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The Impact of Gamification on Motivating Middle-Aged EFL Students and Enhancing Vocabulary Acquisition in Jordan

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ABSTRACT

Middle-aged Jordanians have significant challenges in learning English as a Foreign Language (EFL), despite its growing importance for academic, professional, and social success. Thus, this study examines how gamification attracts middle-aged learners to advance language learning and teaching. This research randomly assigned 60 participants to a gamified vocabulary app or control group. The experimental group employed six weeks of interactive games, quizzes, and competition to encourage and engage. Pre- and post-tests assessed vocabulary, while questionnaires and interviews assessed motivation. Gamification significantly improved vocabulary retention and acquisition in the experimental group over the control group. This study found that gamification promotes language acquisition and engagement among Jordanian middle-aged EFL learners.

Keywords: Middle Aged Students; Vocabulary Acquisition; English Education; Gamification

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1. Introduction

Language acquisition requires cognitive involvement, desire, and practice. Middle-aged EFL students, especially in Jordan, have difficulties along this process. Restricted daily engagement with English, outdated educational structures that may not align with contemporary language acquisition strategies, and psychological elements such as fear of failure and diminished self-esteem may impede progress^[1-5]. Conventional pedagogical approaches may fail to meet their requirements, diminishing motivation and vocabulary^[6-8]. Reading, speaking, and writing need vocabulary^[9-11]. Language learning requires motivation, particularly for adults^[1]. Due to the lack of engagement and real-world application in normal courses, many middle-aged EFL students feel discouraged and detached^[12-14]. Thus, this lack of motivation may sustain disengagement, making English learning and use tougher.

Middle-aged learners have difficulties in language retention owing to cognitive and emotional issues, such as age-related memory deterioration and diminished contextual learning possibilities^[15-18]. This group necessitates innovative pedagogical approaches to foster language development. Gamification incentivizes pupils via competition, rewards, and interactive challenges^[19-21]. Gamification incentivizes students and fosters active learning, rendering it appropriate for adult language learners who may gain from a more participatory experience^[22-24]. Engaging vocabulary courses may aid middle-aged EFL students in retaining vocabulary and reengaging in language study^[25-27]. Effective English language learning methods are critical for Jordanian academic and professional success^[28-33]. Even as English becomes increasingly relevant internationally, many middle-aged Jordanians fail to learn it^[34-37]. Gamification influences motivation and vocabulary acquisition among Jordanian middle-aged EFL students.

Gamification has increasingly been integrated into educational practices, with a primary focus on urging students from a second language learning environment to obtain different language skills. Although various studies have confirmed the significance of gamification in language learning, studies that investigate the influences of gamification on motivating middle-aged students who are learning English as a foreign language and enhancing vocabulary acquisition are still scant. Therefore, this study aimed to conduct a study that

specifically concerns this issue with the ultimate goal of highlighting the substantial prospective impacts of gamification in education.. Based on the aforementioned implications, the results of the study further provide valuable clues about the underlying mechanisms linking students' ages, educational gamification, and ultimately, vocabulary acquisition^[38-41].

The choice of incorporating educational gamification as a potential tool to improve students' language performance and motivation is warranted by its superior and entertaining approach. To utilize gamification, teachers customarily create a series of engaging and motivating exercises with game elements using the principles of game design in order to incentivize students' learning interest, to define certain goals to be highly rewarding and enjoyable, and to increase class involvement as well. The application of educational games can redefine the learning process toward a more profound impact mediated by fostering students' intrinsic and extrinsic participation. Such a profound impact is mainly ascribed to the inherent nature of the educational game in which students are allowed to enjoy a freestyle, fail-safe testing environment, wherein game rules are the primary mechanisms that motivate students by influencing their courageous behavior in language learning^[42-45].

The study is unique because impacts Jordanian education, as proficiency in the English language is becoming increasingly essential for academic and professional achievement^[46-48]. It advocates for dynamic and engaging pedagogical practices to attract adult learners and foster inclusive learning settings. The research has the potential to enhance teacher training and professional development through gamified classrooms, motivating and involving middle-aged learners using innovative methods^[49-51]. The study may influence educational practices in Jordan, motivating lawmakers to include innovative teaching methods in the national curriculum. Gamified EFL modules and resources may enhance the engagement and efficacy of language learning for middle-aged individuals. The research emphasizes the flexibility and engagement of adult education for lifelong learning, facilitating their lifetime learning journey.

Theoretical Framework

This study utilizes Self-Determination Theory (SDT) and Constructivist Learning Theory to analyze the motivation and vocabulary acquisition of Jordanian middle-aged EFL

students using gamification. SDT emphasizes the importance of learning context autonomy, competence, and connection, which are essential for meaningful, self-directed learning. Gamification can motivate students by providing them with choice and control over their learning, empowering them to evaluate their progress through challenges, rewards, and feedback, and fostering social connection through peer collaboration and competition. Constructivist Learning Theory, on the other hand, emphasizes the dynamic and interactive nature of learning, focusing on gamification elements. It emphasizes hands-on learning, problem-solving, and critical thinking, which improves understanding and retention in real-world language usage. Constructivism also emphasizes social contact in learning, allowing students to communicate, debate meanings, and learn from one another. Gamified contextual learning simulates real-life situations, promoting constructivism and enhancing vocabulary acquisition. The study concludes that SDT and Constructivist Learning Theory explain gamification's motivation and learning, suggesting that gamification may increase motivation and vocabulary among Jordanian middle-aged EFL learners. This theoretical framework can help middle-aged EFL students improve their education using gamified learning activities.

2. Literature Review

This literature review on gamification's effects on motivating middle-aged EFL students and improving vocabulary acquisition in Jordan covers three main topics: middle-aged language learners' challenges, gamification's principles and efficacy in education, and vocabulary acquisition. First, middle-aged students have different language learning challenges than younger ones. Research shows cognitive, emotional, and environmental factors enhance these hurdles. Memory recall and processing speed may deteriorate with age, making language learning tougher for older learners^[28]. Anxiety and poor self-esteem may demotivate language learners^[26]. Also consider context and social factors. Middle-aged learners may practice and apply English less than younger learners^[31]. Traditional education may disconnect and dissatisfy adult learners^[1]. Educating this population is in demand. Second, gamification engages people in non-game situations using game design^[18]. Points, badges, leaderboards, and challenges make learning enter-

taining. Gamification improves learning, motivation, and engagement in various educational settings^[27]. Successful gamification in teaching has many components. Gamification encourages students by meeting their psychological needs for autonomy, competence, and relatedness, according to Self-Determination Theory^[52]. Gamification offers alternatives and self-direction to assist students manage their education. Gamification increases engagement via competition and quick feedback. Competition motivates students, according to research^[17]. Feedback helps students track their progress, building confidence and encouraging effort. Gaming boosts adult learning by encouraging socializing. Gamified collaborative activities help students learn by sharing knowledge and building connections^[30]. Moreover, language acquisition requires vocabulary growth for effective communication. Many studies suggest gamification might help all ages learn language. Gamification makes learning fun and culturally relevant, improving vocabulary retention^[53].

Gamified vocabulary learning works well with interactive games and challenges that require vocabulary application. Real-world vocabulary games help students retain language. Instant feedback from gamified exams helps students enhance and reinforce learning^[52].

2.1. Related Studies

Research shows gamification boosts language learning enthusiasm and minimizes anxiety. Learning vocabulary as a game may lessen performance pressure and make it more fun^[30], which makes this crucial for middle-aged students who become worried in conventional classes. To start with, Hamari et al.^[27] assessed education gamification research. Gamification motivates and engages adult students. The research found that points, badges, and leaderboards may engage adult learners and appeal to their natural inclinations. The study underlined the need of linking gamified elements to educational aims to boost their effect. This research illustrates how gamification might motivate middle-aged EFL students to acquire vocabulary by fostering success and engagement. Additionally, Huang and Soman^[52] explored how gamification influences university students' vocabulary. They taught vocabulary via quizzes, games, and immediate feedback. Comparatively, vocabulary retention increased greatly. Learning was more fun and engaging. This study

illustrates how gamification may make vocabulary learning more entertaining and effective, enhancing retention and application for Jordanian middle-aged EFL learners. Moreover, Burguillo^[17] examined online student motivation using gamification. The study studied a competitive university course with incentives. Gamification energized and engaged students more than traditional courses. This research is essential to understanding how gamification drives adults. Teachers may urge middle-aged EFL students to actively study vocabulary using these findings. Kapp^[30] explored gamification's collaborative learning benefits. Social interaction is important in adult learning, according to study. Kapp taught with gamification and collaboration. Participants increased content knowledge and peer interactions. One study found that gamification may help middle-aged EFL learners collaborate and socialize. Gamified vocabulary teaching with collaborative elements may motivate and create a supportive vocabulary learning community.

Furthermore, Chang and Hwang^[54] studied how gamification improves high school language learning. The researchers gamified learning using word games, quizzes, and progress prizes. Students' vocabulary, retention, and motivation improved. According to the findings, gamified elements may support dynamic language acquisition. This research found that gamification promotes vocabulary learning for Jordanian middle-aged EFL learners. Pellas and Peroutseas^[55] examined gamified learning feedback. Study examined how rapid gamified assessment feedback motivates and educates students. Feedback enhances students' self-efficacy and engagement, boosting learning. Gamified vocabulary instruction with feedback may assist middle-aged EFL learners acquire confidence and remember new vocabulary, according to one study.

Gamification improves language learning and motivation, according to these research. They emphasize engaging, participative, and supportive learning environments for middle-aged EFL students. This material will shape the present endeavor to improve EFL teaching in Jordan. Despite rising gamification research, middle-aged EFL learners remain underrepresented. Most language acquisition research ignores middle-aged learners' challenges and focuses on younger or adult learners. Gamification research seldom considers middle-aged EFL students' needs, rewards, and learning styles. Gamification increases motivation and engage-

ment, but studies seldom address cognitive and emotional issues like self-confidence and failure anxiety in middle-aged learners^[26, 28]. Since language learning research overlooks this demographic, they don't receive individualized training that matches their life experiences and learning preferences. Gamification doesn't increase vocabulary acquisition in middle-aged EFL learners either. Gamification boosts motivation and engagement, but its benefits on language memory and real-world use in this age group are unknown. To address these deficiencies, this study analyzes how gamification influences motivation and vocabulary acquisition among underrepresented Jordanian middle-aged EFL students.

2.2. Differences from Previous Studies

This study focuses on middle-aged EFL learners, a demographic overlooked in gamification research. Prior research neglected the cognitive and emotional requirements of middle-aged learners. This research examines the language acquisition within Jordanian society. Research on gamification mostly occurs within Western or universal educational frameworks; hence, this study is essential for comprehending its applicability to Jordanian students. Numerous studies investigate the impact of gamification on student engagement and motivation; however, this particular study concentrates on vocabulary acquisition. This research examines the potential of gamification to enhance vocabulary, an essential language ability. This research investigates the influence of gamification on motivation and cognition via the lenses of Self-Determination Theory and Constructivist Learning Theory. Examining the psychological frameworks that facilitate gamification elucidates its influence on learning. This research aids Jordanian educators in addressing the demands of middle-aged EFL learners. This study is notable for prioritizing actual outcomes above theoretical discourse, excluding classroom advice. This research addresses a deficiency in the literature by incorporating gamification into vocabulary learning for middle-aged EFL learners in Jordan. The results may improve training and further research.

3. Methodology

The research included both quantitative and qualitative approaches to examine the impact of gamification on moti-

vation and language acquisition. Using a convenience sampling, the research included 60 middle-aged EFL students. Selecting students from a Jordanian language institutions ensured variety and linguistic competence. All participants possess pre-intermediate English proficiency, guaranteeing a uniform vocabulary evaluation. The research constituted a randomized controlled trial with experimental and control groups. The control group underwent conventional vocabulary acquisition, whereas the experimental group engaged in gamified vocabulary education. The vocabulary acquisition methodology used in this research included quizzes, competitions, and rewards. The experimental group used online games, flashcards, and word challenges for vocabulary enhancement.

The study utilized various assessment instruments, including standardized vocabulary evaluations, surveys, and semi-structured interviews, to evaluate knowledge before and after an intervention, motivation, and experiences with the gamified learning application, as well as Likert-scale questions about fun, interest, and proficiency in language acquisition. All participants underwent a vocabulary pre-test as part of the data gathering procedures. This demonstrated that the intervention enhanced language learning rather than addressing pre-existing disparities. The experimental group participated in a six-week gamified vocabulary curriculum. Gamified activities enhanced language acquisition and motivation throughout this period. The vocabulary instruction for the control group was simple and limited. Upon the conclusion of six weeks, both groups undertook an identical vocabulary assessment. This facilitated vocabulary comparisons before and after the intervention. Survey and Interviews: Participants completed a motivation survey subsequent to the post-test to assess alterations. The 10 semi-structured interviews conducted with the experimental group elucidated the gamified technique. Interviews evaluated engagement, efficacy, and learner satisfaction.

3.1. Data Analysis

We examined quantitative data from pre- and post-tests using contemporary statistical techniques. We used these methodologies: Preliminary studies used descriptive statistics to characterize participant demographics and pre-test results. The summary computations included means, standard deviations, and frequency distributions. Implied Statistic:

Coupled Two-sample t-test: Contrasted the mean pre- and post-test scores of the experimental and control groups. This examination determines whether the intervention substantially altered vocabulary. We used an independent samples t-test to evaluate post-test results between the experimental and control groups. This research assessed whether gamified interventions influence vocabulary learning differently from conventional training methods. The Cohen's d statistic quantified disparities in language learning across populations. This signifies the applicability of the results beyond mere statistical significance. Analysis of motivation survey data: We computed mean scores and standard deviations for each survey question to assess motivation in both groups. We analyzed the motivation of the experimental and control groups using a one-way ANOVA. This research examined substantial variations in motivation connected to instructional methods. Analysis of transcripts and topics from semi-structured interviews. The thematic analysis of the data identified motivation, engagement, and vocabulary learning as key themes. This method offered comprehensive insights into participants' experiences with the gamified learning program. The methodology was sufficiently robust to investigate the impact of gamification on motivation and vocabulary learning among Jordanian middle-aged EFL students. This research assessed the efficacy and pertinence of gamified learning interventions for this population via mixed approaches and advanced statistical analysis. Outcomes should motivate innovative language acquisition strategies for middle-aged individuals.

3.2. Ethical Considerations

Ethical considerations related to this research are crucial to acknowledge and address appropriately. It is of utmost importance to thoroughly assess the potential impact of the study on the physical, mental, and emotional well-being of participants, as well as their privacy, and individual autonomy. It was essential to obtain informed consent from all participants, ensuring that they have a comprehensive understanding of the research objectives, potential risks, benefits, and any alternative options available to them. Additionally, it was imperative for researchers to prioritize confidentiality and took necessary measures to anonymize data, thereby safeguarding the identities of participants and maintaining their privacy. This included employing encryption techniques, se-

curely storing sensitive information, and strictly controlling access to the data. Regular ethical reviews, both internal and external, were implemented to ensure continuous monitoring and adherence to ethical guidelines throughout the research process.

In addition to these considerations, researchers were mindful of the power dynamics that may exist between themselves and participants, making every effort to minimize any potential coercion or undue influence. They promoted a collaborative and respectful environment, where participants felt comfortable expressing their concerns, asking questions, and withdrawing their participation if desired, without facing any negative consequences. Overall, by upholding these ethical principles, researchers were able to conduct their work responsibly, promoting the well-being and safeguarding the rights and dignity of their participants. Through a comprehensive and diligent approach to ethical considerations, researchers could contribute to the advancement of knowledge in a manner that is both scientifically sound and ethically robust.

4. Results and Discussion

4.1. Quantitative Results

The motivation survey assessed satisfaction, interest, and competence. Gamified vocabulary learning improved mean scores across all metrics compared to traditional instruction.

Table 1 present a comparison of the mean pleasure, interest, perceived competence, and engagement motivation between experimental and control groups. The study includes 60 participants, divided into experimental and control groups. The experimental group found gamified learning to be more enjoyable than traditional schooling. The experimental group exhibited an increase in interest, indicating heightened engagement. Members of the control group perceived traditional teaching methods as unengaging. Members of the experimental group demonstrated enhanced perceived competency, indicating increased learning confidence. The control group exhibited a poorer self-image and exhibited distrust towards conventional methods. The experimental group demonstrated effective outcomes with gamified learning, whereas the control group reported lower levels of competence. Gamified learning engages students effectively.

Table 1. Descriptive statistics motivation survey results.

Group	N	Satisfaction (Mean ± SD)	Interest (Mean ± SD)	Perceived Competence (Mean ± SD)
Experimental Group	30	4.5 ± 0.6	4.6 ± 0.5	4.4 ± 0.7
Control Group	30	3.2 ± 0.8	3.1 ± 0.7	3.0 ± 0.9

As shown in **Table 2**, the study compared the enjoyment, interest, perceived proficiency, and engagement of gamified learners with those of a control group. The experimental group exhibited enhanced enjoyment through gamified learning. The experimental group exhibited greater engagement. The substantial t-value of 8.76 indicated that gamified learning maintained participant engagement. Gamified learning enhances both capacity and confidence, as evidenced by the experimental group reporting significantly higher perceived competence compared to the control group. The experimental group demonstrated greater engagement, as evidenced by an 8.24 t-value. Game-based learning demonstrated greater effectiveness in engaging participants. The data suggest that gamified learning can enhance participant performance and satisfaction.

Table 2. Independent samples t-test results.

Dimension	t(58)	p-Value
Enjoyment	8.14	<0.001
Interest	8.76	<0.001
Perceived Competence	7.42	<0.001
Engagement	8.24	<0.001

As shown in **Table 3**, gamified learning has been shown to significantly improve pleasure, interest, perceived competence, and engagement in educational environments. The experimental group exhibited a 2.05 increase in participant satisfaction, indicating a tangible benefit. The group saw learning as more engaging, achieving a significant effect score of 2.19. The group saw themselves as more capable and successful, suggesting an opportunity to bolster student confidence. Furthermore, gamification significantly

improved engagement compared to conventional techniques, suggesting that it sustains student involvement throughout the educational process.

Table 3. Effect size calculation (Cohen's d).

Dimension	Cohen's d (Effect Size)
Enjoyment	2.05 (large effect)
Interest	2.19 (large effect)
Perceived Competence	1.92 (large effect)
Engagement	2.08 (large effect)

The research indicated that gamification improves

learning results compared to conventional teaching techniques, with Cohen's d values approaching 2.0, signifying considerable and meaningful impacts. Gamification augments student enthusiasm and engagement, especially in educational settings where conventional tactics may be unproductive. The impact sizes demonstrate that gamification significantly improves motivation and learning results in both statistical and practical terms.

The motivation survey showed how gamification motivates middle-aged EFL students. Polls measured enjoyment, interest, competence, and participation. Results of analysis follow in **Table 4**.

Table 4. Motivation dimensions: descriptive statistics.

Motivation Dimension	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)
Enjoyment	4.5 ± 0.6	3.2 ± 0.8
Interest	4.6 ± 0.5	3.1 ± 0.7
Perceived Competence	4.4 ± 0.7	3.0 ± 0.9
Engagement	4.5 ± 0.5	3.2 ± 0.6

One-way ANOVA

We explored whether teaching style affected motivation ratings using a one-way ANOVA. Gamified or traditional training was the independent variable, whereas motivation ratings for each dimension were the dependent variable.

One-way ANOVA results:

Verifying normality and variance homogeneity before ANOVA. A Shapiro-Wilk test indicated both groups had appropriately distributed data ($p > 0.05$). Levene's variance homogeneity test was also non-significant ($p > 0.05$), indicating that groups had equal variances.

As shown in **Table 5**, gamification greatly increased motivation across all aspects compared to traditional teaching. Comparing of two groups without post hoc analysis. However, substantial F-values and p-values showed the inconsistencies were not random. We assessed the practical relevance of each motivation element by evaluating effect estimations using Partial Eta Squared (η^2). The results of the effect size calculations are summarized in **Table 6**.

Gaming stimulated middle-aged EFL students greatly, according to these effect sizes. The one-way ANOVA showed that the experimental group was far more motivated than the control group in all areas. The large effect sizes suggest that gamified learning may improve language acquisition and

motivation. Language training, particularly for middle-aged learners with distinct issues, requires innovative strategies.

Table 5. One-way ANOVA results.

Motivation Dimension	F-Value	p-Value
Enjoyment	F(1, 58) = 66.5	p < 0.001
Interest	F(1, 58) = 75.3	p < 0.001
Perceived Competence	F(1, 58) = 54.6	p < 0.001
Engagement	F(1, 58) = 65.1	p < 0.001

4.2. Qualitative Study Results

In semi-structured interviews, ten participants from the experimental group were interviewed to understand their motivation in gamified learning. The qualitative research revealed several themes that shed light on the benefits of incorporating gamification into the learning process. Firstly, participants reported that gamification made learning enjoyable as it felt more like playing a game rather than studying. This immersive experience not only increased their engagement but also enhanced their overall learning experience.

Secondly, the presence of leaderboards and points in gamified learning encouraged participation and competition among the participants. This competitive aspect motivated them to study harder and put in more effort to achieve higher

Table 6. Effect size calculation (partial eta squared).

Motivation Dimension	Partial Eta Squared (η^2)	Impact
Enjoyment	0.53	Substantial Impact
Interest	0.56	Substantial Influence
Perceived Competence	0.48	Significant Influence
Engagement	0.52	Significant Influence

scores and rankings. Furthermore, gamification proved to be effective in helping participants grasp new terms and concepts. Through immediate feedback and interactive features, gamified learning provided a supportive environment that made learners feel more competent. This boosted their confidence and allowed them to effectively utilize new knowledge. In addition to individual progress, gamified activities also fostered collaboration among learners, creating a sense of community within the group. The collaborative nature of these activities inspired participants to interact with one another, share ideas, and collectively work towards their learning goals. This sense of belonging and shared purpose contributed to a more enriching and motivating learning experience. The study ultimately found that gamification had a positive impact on middle-aged EFL students. Both quantitative and qualitative assessments revealed higher levels of enjoyment, interest, perceived competence, and engagement compared to traditional schooling. Moreover, the research demonstrated that gamification played a crucial role in driving these middle-aged learners to acquire language skills, primarily through increased enjoyment, confidence, and social involvement.

Overall, the incorporation of gamification into the learning process proved to be a highly effective method for stimulating and motivating middle-aged EFL students. The findings from this study highlight the immense potential of gamification in enhancing the overall learning experience and promoting language acquisition among learners in this age group. By incorporating gamification, educators can tap into the intrinsic motivation of learners, making the learning process more enjoyable and engaging. This leads to a deeper understanding of the subject matter and higher retention of knowledge.

Additionally, the collaborative aspect of gamified learning fosters teamwork, communication, and problem-solving skills. By working together towards a common goal, learners develop important interpersonal skills that are essential in

the professional world. The sense of community and camaraderie created through gamification not only aids in knowledge acquisition but also promotes a positive and supportive learning environment. Learners feel empowered to share ideas, ask questions, and take risks without fear of judgment or failure. Furthermore, gamified learning can be tailored to individual learners' needs and preferences, providing a personalized and adaptive learning experience. Through the use of technologies and platforms, educators can create customized learning paths, offering content and challenges that align with each learner's interests and abilities. This individualized approach ensures that learners remain engaged and motivated throughout their educational journey.

In conclusion, the incorporation of gamification into the learning process has proven to be a transformative and effective method for enhancing motivation, engagement, and overall learning outcomes. The positive impact of gamification on middle-aged EFL students, as demonstrated in this study, highlights its potential to revolutionize education and promote lifelong learning. As technology continues to advance, educators must embrace gamification as a powerful tool to create meaningful and enjoyable learning experiences. By harnessing the elements of games and applying them strategically in educational settings, we can cultivate a generation of learners who are enthusiastic, self-driven, and equipped with the necessary skills to thrive in the rapidly evolving world. The study found that the experimental group's English proficiency increased significantly compared with the control group in the post-test stage—both in the game-user group and the game non-user group.

4.3. Group Vocabulary Acquisition Pre- and Post-Test Scores

4.3.1. Vocabulary Growth

We examined how gamification influences vocabulary acquisition in middle-aged EFL students using descriptive

and inferential statistics. As shown in **Table 7**, the experimental group learned more vocabulary after the gamified intervention, but the control group did not.

Table 7. Comparison of experimental and control groups.

Group	Mean	Post-Test Mean	Pre-Test SD
Experimental Group	25	43	5
Control Group	24	30	6

4.3.2. Statistical Results

We used paired samples t-tests to investigate how gamification influenced vocabulary acquisition in each group. The results of these analyses are presented in **Table 8**.

Table 8. Results of paired samples t-test and independent samples t-test for experimental and control groups.

Test Type	t-Value	p-Value
Experimental Group Paired Samples t-Test	t(29) = 12.45	p < 0.001
Control Group Paired Samples t-Test	t(29) = 5.63	p < 0.001
Independent Samples t-Test (Post-test)	t(58) = 9.11	p < 0.001

The research employed a t-test to analyze the pre-test and post-test scores of 30 participants across both an experimental group and a control group. The findings indicated a notable enhancement in performance following the gamified learning program, evidenced by a t-value of 12.45, which reflects a substantial difference between the two groups. A p-value of less than 0.001 indicates that the observed improvement is unlikely to be attributable to random chance, demonstrating a significant increase in the performance of the experimental group following the intervention. The control group exhibited improvement from pre-test to post-test; however, the magnitude of this effect was less pronounced than that observed in the experimental group. A p-value of less than 0.001 signifies statistical significance, demonstrating that the control group experienced a notable increase in scores following traditional instruction, albeit to a lesser extent than the experimental group. The independent samples t-test revealed a significant difference between the experimental and control groups, evidenced by a t-value of 9.11, indicating that the experimental group outperformed the control group. A p-value of less than 0.001 signifies that the performance difference between the experimental and control groups is statistically significant, demonstrating that the experimental group outperformed the control group significantly.

As shown in **Table 9**, the Effect Size Calculation is a statistical instrument that quantifies the disparity between an experimental intervention and a control group. It offers a quantitative assessment of the disparity in results between the two groups. The experimental group had a significant effect size, demonstrating that the intervention substantially impacted outcomes including satisfaction, interest, and perceived competence. The control group had a moderate to high effect size, indicating that their experience with conventional teaching approaches positively influenced the observed results, although to a lesser extent.

Table 9. Effect size calculation.

Group	Cohen's d
Experimental Group	2.20 (large influence)
Control Group	0.85 (medium effect)

The substantial impact size of 2.20 signifies that the intervention was very efficient in markedly enhancing outcomes such as pleasure, interest, and perceived competence. The control group had a moderate effect size, indicating that conventional procedures had a beneficial albeit relatively lesser impact on these outcomes. Effect sizes, such as Cohen's d, assist researchers and educators in assessing the value of an intervention based on its practical significance. The experimental intervention had a substantial practical impact, positioning it as a compelling option for ongoing use or additional investigation. The control group's modest result indicates that conventional techniques may be less helpful in enhancing motivation and competence compared to the experimental intervention.

4.4. Discussion

Gaming encourages and increases vocabulary acquisition in middle-aged EFL students, according to one study. Gamified learning improved motivation and vocabulary retention compared to traditional training. This study uses SDT and Constructivist Learning Theory. The data support these theories.

Gamification satisfies SDT psychological needs by significantly improving motivation ratings across all areas (enjoyment, curiosity, perceived competence, and engagement). Gamified rewards and competition enhanced intrinsic motivation in the experimental group, improving enjoyment

and competence. Gamified exercises provide immediate feedback, helping players analyze their progress and feel competent. This supports SDT's assertion that met psychological requirements inspire and engage students.

Experimental group participation matches Constructivist Learning Theory's emphasis on active learning. Gamified activities promoted socialization and knowledge sharing, improving understanding. Participants' experiences with gamified language-application tasks confirm constructivist claims that contextual learning promotes retention. Qualitative interviews demonstrated that collaborative and competitive activities encouraged participants, confirming the idea that adult learners require social interaction.

This study corroborates prior research on educational gamification, demonstrating its efficacy as a motivator for learners and its superior capacity to promote engagement compared to conventional techniques. Competitive elements in gamification, such leaderboards and point systems, are proposed to augment student engagement. The research corroborates the conclusions of Huang and Soman^[52] that gamification improves vocabulary learning, shown by a significant rise in post-test scores among middle-aged EFL learners. The qualitative results corroborate the findings of Su and Cheng^[56] that interactive game-based learning facilitates vocabulary acquisition. The research underscores the significance of context and interaction in gamified vocabulary acquisition. The study emphasizes the significance of prompt feedback in gamified education, as observed by Pellas & Peroutseas^[55]. The findings provide a solid framework for analyzing the effects of gamification on educational achievements. This research assists instructors in developing engaging settings for adult learning and posits that creative teaching practices may augment motivation and boost results for adult learners.

5. Conclusions

The research indicated that gamification notably enhanced vocabulary acquisition among middle-aged EFL students in Jordan. Gamification has been shown to enhance motivation related to pleasure, curiosity, perceived skill, and engagement compared to traditional training methods. The experimental group demonstrated superior vocabulary retention, suggesting that gamified learning facilitates language

acquisition. The results corroborate Self-Determination Theory and Constructivist Learning Theory, indicating that innovative teaching strategies can enhance motivation and learning outcomes for adult learners. The study advocates for language learning experts and institutions to incorporate gamification into their curriculum design.

The results of a study on the use of gamified vocabulary learning tasks to motivate bilingual English as a Foreign Language (EFL) students with different motivation styles suggest that EFL teachers should incorporate digital hobbies into their teaching. This can be done through the use of digital apps, games, digital storytelling, and learning management systems. Utilizing technology in the classroom can help to enhance digital literacy, increase student engagement, and improve the performance of less motivated students. The gamification of vocabulary learning has been found to increase students' willingness to participate in class and actively study vocabulary. As a result, it is important for instruction to take into account learners' intrinsic and extrinsic motivation styles in order to maximize vocabulary learning. The evidence suggests that middle-aged learners may face challenges with gamification, and as such, attention should be given to providing them with greater detail, resources, encouragement, and recognition of their achievements. This can be achieved through the use of digital games, autonomous task game playing, substituting traditional homework with gamified tasks, and engaging them with vocabulary listening and speaking tasks that require higher-level skills. Furthermore, creating bilingual games and interactions for learners in school programs can promote the development of their intercultural competence, language acquisition, and 21st-century skills. These skills are essential for future professionals.

Key recommendations include prioritizing instant feedback, fostering cooperative learning, customizing gamification for learners, utilizing technology and interactive tools, implementing continuous evaluation and adjustment, and encouraging lifelong learning. Future studies should investigate the impact of gamification on vocabulary acquisition and motivation in EFL contexts over time, as well as identify which game elements are most effective for specific groups and learning environments. The findings corroborate prior research on gamification in education and indicate that innovative teaching strategies can enhance motivation and improve outcomes for adult learners.

Author Contributions

L.M.R. led the conceptualization, data curation, drafting, and supervision. M.H.A. contributed to methodology, formal analysis, visualization, and project administration. I.F.H., K.A., and F.M.A.-K. participated in formal analysis and manuscript review.

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The authors declare no conflict of interest.

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