content and Language Integrated Learning (CLIL) context, in an empirical study by Lazou and Tsinakos [52]. ARTutor4 is also incredibly simple to use and does not require extensive IT abilities of the educators, who did not have any programming or computational skills. It consists of a mobile application and a web-based AR creation tool that allows users to interact with augmentations, such photographs, audio, 3D models and embedded links [59]. Finally, the game evaluation was selected. A collaborative, digital wall would be ideal for the learners to share and comment on each other's ideas and impressions on their overall learning progress and their ARECG experience.

#### 3.1.1. The AR Escape Room Game Narrative and Learning Experience

The game begins with the players being welcomed at the classroom door by their teacher, who gives each one of them a ticket for an imaginative guided tour for the Globe Theatre in London. Players have to speak in English and use the information printed on their tickets (e.g., the time of the guided tour, the meeting place, the name of the tour guide) in order to find the rest of the group members and to form their team. The game is designed to accommodate two teams of four to five members each. They meet at different classroom spots; they use their mobile devices to scan the tickets in order to access the first augmentation, which consists of an auditory extract. It is the voice of their prospective tour guide informing them that Shakespeare's ghost has locked them in the Globe Theatre, but luckily there is a spare key somewhere in the theatre. The tour guide sets the mission of the game, which is to find the missing key. S/he concludes by saying that the answers are in the students' hands, thus encouraging them to take further action with whatever they hold

in their hands, i.e., their ticket and their mobile devices. There follows a variety of AR clues and messages, which will guide learners to different classroom areas in order for them to find the next clue, which will bring them closer to escaping. During their mission, players must read (Figure 3), listen (Figure 4), keep notes and decode messages, as well as work quickly and cooperatively, while using their critical thinking skills, if they want to stand a chance of finding the hidden key and escaping from the Globe Theatre.

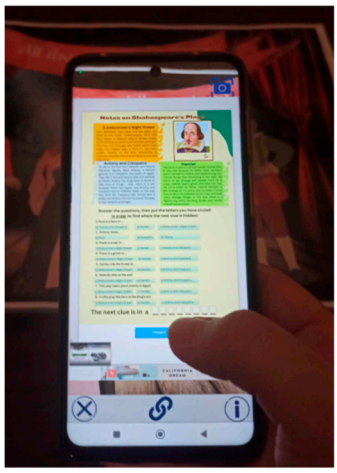

**Figure 3.** An interactive reading passage.

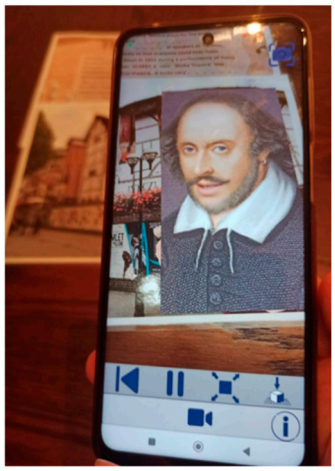

**Figure 4.** Shakespeare's talking AI avatar.

Each clue introduces different content and cultural elements of the life and work of Shakespeare and, at the same time, it provides opportunities for practicing language skills in English. The classroom should be divided into two sections and the players should be informed of their designated playing area. Both teams receive the same clues and messages, which they look for in that specific classroom space. One clue leads them carefully to the next one and there is no danger of overriding from one to the other. In particular, 'LockED in ShakespeARe's Globe Theatre' follows a sequential organization method [60], because game participants are asked to solve one puzzle at a time, the answer of which will reveal the following clue in the sequence, until they reach the final puzzle and find the key that they had been looking for in order to manage their escape and win the game (Figure 5).

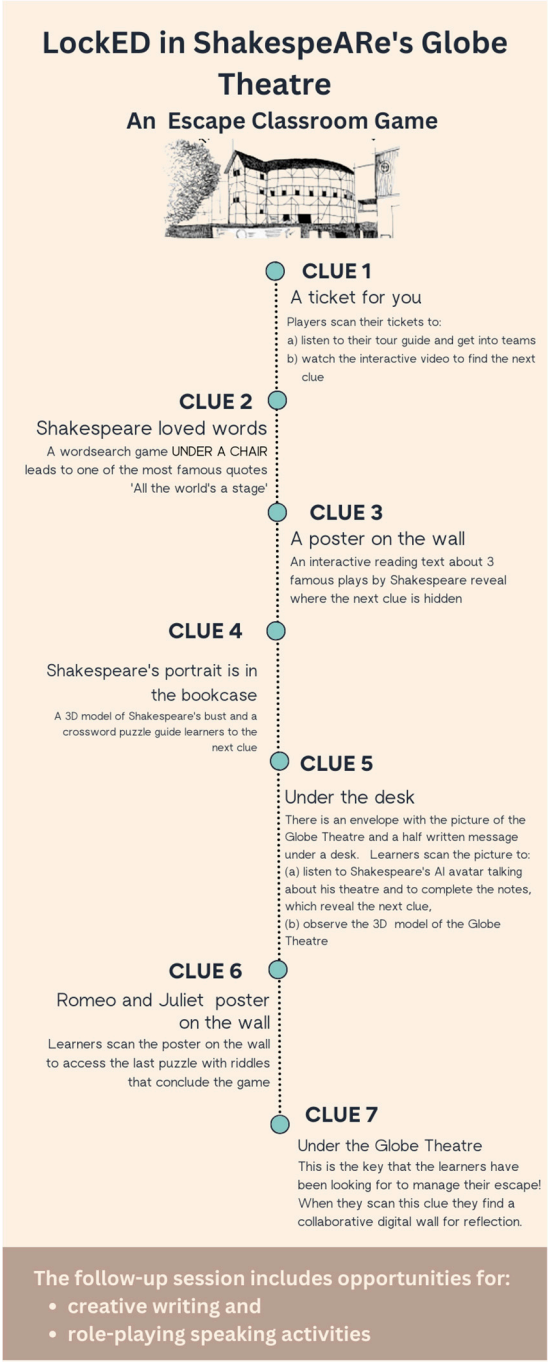


**Figure 5.** The linear organization of the ARECG.

The post-game, follow-up session provides players with the chance to collaborate on one or more activities of their choice depending on their needs and interests, ranging from creating their own guided tour, acting out the experience of interviewing Shakespeare's ghost, to writing about their adventure in the Globe Theatre in the form of an article or an email, before assessing their overall AR experience via a collaborative digital wall.

### 3.1.2. AR Escape Room Game Development

For the implementation process of the whole ARECG experience, the ADDIE (analysis, design, development, implementation and evaluation) model was chosen, as it is a pertinent tool, which has received positive comments due to its effectiveness, in recent literature related to designing AR interventions in the EFL context [61]. The multimodal AR elements

of the game aspire to offer a rich experience with opportunities for deep and meaningful learning, while practicing all four skills in the English language and raising cultural awareness. The extra factor of urgency and competition among the teams encourages learners to finish the tasks as quickly and as effectively as possible. Peer feedback and assistance are also important, so as to keep away from mistakes that prevent their team from locating the next clue.

During the process, the learners are actively engaged in a variety of tasks that are supported by a range of tools. These tasks are carefully chosen, so as to cater for the different learning needs, styles and abilities of the participants. In other words, the puzzle activities try to be inclusive and to allow learners at various levels of English language proficiency to participate and contribute to the extent they can and to enjoy the benefits of an ARECG. On the contrary, the educators take a more active role before the game regarding its organization. During the game, their role is limited to that of an observer. Even if the learners face difficulties, they are not supposed to give answers, but to help the learners think about how to use the clues given to them. The approximate time required for game completion is 45 min, while the reflection and follow-up activities could last for another one to two teaching sessions.

### 3.2. Methods

For the ARECG evaluation, in-service English language teachers' views were explored after experiencing 'LockED in ShakespeARe's Globe Theatre' in real-world settings. Any cutting-edge learning innovation should take seriously into consideration teachers' attitudes and perspectives towards it [62], which are influenced by the perceived flexibility of the suggested medium, as well as by its ability to inspire learners and create the framework within which unbiased learning can take place. Teachers are usually the first ones to either accept and introduce teaching innovations into their classrooms, or to have ambivalent thoughts about them and, finally, deny using them in their teaching practices [63]. The main research tools at this stage of the evaluation were a 33-item questionnaire and some semi-conducted interviews. Four game sessions were organized on different days and locations over the summer period of 2023, so as to accommodate teacher availability. Small groups of teachers were, firstly, introduced to the concept of ARECG and then they were helped to download ARTutor4 and to familiarize themselves with it, if that was necessary. After the game session, the teachers completed a 33-item questionnaire adapted from the relevant literature, presenting validated survey instruments [62,64]. The particular survey instruments were chosen, among others, because they are compatible with the principles of deep meaningful learning due to their emphasis on active engagement, constructive and intentional learning, the provision of authentic learning experiences and a positive learning environment. The questions were adapted according to the purposes and the characteristics of the present study and enriched with some further aspects concerning the participants' demographics, the overall experience and their future intentions in relation to introducing an ARECG into their teaching practices. The items were all in English, as the participants are proficient English language speakers (Table 1).

**Table 1.** The questionnaire items regarding the teachers' ARECG experience and perceptions.

| Item | Description | Source |
|---|---|---|
| | Demographics | |
| 1. | Gender | [62] |
| 2. | Age group | |
| 3. | Years of teaching experience | |
| 4. | Occupational service level | |
| 5. | How familiar are you with augmented reality? | |
| 6. | How familiar are you with escape classroom games in general? | |

**Table 1.** *Cont.*

| Item | | Description | Source |
|---|---|---|---|
| | | Your ARECG experience | |
| 7. | | Did you manage to finish the game on time? | |
| 8. | | How much time did it take you? | [62] |
| 9. | | Did you face any technical difficulties? | |
| | | Delving deeper into the ARECG experience | |
| 10. | | The level of difficulty of the ARECG puzzles is suitable for A2 CEFR level English language learners | |
| | C1 | Perceived enjoyment | |
| 11. | | Playing this ARECG is an enjoyable activity | [62] |
| | C2 | Motivation | |
| 12. | | The ARECG is fun to be involved in | [62] |
| 13. | | This ARECG can be described as very stimulating | [65] |
| 14. | | After trying this ARECG for a while, I felt pretty competent | |
| | C3 | Cognitive benefits | |
| 15. | | This type of ARECG enhances receptive and productive language skills in English | |
| 16. | | This type of ARECG allows for easier memorizing of new content | |
| 17. | | This type of ARECG enables the effective application of the material learned | [65] |
| 18. | | This type of ARECG facilitates a better analysis of the problems | |
| 19. | | This type of ARECG promotes autonomous learning | |
| 20. | | This type of ARECG enhances active learning | |
| 21. | | This type of ARECG increase learners' attention span and concentration levels | |
| | C4 | Perceived learning | |
| 22. | | A lot of factual information related to the main topics of the ARECG have been learned | |
| 23. | | The key ideas presented in the materials are thoroughly comprehended | [65] |
| 24. | | The learning activities were authentic and purposeful | |
| 25. | | The activities in the ARECG boost language learners' confidence in English | |
| 26. | | There were opportunities for reflection and drawing of conclusions | |
| | C5 | Satisfaction | |
| 27. | | I was satisfied with the ARECG experience | |
| 28. | | I was satisfied with the teaching method adopted in this type of ARECG | [65] |
| 29. | | I was satisfied with the ARECG learning environment | |
| 30. | | I was satisfied with the overall learning effectiveness | |
| | | Teachers' future intentions | |
| 31. | | Would you be interested in organizing an ARECG in your class? | |
| 32. | | Would you create an ARECG by yourself for your students? | |
| 33. | | Would you be interested in learning how to make an ARECG for your students in the future? | |

After the completion of the questionnaire, the teachers participated in semi-structured interviews in order to further elaborate on the questionnaire answers and expand on their ARECG experience with comments and specific examples (Table 2).

This kind of interview provided the interviewees with the opportunity to discuss their answers freely and to exchange ideas, therefore offering a wide range of replies. There were instances when one person complemented the other's responses, thus resulting in more reliable and trustworthy records [66,67]. The researcher facilitated the interview by posing open-ended questions and encouraging dialogue among the participants in a friendly and relaxing atmosphere. The interviews followed the recommendations for conducting successful interviews [68] and were geared toward active listening without interruptions. Additionally, all participants had sufficient time to elaborate on their thoughts and impressions.

**Table 2.** Interview items regarding the teachers' ARECG experience and perceptions.

| Item | Description |
|---|---|
| 1. | How experienced are you with AR? |
| 2. | How experienced are you with escape classroom games? |
| 3. | How would you describe your LockED in ShakespeARe's Globe Theatre experience? Please elaborate. |
| 4. | What were the ARECG's strong points in terms of the students' emotional/social/cognitive development? |
| 5. | Would you consider using this ARECG in your class? Why? Please be specific. |
| 6. | What would you add or eliminate from the game? Please be specific and explain. |
| 7. | Would you like to make any further comments? |

## 4. Results

The processing of the primary data followed descriptive analysis, with an attempt to make correlations between the different variables of the sample population and to draw some conclusions, respectively. Secondly, the data derived from the teachers' semi-structured interviews were transcribed and went through thematic analysis with coding techniques, which revealed key concepts and patterns from the participants' responses. These key concepts were compared and contrasted across the participants in order to find similarities or differences in the participants' perspectives and attitudes towards the ARECG. The conclusions from the different data sources were compared with each other in order to gain a comprehensive understanding of the game's impact on the teachers' experience and attitudes in light of the research questions. All sources of data provided a detailed and in-depth overview and evaluation of the game's effectiveness and suitability for deep and meaningful English language learning.

### *4.1. Demographics*

The participants in this ARECG evaluation were ten in-service English language teachers working in K-12 education in Thessaloniki, Greece. All of the participants were female, with the majority of them being considered as middle aged, something that perfectly aligns with the structure of the present educational system and the fact that most of them work at the primary level of education (Figure 6).

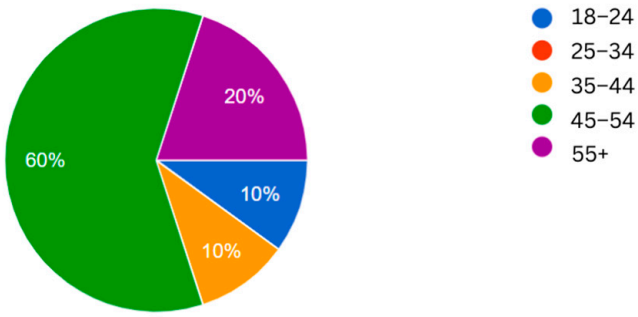


**Figure 6.** Participants' age group.

Nevertheless, this sample of participants seems to have a large amount of teaching experience, which guarantees that they are well informed about the current English language learning curriculum in a Greek state school and the available course materials for each level (Figure 7).

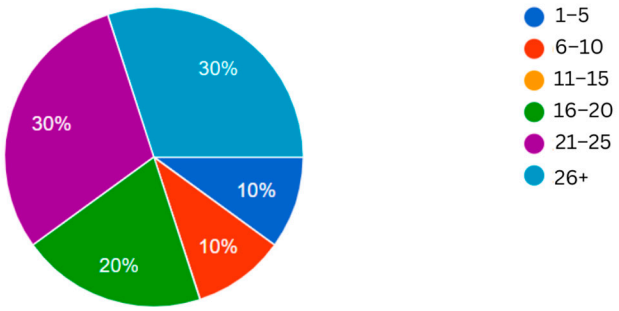


**Figure 7.** Participants' years of teaching experience.

### *4.2. Evaluation of the Experience*

Regarding their experience with AR, it seems that the majority of teachers had a relatively low level of familiarity (Figure 8).

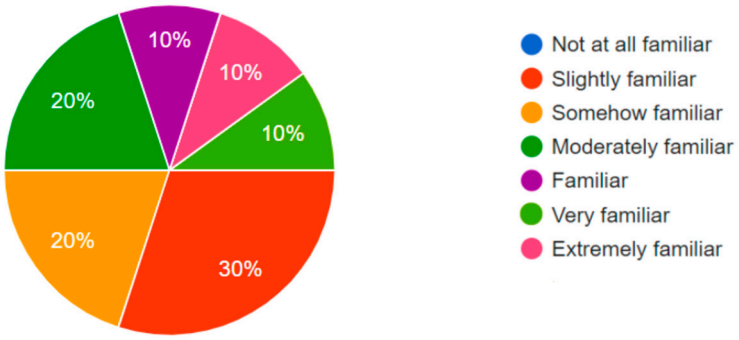


**Figure 8.** Participants' familiarity with AR.

In terms of their familiarity with escape games, there was a diverse range of responses from the teachers. Approximately half of them reported low levels of familiarity, whereas the rest of them were more comfortable with escape games because they had first-hand experiences. All of the participants managed to finish the game on time and 40% of them encountered some kind of technical problem. Although these issues were easily resolved by sharing spare devices, they did affect the game completion time (Figure 9).

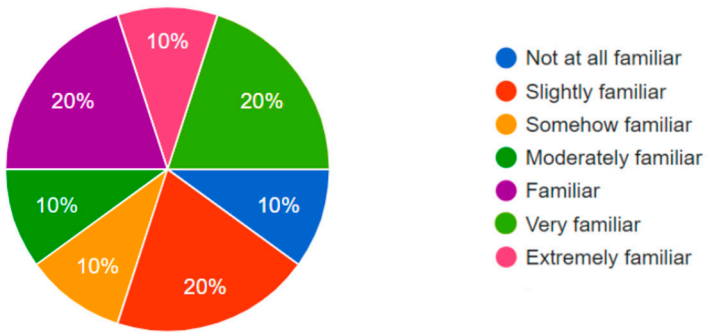


**Figure 9.** Participants' familiarity with ECGs.

The heterogeneity of the participants' familiarity levels both with AR and escape games is reflected in the time for game completion, which ranged from 15′ to 25′+ (Figures 10 and 11).

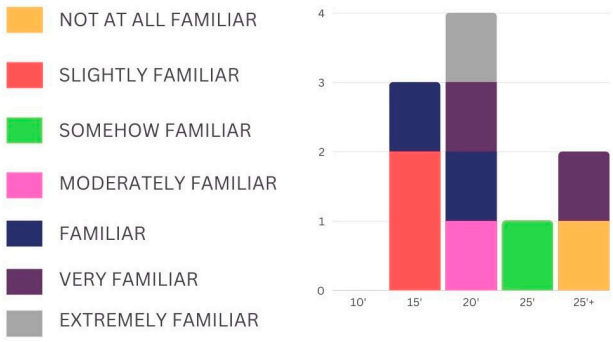


**Figure 10.** Participants' familiarity with ECGs and time of game completion.

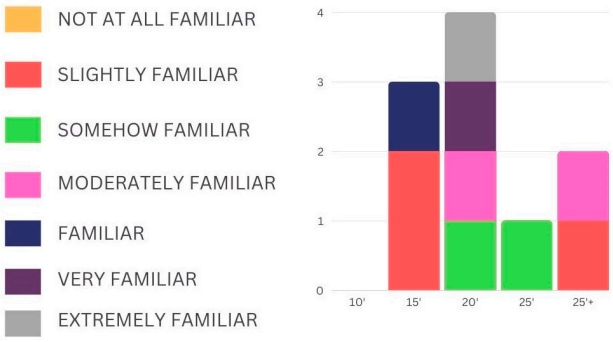


**Figure 11.** Participants' familiarity with AR and time of game completion.

Although, we cannot draw any conclusions or make any valid correlations between the levels of familiarity with AR or escape games and the time of completion of the game, mainly due to the limited sample of participants, it is encouraging that all participants managed to finish the game on time. This fact also implies that the ARECG is user friendly and suitable for all levels of familiarity with AR and ECGs.

The teachers' played the game as if they were A2 CEFR level students learning English. Their teaching experience and familiarity with the topic helped them understand that the level of difficulty of the puzzles was suitable and nicely balanced for the requirements and demands of the target group (Figure 12).

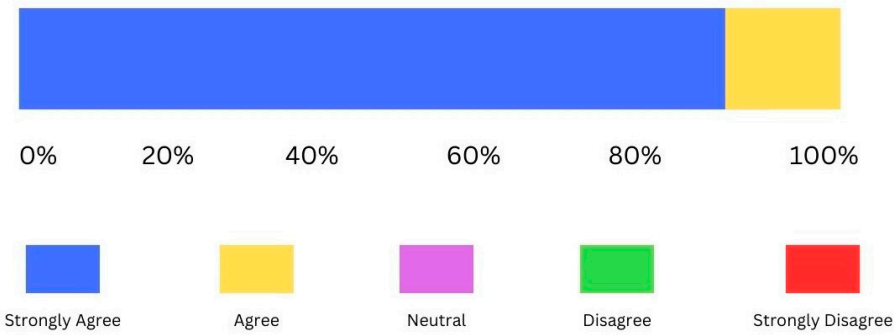


**Figure 12.** ARECG's suitability for the level of English language learners it is intended for.

### *4.3. Evaluation of Perceived Enjoyment, Motivation, Cognitive Benefits, Perceived Learning and Satisfaction*

The teachers' perceptions towards the ARECG were very positive. The first construct (C1) explored the level of enjoyment felt by the participants when involved in the ARECG. The majority of teachers (90%) strongly agreed that it was an enjoyable activity, a result that can be attributed to the pleasant and playful AR environment (Figure 13).

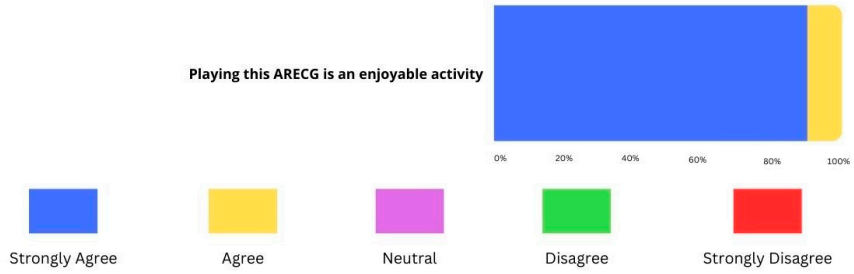


**Figure 13.** Construct 1: perceived enjoyment.

The same percentages applied to the second construct (C2), which reflected the motivation factors regarding fun and stimulation that the participants had experienced while participating in the ARECG (Figure 14).

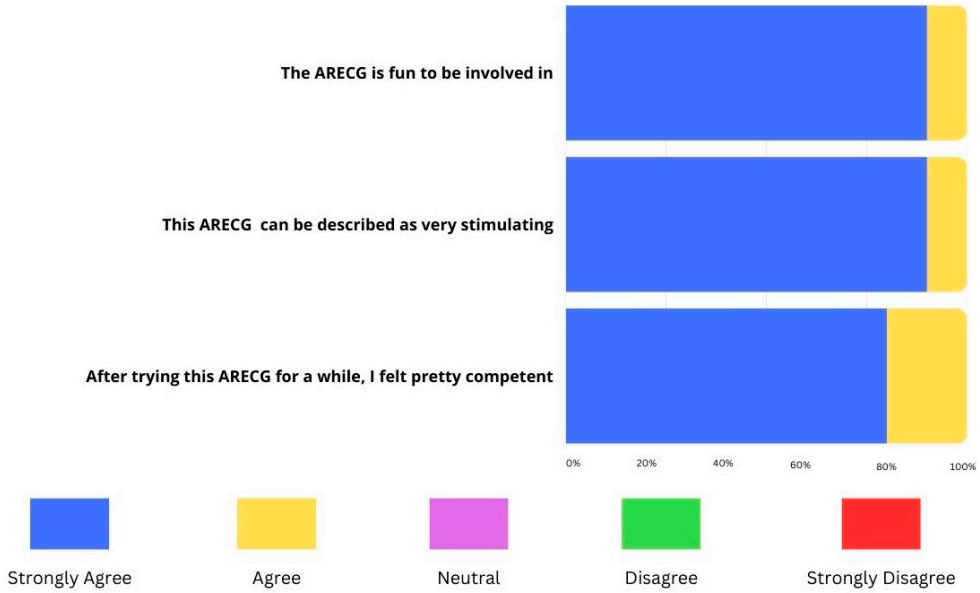


**Figure 14.** Construct 2: motivation.

The third construct (C3) examined teachers' perceptions of the cognitive benefits of the 'LockEd in ShakespeARe's Globe Theatre', which proved to be very promising and favorable, as 100% of the participants strongly agreed that the game enhances receptive and productive skills in English and that it promotes active learning. Similarly, the majority of teachers strongly agreed that it also promotes autonomous learning, better memorization of content and that it facilitates a better analysis of the problems posed. In the same vein, the largest percentage of teachers strongly agreed that the ARECG increases the learners' attention span and concentration levels, and that it enables the effective application of the material learned (Figure 15).

The fourth construct (C4) explored the learning effectiveness of this innovative approach. In particular, 100% of the teachers strongly agreed that the key ideas in the materials were thoroughly comprehended and the activities used in the ARECG were authentic and purposeful, whereas 90% of the teachers strongly agree that the game is suitable for autonomous learning. The teachers also found that this ARECG boosts learners' confidence in English and that it provided them with opportunities for reflection and the drawing of conclusions (80% strongly agreed). Finally, it should be mentioned that a large percentage of the teachers who played the game strongly agreed that 'LockED in ShakespeARe's Globe Theatre' will help students learn a lot of factual information related to Shakespeare's life, plays and the Globe Theatre (Figure 16).

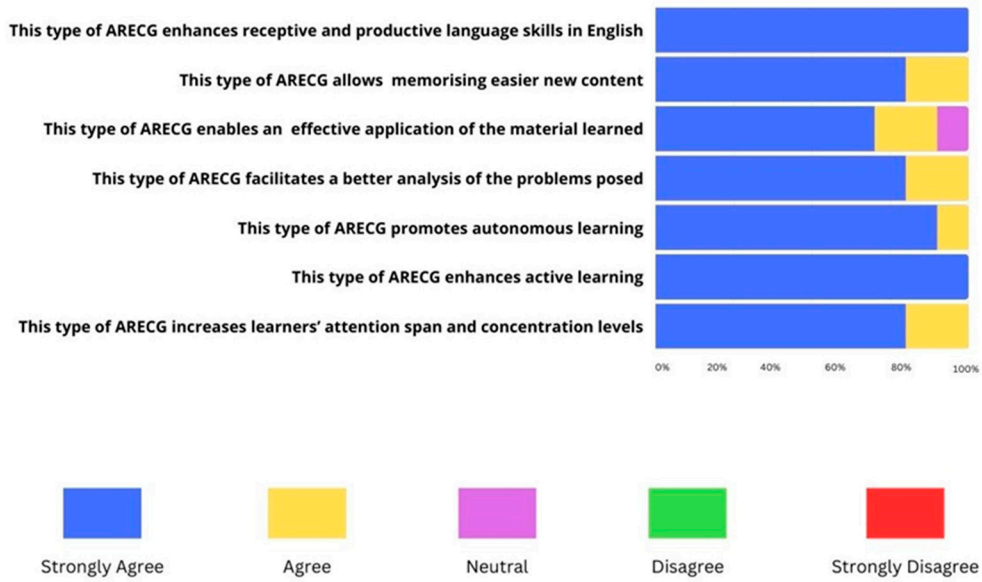


**Figure 15.** Construct 3: cognitive benefits.

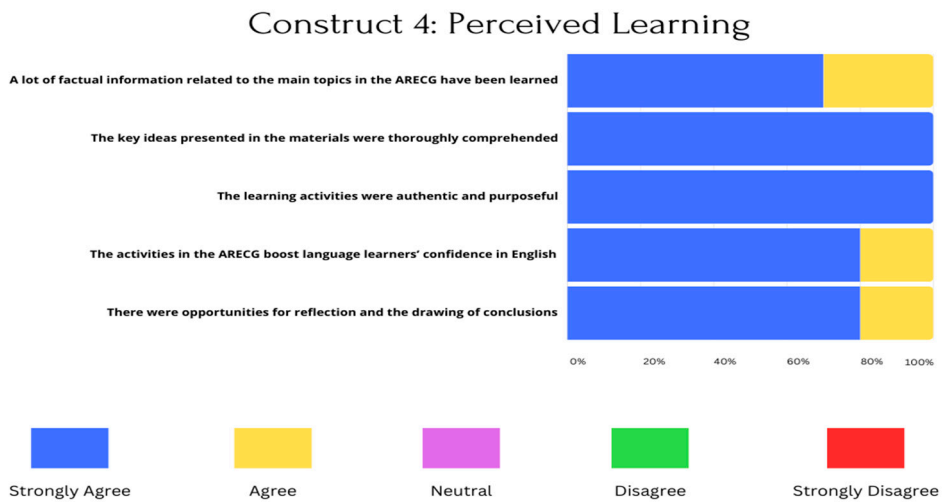


**Figure 16.** Construct 4: perceived learning.

The fact that educators revealed positive perceptions throughout both constructs (C3 and C4) allows us to draw the conclusion that they understood the distinctive advantages and pedagogical value of this alternative approach.

The last construct (C5) examined the degree of satisfaction the teachers felt after game completion. The results were remarkably high, as all of the teachers strongly agreed that they were satisfied with the ARECG experience and the learning environment. Similarly, almost all teachers strongly agreed that they were satisfied with the teaching method adopted in the game and the overall learning experience (Figure 17).

Enjoyment, motivation and satisfaction are thought to be highly related behavioral attributes that influence people's interest in participating in a process and their resilience in achieving the desired goals. The responses provided in these statements were generally consistent with those in C1 and C2 (perceived enjoyment and motivation), which reveals that the participants had a pleasant and memorable experience, despite the few easily resolved technical problems encountered by some of them.

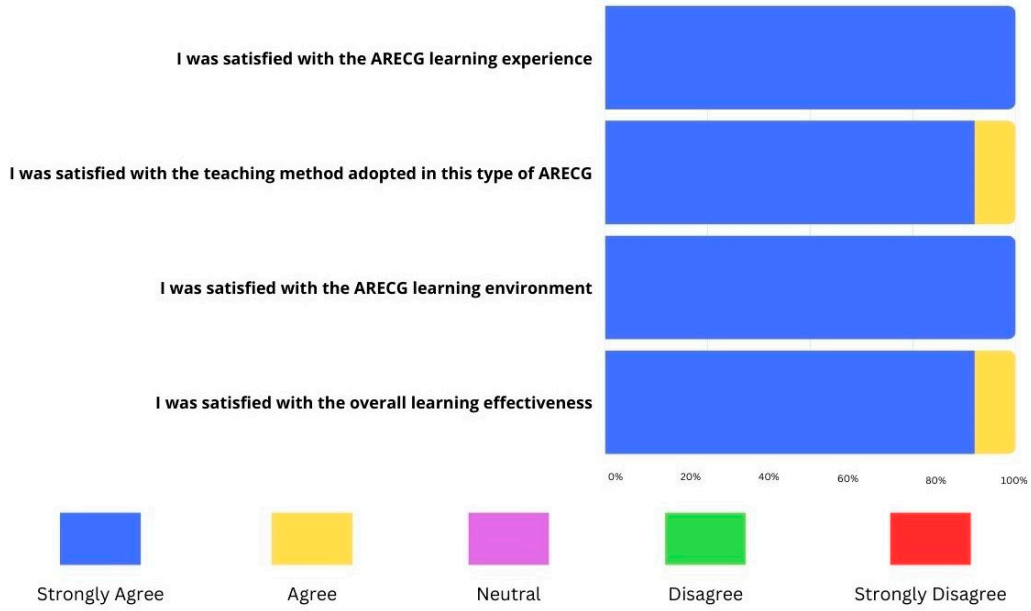


**Figure 17.** Construct 5: satisfaction.

### *4.4. Teachers' Future Intentions in Relation to ARECG Adoption*

Teachers' future intentions in relation to introducing ARECGs in their teaching practices were also very encouraging, as the vast majority would love to organize such a type of game in their class and they would also like to try to create one themselves. It is also quite remarkable to note that all of the teachers who participated in the ARECG strongly agreed that they would like to take part in some kind of teacher training in order to learn how to design ARECGs and to implement them in their classes (Figure 18).

**Figure 18.** Teachers' future intentions in relation to ARECG adoption.

### *4.5. Teachers' Interviews*

The semi-conducted interviews took place in a friendly and relaxing atmosphere after the end of the game in order to avoid all their emerging feelings, thoughts and emotions fading away. The participants were prompted by questions that reflected the questionnaire.

The interviews began by commenting on previous AR experiences and revealed that none of the teachers had ever participated in or created an ARECG.

Participant 1: "I have played with my students some escape classroom games in classroom. But mainly digital ones, not AR".

The participants' remarks provided encouraging feedback in relation to how satisfied they were with the learning experience, the learning environment, the effectiveness of the

game and the teaching methods applied to it. The participants enjoyed the game's immersive and interactive nature. They considered it productive and stimulating, and they were impressed with the invaluable learning experiences it can provide in the classroom context.

Participant 2: "It is tremendously enjoyable because it retains attention to the very end through a wide range of carefully planned interactive activities".

Participant 3: "It was brilliant".

Participant 4: "I wish I could do it every day. It's really fun. The worst thing is that it finished".

Participant 5: "It was fascinating and we always had something to look forward to. That was full of mystery and we liked it a lot".

The teachers' overall comments on the ARECG's strong points in terms of the students' emotional, social and cognitive development were enlivening, with a focus on student cooperation, collaboration and communication while completing the game tasks.

Participant 6: "Even shy students can participate and contribute to the game because they get help from their team".

Participant 7: "It boosts students' confidence since they find clues during the game".

Participant 8: "It promotes cooperation among group members who have to work together to get the clues".

They highlighted the ARECG's positive impact on the learning outcomes and on the fact that students are engaged with tasks in close relation to the topic of the game. They pinpointed that the well-designed structure of the game allows for scaffolding and supports active learning and meaningful participation. Moreover, the teachers agreed that the game has good potential to boost English language performance because there is ongoing vocabulary practice. Language skills like reading, listening and speaking are also practiced during the game and there are several opportunities for students to hone their writing in the follow-up sections.

Participant 9: "Learners learn a lot and improve their listening, reading and speaking skills through a great variety of tasks".

Participant 10: "They will definitely learn and remember the new words".

Participant 1: "Good scaffolding of the activities".

Further remarks by the participants suggested that the ARECG provided an optimal learning environment and an effective teaching method with activities that are well aligned with the curriculum, addressing the topic of Shakespeare's work and life in a comprehensive manner and providing an alternative and engaging learning approach. Learners' social involvement through the interactive activities and the use of technology was another favorable comment related to the ability of the ARECG to create an excellent environment for learning.

Participant 2: "I think that it perfectly fits our curriculum and the topics that our book covers. And also I think that it is a great chance to make something out of the book. Something totally different from what students are used to".

Participant 3: "They feel stimulated when they have to do with technology and they also feel socially engaged because they interact more or less all the time, in many ways".

Participant 4: "Learners gain cultural awareness as they learn facts about Shakespeare and his work".

Participant 5: "There are activities for all students to contribute".

Furthermore, the teachers also highlighted the chances provided to the learners to draw conclusions and to receive feedback during play time and after it had ended. They mentioned the flexible follow-up activities that encourage learners to critically review their experience and to exchange their views on it with their peers.

Participant 6: "The follow-up, the reflection. Very flexible".

Additionally, it has to be noted that the teachers' comments show a genuine interest in ARECGs and more specifically in 'LockED in ShakespeARe's Globe Theatre' because their firsthand experience allowed them to envisage the game's impact on their students' English language learning performance. Moreover, they all mentioned their need for some

serious training on the matter and they agreed that they would be interested in attending a seminar or a workshop in the near future.

Participant 6: "I would 100% consider using it. I think it was excellent".

Participant 7: "We need training but it's something that can be done. It's not something over-ambitious".

Also, the teachers stressed the importance of having a strong WiFi connection at schools and compatible, available devices.

Participant 3: "Always have a plan B and printed materials with you not to ruin the lesson".

Participant 4: "I'm a bit worried as to the number of tablets or mobile phones that are available. There are not many".

Last, but not least, it was noticed by several teachers, the need for an introductory unit that students can always refer back to, as students quite often tend to forget what the teacher has explained to them or they do not pay attention at critical moments. In this way, learner autonomy will be enhanced, and the game can be used in flipped classrooms, it can be assigned for self-study or as useful material for remote teaching.

Participant 10: "I think you need an introduction of some kind. A video or an audio message. Children don't always listen to us, do they?"

## 5. Discussion and Conclusions

### *5.1. The ARECG as a Useful Pedagogical Tool That Enhances Deep and Meaningful English Language Learning*

Based on the pertinent literature and the key findings emerging from the teachers' perspectives on 'LockED in ShakespeARe's Globe Theatre', it seems that this ARECG bears a wealth of deep and meaningful learning characteristics.

(a) Active engagement

One of the key findings, which highlights the impact of the ARECG immersive experience on the learners, is their active engagement. All of the teachers who evaluated the game, commented positively on the fact that the game enhances active learning. Indeed, as the game progresses, the learners receive feedback that leads them to the next clue, which in turn requires their active participation in order to be solved. Enthusiasm and anticipation, active physical movement and constructive thinking are also required if learners wish to find the clues and win the game. Additionally, their active engagement promotes receptive and productive skills in English. As learners immerse themselves in this AR experience, they read, listen and interact with the content at different stages of the game and, therefore, a holistic approach to learning is guaranteed. The teachers responded remarkably positively in the questionnaire to questions related to Constructs 3 and 4, which leads us to the conclusion that they recognized the significant benefits and instructional usefulness of this innovative approach. This outcome is also in agreement with similar studies conducted with regard to the effect of AR games on the practice and development of foreign language skills [69–73]. Moreover, the teachers reported that vocabulary is presented naturally and practiced in combination with the other language skills and never in isolation. Students are more likely to recall and to internalize vocabulary as they interact and repeat it several times during the game, but with a different purpose every time. These observations are in alignment with previous studies on vocabulary acquisition and AR games [36,74–76] and, therefore, make 'LockED in ShakespeARe's Globe Theatre' an ARECG that provides valid opportunities for vocabulary retention and contributes to the current literature.

(b) Creativity, critical thinking and problem solving

'LockED in ShakespeARe's Globe Theatre' is weaved around a series of challenging interactive tasks that require learners to use their critical thinking skills, such as logical reasoning, problem analysis and decision making, in order to collect the clues and to overcome obstacles. They also need to make informed decisions and to explore different solutions that will lead them to escape. The teachers' questionnaires and their interview

responses also support the view that the game promotes creative and critical thinking elements combined with content awareness and spontaneous decision making.

(c) Authenticity

The findings from the teachers' evaluation show that this ARECG's major advantage is that it enhances authenticity at multiple levels. First of all, learners can virtually visit the Globe Theatre and meet Shakespeare's AI avatar, who willingly shares his experience and knowledge with them. Secondly, students are involved in tasks that resemble real-life situations. A sense of purpose is created, and learners understand the underlying importance of their actions that reflect potential implications and benefits in a future real-life context. Moreover, this ARECG caters for learners' authentic needs and promotes differentiated and personalized learning, as there is a variety of activities characterized by a gradual and smooth transition in task difficulty, which enables learners at different levels in English language proficiency to participate wholeheartedly toward winning the game.

(d) Cooperation, group and peer work

'LockED in ShakespeARe's Globe Theatre' can stimulate social interaction and collaboration among participants, therefore enhancing the social dimension of deep and meaningful language learning. Students are encouraged to work in teams from the very beginning of the game, sharing insights and combining their abilities in order to overcome obstacles and to solve the puzzles. They benefit from each other's perspectives and experiences in an environment that encourages peer learning, teamwork, communication and collaboration. Working inclusively as a group provides to all the members a sense of belonging and encourages learners to value and respect different viewpoints and abilities.

(e) Working autonomously/intentional learning

The ARECG's context and content enable learners to work autonomously and to participate in self-directed learning. The teachers' questionnaires and their interviews supported the view that the students are encouraged to explore the AR elements, to make decisions and to take responsibility for their learning journey. However, their learning progress could be further supported if there was an introductory unit, which explains the context of the game and introduces the players into it smoothly. In this way, the ARECG will not have to rely solely on an educator's briefing and introduction. It could actually be used as self-study materials in a flipped classroom context, or as a way to revise in physical or remote classes.

(f) Reflection and the drawing of conclusions

The factor of reflection and the construction of meaning are vital components of the game, during which learners identify their strong points and take ownership of their learning. The teachers' responses, which showed 80% of them in strong agreement, identified reflection as one of the game's important features because of its flexible form. The collaborative digital wall, where students post their thoughts and feelings, empowers them to lead the way in their learning journey, to understand how far they have progressed and to appreciate the relevance of the game's content to real-life situations.

### *5.2. The ARECG's Contribution to Increasing Students' Motivation, Engagement and Satisfaction toward Language Learning*

Findings from the teachers' evaluation revealed that 'LockED in ShakespeARe's Globe Theatre' has an impact on the participants' enjoyment, motivation and satisfaction toward language learning. This result can be justified by the playful and interactive nature of the ARECG itself, and it is in harmony with the studies by Taskiran [77] and Perry [72] that also highlighted the potential of AR in stimulating enthusiasm and motivation in ELT classrooms. Motivation and satisfaction seem to be highly interrelated and, therefore, they can influence people to preserve their interest until they reach the desired outcomes [62]. In this vein, the participants who feel enjoyment and satisfaction during the game, are quite likely to develop a positive attitude towards the learning experience, thus making them

more willing to participate in relevant learning opportunities and increasing their learning performance, as suggested by the recent literature [51–53,78]. Additionally, a pleasant learning environment can lower anxiety levels, therefore, making them feel more comfortable and motivated to participate actively in their language learning progress [66,79]. In other words, motivation and satisfaction in an ARECG enhance information and vocabulary retention because the language learning process is associated with an enjoyable experience. Indeed, learners who have experienced enjoyment, motivation and satisfaction in an ARECG are more likely to look for opportunities to apply their newly acquired knowledge, or to find themselves involved in similar learning activities, as supported by Taskiran [80] and Vedadi et al. [81].

### 5.3. Teachers' Future Intentions toward ARECGs

All of the participants who immersed themselves in the world of 'LockED in ShakespeARe's Globe Theatre' reported a positive experience, high levels of enjoyment, satisfaction and engagement, which was translated into enthusiasm, favorable comments and eagerness to use this ARECG or even create similar ones in the near future. The teachers seemed to have been captivated by the potential of AR and a combination of factors, ranging from a vibrant and dynamic classroom environment that caters for different leaning needs and empowers students to take ownership of their learning journey to the alignment of the ARECG with the educational goals and the school curriculum. However, they all stressed the need for some serious training that can impact their professional development, before embarking on implementing ARECGs. This remark is also in accordance with findings by Marques and Pombo [82], who highlighted the importance of teacher training in relation to AR practices and whose study showed improved teacher understanding on the educative use of AR and GBL, as well as changes in teachers' practices after attending an organized workshop. It is quite often the case that the prospect of incorporating new technology-enhanced teaching opportunities excites many teachers. Nevertheless, if there is no real purpose for implementation, then the added value to the learning experience is poor [83]. Moreover, a stable internet connection and compatible mobile devices are indeed needed at schools. The teachers highlighted the importance of having the appropriate equipment before embarking on designing and delivering immersive experiences. They all stressed that it would be demoralizing and disappointing for them and for their students if the whole game experience was ruined because of a poor internet connection or because of other technical, last minute, problems.

### 5.4. Conclusions and Recommendations for Future Develoment

'LockED in ShakespeARe's Globe Theatre', an innovative ARECG for English language learning, was designed, developed and evaluated by 10 in-service English language teachers, and was found to provide optimal conditions for deep meaningful language learning and it is suitable for students' diverse language learning needs, since it fosters a student-centered, friendly learning environment. Additionally, the teachers pinpointed the game's advantages in relation to vocabulary retention and foreign language development through the holistic and playful manner of the game, which encourages learners to retrieve all the knowledge they have gained and to combine it with new schemata, so as to communicate and proceed into their culturally rich, immersive language learning experience. Increased motivation and satisfaction levels were also identified as crucial game components, driven by an engaging storyline and skillfully scaffolded challenges.

The limitations of this study include the limited number of participants and the brief available timeframe for the evaluation. Further considerations to be taken into account are the characteristics and affordances of the participants' mobile devices and the availability of a strong WiFi network. If there is lack of devices that can support AR or the network is not strong enough for the smooth transition of the game, then the quality of the experience will be affected, thus the views and the opinions of the participants will provide misleading results.

Directions for future research include comparative studies with and without the use of immersive technologies, such as AR and VR. Furthermore, future studies could involve groups of teachers and students with richer demographic diversity. Pre- and post-game tests, along with questionnaires, observations and interviews with learners could shed light on their learning outcomes, motivation, engagement and attitudes towards language learning.

Last, but not least, teacher training seminars and workshops could be organized to enable teachers to hone their pedagogical and digital skills and apply them to the design and development of future ARECGs, not only in the EFL context, but in a wider range of school subjects, ranging from history and arts to math and biology. Physical and virtual teacher practice communities for peer collaboration and the review of ARECG materials could be developed and investigated by researchers in relation to educators' attitudes towards the effectiveness and the role of games in their practices.

Education leaders and policymakers should take action regarding the limited availability of such teacher training programs and prioritize ongoing professional development that will place English language teaching in the Industry 4.0 era.

**Author Contributions:** Conceptualization, A.V. and S.M.; methodology, A.V.; software, A.V.; validation, S.M. and A.T.; formal analysis, A.V.; investigation, A.V.; resources, A.T.; data curation, A.V.; writing—original draft preparation, A.V.; writing—review and editing, S.M. and A.T.; visualization, A.V.; supervision, S.M.; project administration, S.M.; funding acquisition, A.T. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the International Hellenic University on 11 July 2023 (application protocol code 230/30 June 2023).

**Data Availability Statement:** The data are available here: https://doi.org/10.5281/zenodo.10514673.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. Alper, A.; Öztas, E.S.; Atun, H.; Çinar, D.; Moyenga, M. A Systematic Literature Review towards the Research of Game-Based Learning with Augmented Reality. *Int. J. Technol. Educ. Sci.* **2021**, *5*, 224–244. [CrossRef]
2. Stenros, J. The Game Definition Game: A Review. *Games Cult.* **2017**, *12*, 499–520. [CrossRef]
3. Piaget, J. *Play Dreams & Imitation in Childhood*; Routledge & Kegan Paul: London, UK, 1951.
4. Klimova, B.F. Games in the Teaching of English. *Procedia-Soc. Behav. Sci.* **2015**, *191*, 1157–1160. [CrossRef]
5. Christopoulos, A.; Mystakidis, S. Gamification in Education. *Encyclopedia* **2023**, *3*, 1223–1243. [CrossRef]
6. Bennett, S.; Maton, K.; Kervin, L. The 'Digital Natives' Debate: A Critical Review of the Evidence. *Br. J. Educ. Technol.* **2008**, *39*, 775–786. [CrossRef]
7. Black, A. Gen Y: Who They Are and How They Learn. *Educ. Horiz.* **2010**, *88*, 92–101.
8. Fotaris, P.; Mastoras, T. Escape Rooms for Learning: A Systematic Review. In Proceedings of the 12th European Conference on Game Based Learning, Sophia Antipolis, France, 4–5 October 2018; pp. 235–243. [CrossRef]
9. Mystakidis, S.; Lympouridis, V. Immersive Learning. *Encyclopedia* **2023**, *3*, 396–405. [CrossRef]
10. Johnson, K.L.; Westbrooks, K. Quelling the Boredom with Alternative Instruction: Augmented Reality, Escape Kits, and Scavenger Hunts. *Int. J. Soc. Educ. Sci.* **2021**, *3*, 180–196. [CrossRef]
11. Warmelink, H.; Mayer, I.; Weber, J.; Heijligers, B.; Haggis, M.; Peters, E.; Louwerse, M. AMELIO: Evaluating the Team-Building Potential of a Mixed Reality Escape Room Game. In Proceedings of the Extended Abstracts Publication of the Annual Symposium on Computer-Human Interaction in Play, Amsterdam, The Netherlands, 15–18 October 2017; pp. 111–123.
12. Elford, D.; Lancaster, S.J.; Jones, G.A. Fostering Motivation toward Chemistry through Augmented Reality Educational Escape Activities. A Self-Determination Theory Approach. *J. Chem. Educ.* **2022**, *99*, 3406–3417. [CrossRef]
13. Estudante, A.; Dietrich, N. Using Augmented Reality to Stimulate Students and Diffuse Escape Game Activities to Larger Audiences. *J. Chem. Educ.* **2020**, *97*, 1368–1374. [CrossRef]
14. Ferreiro-González, M.; Amores-Arrocha, A.; Espada-Bellido, E.; Aliaño-Gonzalez, M.J.; Vázquez-Espinosa, M.; González-de-Peredo, A.V.; Sancho-Galán, P.; Álvarez-Saura, J.Á.; Barbero, G.F.; Cejudo-Bastante, C. Escape Classroom: Can You Solve a Crime Using the Analytical Process? *J. Chem. Educ.* **2019**, *96*, 267–273. [CrossRef]

15. Malliarakis, C.; Shabalina, O.; Mozelius, P. Can You Escape from Dr. Tom Cat's Lab? Educational Escape Rooms with Scientists, Riddles and Serious Games as Learning Tools. In Proceedings of the European Conference on Game Based Learning, ECGBL 2021, Brighton, UK, 24–25 September 2021; Volume 15, pp. 525–534.
16. Roy, B.; Gasca, S.; Winum, J.-Y. Chem'Sc@ Pe: An Organic Chemistry Learning Digital Escape Game. *J. Chem. Educ.* **2023**, *100*, 1382–1391. [CrossRef]
17. Wild, F.; Marshall, L.; Bernard, J.; White, E.; Twycross, J. UNBODY: A Poetry Escape Room in Augmented Reality. *Information* **2021**, *12*, 295. [CrossRef]
18. Paraschivoiu, I.; Buchner, J.; Praxmarer, R.; Layer-Wagner, T. Escape the Fake: Development and Evaluation of an Augmented Reality Escape Room Game for Fighting Fake News. In Proceedings of the Extended Abstracts of the 2021 Annual Symposium on Computer-Human Interaction in Play, Virtual, 18–21 October 2021; ACM: New York, NY, USA, 2021; pp. 320–325.
19. Mystakidis, S.; Berki, E. The Case of Literacy Motivation: Playful 3D Immersive Learning Environments and Problem-Focused Education for Blended Digital Storytelling. In *Virtual Reality in Education: Breakthroughs in Research and Practice*; IGI Global: Hershey, PA, USA, 2019; pp. 259–274.
20. Craik, F.I.; Lockhart, R.S. Levels of Processing: A Framework for Memory Research. *J. Verbal Learn. Verbal Behav.* **1972**, *11*, 671–684. [CrossRef]
21. Marton, F.; Säljö, R. On Qualitative Differences in Learning: I—Outcome and Process. *Br. J. Educ. Psychol.* **1976**, *46*, 4–11. [CrossRef]
22. Marton, F. Approaches to Learning. In *The Experience of Learning*; Scottish Academic Press: Edinburgh, UK, 1997; pp. 39–58.
23. Mystakidis, S.; Berki, E.; Valtanen, J. The Patras Blended Strategy Model for Deep and Meaningful Learning in Quality Life-Long Distance Education. *Electron. J. E-Learn.* **2019**, *17*, 66–78. [CrossRef]
24. Ausubel, D.P. In Defense of Verbal Learning. *Educ. Theory* **1961**, *11*, 15–25. [CrossRef]
25. Mystakidis, S. Deep Meaningful Learning. *Encyclopedia* **2021**, *1*, 988–997. [CrossRef]
26. Engeström, Y. Activity Theory and the Social Construction of Knowledge: A Story of Four Umpires. *Organization* **2000**, *7*, 301–310. [CrossRef]
27. Beattie IV, V.; Collins, B.; McInnes, B. Deep and Surface Learning: A Simple or Simplistic Dichotomy? *Account. Educ.* **1997**, *6*, 1–12. [CrossRef]
28. Hay, D.B. Using Concept Maps to Measure Deep, Surface and Non-learning Outcomes. *Stud. High. Educ.* **2007**, *32*, 39–57. [CrossRef]
29. Smith, T.W.; Colby, S.A. Teaching for Deep Learning. *The clearing house: A journal of educational strategies, issues and ideas* **2007**, *80*, 205–210. [CrossRef]
30. Kirriemuir, J.; McFarlane, A. *Literature Review in Games and Learning*; Futurelab: Bristol, UK, 2004.
31. McFarlane, A.; Sparrowhawk, A.; Heald, Y. Report on the Educational Use of Games. 2002. Available online: https://shs.hal.science/hal-00699812/ (accessed on 12 December 2023).
32. Azuma, R.T. A Survey of Augmented Reality. *Presence Teleoperators Virtual Environ.* **1997**, *6*, 355–385. [CrossRef]
33. Castellanos, A.; Pérez, C. New Challenge in Education: Enhancing Student's Knowledge through Augmented Reality. In *Augmented Reality*; De Gruyter: Berlin, Germany, 2017; pp. 273–294. [CrossRef]
34. Burkhard, R.; Schmitt, G. Visualising Future Cities in the ETH Value Lab: New Methods for Education and Learning. In *Mixed Reality In Architecture, Design And Construction*; Springer: Berlin/Heidelberg, Germany, 2009; pp. 205–218.
35. Weerasinghe, M.; Quigley, A.; Ducasse, J.; Čopič Pucihar, K.; Kljun, M. Educational Augmented Reality Games. In *Augmented Reality Games II: The Gamification of Education, Medicine and Art*; Springer: Cham, Switzerland, 2019; pp. 3–32.
36. Wang, D.; Khambari, M.N.M. The Application of a Game-Based AR Learning Model in English Sentence Learning. *Malays. Online J. Educ. Technol.* **2020**, *8*, 63–71. [CrossRef]
37. Castañeda, M.A.; Guerra, A.M.; Ferro, R. Analysis on the Gamification and Implementation of Leap Motion Controller in the IED Técnico Industrial de Tocancipá. *Interact. Technol. Smart Educ.* **2018**, *15*, 155–164. [CrossRef]
38. Hsu, T.-C. Learning English with Augmented Reality: Do Learning Styles Matter? *Comput. Educ.* **2017**, *106*, 137–149. [CrossRef]
39. Küçük, S.; Yýlmaz, R.M.; Göktaþ, Y. Augmented Reality for Learning English: Achievement, Attitude and Cognitive Load Levels of Students. *Educ. Sci./Egit. Ve Bilim* **2014**, *39*, 393–404. [CrossRef]
40. Ibrahim, A.; Huynh, B.; Downey, J.; Höllerer, T.; Chun, D.; O'donovan, J. Arbis Pictus: A Study of Vocabulary Learning with Augmented Reality. *IEEE Trans. Vis. Comput. Graph.* **2018**, *24*, 2867–2874. [CrossRef]
41. Rozi, I.; Larasati, E.; Lestari, V. *Developing Vocabulary Card Base on Augmented Reality (AR) for Learning English*; IOP Publishing: Bristol, UK, 2021; Volume 1073, p. 012061.
42. Sayımer, İ.; Küçüksaraç, B. Contribution of New Technologies to University Education: Opinions of Communication Faculty Students on Augmented Reality Applications Yeni Teknolojilerin Üniversite Eğitimine Katkısı: İletişim Fakültesi Öğrencilerinin Artırılmış Gerçeklik Uygulamalarına Ilişkin Görüşleri. *J. Hum. Sci.* **2015**, *12*, 1536–1554.
43. Solak, E.; Cakir, R. Exploring the Effect of Materials Designed with Augmented Reality on Language Learners' Vocabulary Learning. *J. Educ. Online* **2015**, *12*, 50–72. [CrossRef]
44. Parmaxi, A.; Demetriou, A.A. Augmented Reality in Language Learning: A State-of-the-art Review of 2014–2019. *J. Comput. Assist. Learn.* **2020**, *36*, 861–875. [CrossRef]

45. Atwood-Blaine, D.; Huffman, D. Mobile Gaming and Student Interactions in a Science Center: The Future of Gaming in Science Education. *Int. J. Sci. Math. Educ.* **2017**, *15*, 45–65. [CrossRef]
46. Echeverría, A.; Améstica, M.; Gil, F.; Nussbaum, M.; Barrios, E.; Leclerc, S. Exploring Different Technological Platforms for Supporting Co-Located Collaborative Games in the Classroom. *Comput. Hum. Behav.* **2012**, *28*, 1170–1177. [CrossRef]
47. Ruiz-Ariza, A.; Casuso, R.A.; Suarez-Manzano, S.; Martínez-López, E.J. Effect of Augmented Reality Game Pokémon GO on Cognitive Performance and Emotional Intelligence in Adolescent Young. *Comput. Educ.* **2018**, *116*, 49–63. [CrossRef]
48. Cai, S.; Chiang, F.-K.; Sun, Y.; Lin, C.; Lee, J.J. Applications of Augmented Reality-Based Natural Interactive Learning in Magnetic Field Instruction. *Interact. Learn. Environ.* **2017**, *25*, 778–791. [CrossRef]
49. Chen, C.-H.; Chou, Y.-Y.; Huang, C.-Y. An Augmented-Reality-Based Concept Map to Support Mobile Learning for Science. *Asia-Pac. Educ. Res.* **2016**, *25*, 567–578. [CrossRef]
50. Chen, C.-M.; Tsai, Y.-N. Interactive Augmented Reality System for Enhancing Library Instruction in Elementary Schools. *Comput. Educ.* **2012**, *59*, 638–652. [CrossRef]
51. Efstathiou, I.; Kyza, E.A.; Georgiou, Y. An Inquiry-Based Augmented Reality Mobile Learning Approach to Fostering Primary School Students' Historical Reasoning in Non-Formal Settings. *Interact. Learn. Environ.* **2018**, *26*, 22–41. [CrossRef]
52. Hung, Y.; Chen, C.; Huang, S. Applying Augmented Reality to Enhance Learning: A Study of Different Teaching Materials. *J. Comput. Assist. Learn.* **2017**, *33*, 252–266. [CrossRef]
53. Hwang, G.-J.; Wu, P.-H.; Chen, C.-C.; Tu, N.-T. Effects of an Augmented Reality-Based Educational Game on Students' Learning Achievements and Attitudes in Real-World Observations. *Interact. Learn. Environ.* **2016**, *24*, 1895–1906. [CrossRef]
54. Vicari, C. Escape the Planet: Empowering Student Designers to Create a Science-Based Escape Room with Augmented Reality. *Int. J. Des. Learn.* **2020**, *11*, 80–95. [CrossRef]
55. Tzima, S.; Styliaras, G.; Bassounas, A. Revealing Hidden Local Cultural Heritage through a Serious Escape Game in Outdoor Settings. *Information* **2020**, *12*, 10. [CrossRef]
56. Mikkelsen, S.L.; Hartzen, A.; Khaled, R. Escape from Trelleborg–Situated Learning through Augmented Reality. In Proceedings of the 8th International Conference on the Foundations of Digital Games, Society for the Advancement of the Science of Digital Games, Chania, Greece, 14–17 May 2013.
57. Dimova, G.; Videnovik, M.; Trajkovik, V. Using Educational Escape Room to Increase Students' Engagement in Learning Computer Science. In Proceedings of the 17th International Conference on Informatics and Information Technologies, Ss. Cyril and Methodius University in Skopje, Faculty of Computer Science and Engineering, Republic of North Macedonia, Virtual, 8 May 2020.
58. Clarke, S.; Peel, D.J.; Arnab, S.; Morini, L.; Keegan, H.; Wood, O. EscapED: A Framework for Creating Educational Escape Rooms and Interactive Games for Higher/Further Education. *Int. J. Serious Games* **2017**, *4*, 73–86. [CrossRef]
59. Lytridis, C.; Tsinakos, A.; Kazanidis, I. ARTutor—An Augmented Reality Platform for Interactive Distance Learning. *Educ. Sci.* **2018**, *8*, 6. [CrossRef]
60. Nicholson, S. The State of Escape: Escape Room Design and Facilities. *Meaningful Play* **2016**, *2016*, 1–20.
61. Lazou, C.; Tsinakos, A. Exploring Augmented Reality Affordances for Media Literacy in the EFL Context. *Eur. Conf. e-Learn.* **2022**, *21*, 449–457. [CrossRef]
62. Mystakidis, S.; Christopoulos, A. Teacher Perceptions on Virtual Reality Escape Rooms for Stem Education. *Information* **2022**, *13*, 136. [CrossRef]
63. Wilson, D.W.; Jenkins, J.; Twyman, N.; Jensen, M.; Valacich, J.; Dunbar, N.; Wilson, S.; Miller, C.; Adame, B.; Lee, Y.-H. Serious Games: An Evaluation Framework and Case Study. In Proceedings of the 2016 49th Hawaii International Conference on System Sciences (HICSS), IEEE, Koloa, HI, USA, 5–8 January 2016; pp. 638–647.
64. Lee, J. Problem-Based Gaming via an Augmented Reality Mobile Game and a Printed Game in Foreign Language Education. *Educ. Inf. Technol.* **2022**, *27*, 743–771. [CrossRef]
65. Lee, E.A.-L.; Wong, K.W.; Fung, C.C. How Does Desktop Virtual Reality Enhance Learning Outcomes? A Structural Equation Modeling Approach. *Comput. Educ.* **2010**, *55*, 1424–1442.
66. Arksey, H.; Knight, P.T. *Interviewing for Social Scientists: An Introductory Resource with Examples*; Sage: New York, NY, USA, 1999; ISBN 1-4462-3031-7.
67. Watts, M.; Ebbutt, D. More than the Sum of the Parts: Research Methods in Group Interviewing. *Br. Educ. Res. J.* **1987**, *13*, 25–34. [CrossRef]
68. Jacob, S.A.; Furgerson, S.P. Writing Interview Protocols and Conducting Interviews: Tips for Students New to the Field of Qualitative Research. *Qual. Rep.* **2012**, *17*, 6. [CrossRef]
69. Liao, C.-H.D.; Wu, W.-C.V.; Gunawan, V.; Chang, T.-C. Using an Augmented-Reality Game-Based Application to Enhance Language Learning and Motivation of Elementary School EFL Students: A Comparative Study in Rural and Urban Areas. *Asia-Pac. Educ. Res.* **2023**, 1–13. [CrossRef]
70. Liu, Y.; Holden, D.; Zheng, D. Analyzing Students' Language Learning Experience in an Augmented Reality Mobile Game: An Exploration of an Emergent Learning Environment. *Procedia-Soc. Behav. Sci.* **2016**, *228*, 369–374. [CrossRef]
71. Lyu, Y. Using Gamification and Augmented Reality to Encourage Japanese Second Language Students to Speak English. Master's Thesis, KTH, School of Electrical Engineering and Computer Science (EECS), Stockholm, Sweden, 2019.

72. Perry, B. Gamifying French Language Learning: A Case Study Examining a Quest-Based, Augmented Reality Mobile Learning-Tool. *Procedia-Soc. Behav. Sci.* **2015**, *174*, 2308–2315. [CrossRef]
73. Wedyan, M.; Falah, J.; Elshaweesh, O.; Alfalah, S.F.; Alazab, M. Augmented Reality-Based English Language Learning: Importance and State of the Art. *Electronics* **2022**, *11*, 2692. [CrossRef]
74. Chen, R.W.; Chan, K.K. Using Augmented Reality Flashcards to Learn Vocabulary in Early Childhood Education. *J. Educ. Comput. Res.* **2019**, *57*, 1812–1831. [CrossRef]
75. Pu, M.; Zhong, Z. Development of a Situational Interaction Game for Improving Preschool Children'performance in English-Vocabulary Learning. In Proceedings of the 2018 International Conference on Distance Education and Learning, Beijing, China, 26–28 May 2018; pp. 88–92.
76. Yilmaz, R.M. Educational Magic Toys Developed with Augmented Reality Technology for Early Childhood Education. *Comput. Hum. Behav.* **2016**, *54*, 240–248. [CrossRef]
77. Taskiran, A. The Effect of Augmented Reality Games on English as Foreign Language Motivation. *E-Learn. Digit. Media* **2019**, *16*, 122–135. [CrossRef]
78. Di Serio, Á.; Ibáñez, M.B.; Kloos, C.D. Impact of an Augmented Reality System on Students' Motivation for a Visual Art Course. *Comput. Educ.* **2013**, *68*, 586–596. [CrossRef]
79. Ustun, A.B.; Simsek, E.; Karaoglan-Yilmaz, F.G.; Yilmaz, R. The Effects of AR-Enhanced English Language Learning Experience on Students' Attitudes, Self-Efficacy and Motivation. *TechTrends* **2022**, *66*, 798–809. [CrossRef]
80. Taskiran, A. Augmented Reality Games and Motivation in Language Learning. In Proceedings of the EdMedia+ Innovate Learning, Amsterdam, The Netherlands, 25–29 June 2018; Association for the Advancement of Computing in Education (AACE): Waynesville, NC, USA, 2018; pp. 892–898.
81. Vedadi, S.; Abdullah, Z.B.; Cheok, A.D. The Effects of Multi-Sensory Augmented Reality on Students' Motivation in English Language Learning. In Proceedings of the 2019 IEEE Global Engineering Education Conference (EDUCON), IEEE, Dubai, United Arab Emirates, 8–11 April 2019; pp. 1079–1086.
82. Marques, M.M.; Pombo, L. The Impact of Teacher Training Using Mobile Augmented Reality Games on Their Professional Development. *Educ. Sci.* **2021**, *11*, 404. [CrossRef]
83. Saltan, F.; Arslan, K. A Comparison of In-Service and Pre-Service Teachers' Technological Pedagogical Content Knowledge Self-Confidence. *Cogent Educ.* **2017**, *4*, 1311501. [CrossRef]


**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.