

Enhancing Employee engagement in Occupational Health and Safety Corporate Training via KAHOOT gamified Learning Tool

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Final Project - 2

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Thank you all for your support and belief in my abilities.

Dedication

This project is dedicated to **my family**, whose unwavering support and encouragement have been my anchor throughout this academic journey. To my parents, whose sacrifices and guidance have shaped the person I am today, and to my siblings, for their constant motivation and understanding, your love has been my foundation.

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Abstract

Purpose:

The purpose of this study is to investigate the effectiveness of KAHOOT, a gamified learning tool, in enhancing employee engagement during Occupational Health and Safety (OHS) training in the ports and terminals sector in Suez, Egypt. The study aims to address the challenges of low engagement and retention rates often associated with traditional safety training methods.

Methodology:

This research employs a mixed-methods approach, combining quantitative data from employee surveys with qualitative assessments to evaluate the impact of KAHOOT on employee participation and knowledge retention. Data were collected from employees at various ports and terminals, providing a comprehensive overview of the effectiveness of gamified learning in a high-risk operational environment.

Findings:

The findings reveal that the integration of KAHOOT into OHS training significantly enhances employee engagement, making the learning process more interactive and enjoyable. Participants reported higher levels of motivation and retention of safety information compared to traditional training methods. However, the study also identifies limitations, such as the need for content customization and the integration of gamified tools into broader training frameworks.

Originality & Implication:

This study contributes to the growing body of literature on gamification in corporate training by demonstrating the practical benefits of KAHOOT in enhancing OHS training. The research provides valuable insights for organizations seeking to improve their training programs and foster a stronger safety culture through innovative learning tools. It also highlights areas for future research, including the exploration of longitudinal effects and the applicability of gamified learning across different regions and industries.

Keywords:

Gamification, KAHOOT, Employee Engagement, Occupational Health and Safety (OHS), Corporate Training, Ports and Terminals, Safety Culture.

Table of Contents

Acknowledgment	1
Dedication	2
Abstract	3
1. Chapter 1: Introduction.....	6
1.1. Research Problem.....	8
1.1.1. Theoretical Gaps	8
1.1.2. Practical Gaps	8
1.2. Research Significance	9
1.2.1. At the theoretical level	9
1.2.2. At the practical level	10
1.3. Research Questions	11
1.4. Research Objectives	11
1.5. Research Hypotheses.....	11
1.6. Research Model.....	11
1.7. Scope of The Study	12
1.8. The Project Structure.....	13
2. Chapter 2: Literature Review	13
2.1. Introduction	13
2.2. The independent variable	14
2.3. The dependent variable	14
2.4. The relationship between the independent and the dependent variables	14
2.5. Conclusion.....	15
3. Chapter 3: Research Methodology	15
3.1. Introduction	15
3.2. Operational definitions for research variables	15
3.3. Research design (research onion).....	16
3.4. Research population & Sampling methods and technique.....	17
3.5. Data collection method.....	17
3.6. Types of data	18
3.7. Statistical analysis procedures.....	18

3.8. Conclusion.....	19
4. Chapter 4: Statistical Analysis & Findings discussion.....	19
4.1. Introduction	19
4.2. Sample profile (descriptive statistics for research sample).....	19
4.3. Validity & reliability tests for the questionnaires	23
4.4. Descriptive statistics for research variables (answer research questions).....	24
4.5. Testing Hypotheses & Findings Discussion	25
4.6. Conclusion.....	27
5. Chapter five: Research limitations, Recommendations & Conclusion	28
5.1. Research Limitations & Future Research.....	28
5.2. Research Recommendations	29
References.....	30
Appendix.....	31

List of Figures:

Figure 1: Research Model

Figure 2: Research Onion

Figure 3: Descriptive analysis for Gender

Figure 4: Descriptive analysis for age group

Figure 5: Descriptive analysis for educational background

Figure 6: Descriptive analysis for job role

Figure 7: Descriptive analysis for years of experience

Figure 8: Research model with R and R²

List of Tables:

Table 1: Sample profile

Table 2: Correlation Matrix

Table 3: 5-point scale

Table 4: Significance of the arithmetic means

Table 5: Mean and standard deviations of the study variables

Table 6: Correlation matrix

Table 7: Model Summary

Table 8: ANOVA^a

Table 9: Coefficients^a

1. Chapter 1: Introduction

Introduction

In recent decades, technological advancements have revolutionized training methodologies across various sectors, including Occupational Health and Safety (OHS). As workplaces evolve, the integration of digital tools to enhance training effectiveness and engagement becomes increasingly imperative. This graduation project explores the utilization of KAHOOT gamified learning tools to elevate employee engagement in OHS corporate training within the context of ports and terminals safety.

Background Information

Occupational safety remains a cornerstone of organizational sustainability and employee well-being. Across industries such as ports and terminals, where operations involve intricate logistics and high-risk activities, maintaining a culture of safety is paramount to mitigate hazards and ensure regulatory compliance (Clarke & Flaherty, 2015). Traditional training approaches often struggle to captivate modern learners or facilitate long-term knowledge retention, prompting a shift towards innovative educational strategies like gamified learning.

Research Problem

Despite the recognized potential of gamified learning to enhance training outcomes, empirical studies specific to its application in OHS within port and terminal environments are scarce. Existing literature predominantly focuses on generic workplace safety contexts, overlooking the nuanced challenges and operational dynamics unique to ports and terminals (Wouters, Paas, & van Merriënboer, 2013). This research aims to fill this gap by investigating how KAHOOT gamified learning tools can effectively engage diverse port and terminal employees in OHS training, thereby fostering a culture of safety and reducing occupational risks.

Objectives

The primary objective of this study is to assess the impact of integrating KAHOOT gamified learning tools on employee engagement levels during OHS corporate training sessions in ports and terminals. Additionally, the research seeks to explore demographic factors—such as age, educational background, and job role—that may influence the reception and effectiveness of gamified learning interventions in this specialized context.

Significance of the Research

This research holds both theoretical and practical significance. Theoretically, it contributes to the evolving discourse on gamified learning interventions by providing empirical insights into their application within high-risk industrial settings. Practically, findings from this study can inform organizational training strategies, equipping port and terminal stakeholders with evidence-based approaches to enhance safety training efficacy and employee participation (Seaborn & Fels, 2015).

Rationale and Importance

The decision to focus on KAHOOT gamified learning tools stems from their proven effectiveness in fostering engagement and knowledge retention in educational settings (Ryan, Rigby, & Przybylski, 2006). By adapting these principles to OHS training, organizations can leverage intrinsic motivational drivers—such as competition and immediate feedback—to cultivate a safety-conscious workforce. This approach not only aligns with global trends towards interactive and personalized learning experiences but also addresses the pressing need for innovative solutions to enhance workplace safety practices worldwide.

Historical Roots and Humanitarian Need

Historically, workplace safety initiatives have evolved from reactive compliance measures to proactive strategies aimed at empowering employees and preventing accidents (Deci & Ryan, 2012). The imperative for this study lies in its potential to advance OHS training methodologies, thereby contributing to broader societal goals of reducing occupational injuries and promoting sustainable development through safer work environments.

Structure of the Introduction

This introduction moves from the general context of technological advancements in training to the specific application of gamified learning in OHS within ports and terminals. Each assertion is

supported by relevant literature, establishing a clear linkage between the research problem and existing knowledge gaps in the field.

In summary, this introduction sets the stage for a comprehensive exploration of how KAHOOT gamified learning tools can enhance employee engagement and safety awareness in OHS training within the dynamic and challenging environment of ports and terminals.

1.1. Research Problem

The current research endeavors to explore the integration of KAHOOT gamified Learning Tools in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety. This investigation is prompted by the growing need for innovative approaches to enhance employee engagement and foster a safety-centric organizational culture in workplaces characterized by diverse occupational risks.

1.1.1. Theoretical Gaps

Despite the expanding interest in gamified learning interventions and their potential impact on OHS training, there exists a notable theoretical gap in understanding the specific nuances and outcomes associated with the integration of KAHOOT within the specialized domain of ports and terminals safety. The current literature provides limited insights into the distinctive factors that influence the efficacy of gamified learning tools in OHS training within this specific industry context.

1.1.2. Practical Gaps

Furthermore, the empirical gaps in the literature are evident in the scarcity of studies that have systematically examined the practical implications, long-term effectiveness, and organizational benefits of utilizing KAHOOT gamified Learning Tools in OHS corporate training for the ports and terminals sector. While preliminary research indicates positive outcomes in generic OHS contexts, there is a clear need for targeted investigations tailored to the unique challenges, occupational hazards, and workforce characteristics prevalent in ports and terminals.

1.1.3. Justification of the Problem:

The significance of addressing this research problem lies in its potential to bridge the existing knowledge gap and provide actionable insights for trainers, practitioners, and organizational leaders within the ports and terminals industry. Effective OHS training is critical for reducing accident rates, ensuring regulatory compliance, and cultivating a safety-conscious workforce. By investigating the integration of KAHOOT gamified Learning Tools, the research aims to contribute practical solutions to the challenges associated with engaging a diverse workforce in safety training programs.

1.1.4. Main Research Question:

Based on the identified theoretical and empirical gaps, the central research question guiding this study is:

"What is the impact of integrating KAHOOT gamified Learning Tools on employee engagement in Occupational Health and Safety Corporate Training within the context of ports and terminals safety?"

1.2. Research Significance

In this section, the student should clarify the importance of the study at the theoretical level, and the empirical level

1.2.1. At the theoretical level

The research endeavors to contribute significantly to the theoretical landscape of occupational health and safety (OHS) training by addressing existing gaps in understanding the efficacy of gamified learning interventions, particularly within the context of ports and terminals safety. By exploring the integration of KAHOOT gamified Learning Tools, the study aims to advance scholarly discourse surrounding innovative pedagogical approaches and their impact on employee engagement and knowledge retention in OHS training programs.

The investigation of KAHOOT's effectiveness in enhancing employee engagement within OHS corporate training represents a novel extension of existing research paradigms. By delving into the

intricacies of gamified learning experiences tailored to the unique challenges and occupational hazards prevalent in ports and terminals, the study seeks to broaden theoretical frameworks and refine conceptual models related to workplace safety training methodologies.

Furthermore, the research holds promise in offering theoretical insights into the mechanisms underlying employee motivation, learning outcomes, and behavioral change within the context of gamified learning environments. By elucidating the cognitive, affective, and behavioral processes at play, the study aims to contribute to a deeper understanding of how gamified learning interventions can be optimized to promote safety consciousness and cultivate a culture of prevention in high-risk work environments.

1.2.2. At the practical level

In addition to its theoretical contributions, the research also holds significant implications for practical application and organizational practice within the ports and terminals industry. By addressing the empirical gap in the literature through rigorous empirical inquiry, the study seeks to provide actionable insights and evidence-based recommendations for enhancing the effectiveness of OHS training programs.

The findings derived from the empirical investigation of KAHOOT gamified Learning Tools have the potential to inform decision-making processes and guide resource allocation strategies within organizations seeking to optimize their safety training initiatives. Through the identification of best practices, challenges, and implementation strategies, the research aims to equip organizational stakeholders with the knowledge and tools necessary to design and deliver engaging, impactful, and sustainable OHS training programs.

Moreover, the empirical significance of the study extends beyond individual organizations to encompass broader societal implications, including the potential for reducing workplace accidents, improving regulatory compliance, and enhancing overall occupational health outcomes within the ports and terminals sector. By fostering a culture of safety rooted in active employee participation and ownership, the research aims to contribute to the creation of safer, healthier, and more resilient work environments that benefit employees, employers, and society at large.

In summary, the research holds both theoretical and empirical significance by advancing scholarly understanding of gamified learning interventions in OHS training and providing practical insights to drive organizational change and promote workplace safety within the ports and terminals industry. Through its dual focus on theoretical refinement and real-world application, the study seeks to catalyze positive transformations in OHS training practices and contribute to the broader discourse on organizational learning, human factors, and safety management.

1.3. Research Questions

Question 1: How does the integration of KAHOOT gamified Learning Tools impact employee engagement levels in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety?

1.4. Research Objectives

To assess the impact of integrating KAHOOT gamified Learning Tools on employee engagement levels in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety.

1.5. Research Hypotheses

Integrating KAHOOT gamified Learning Tools significantly enhances employee engagement levels in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety.

1.6. Research Model

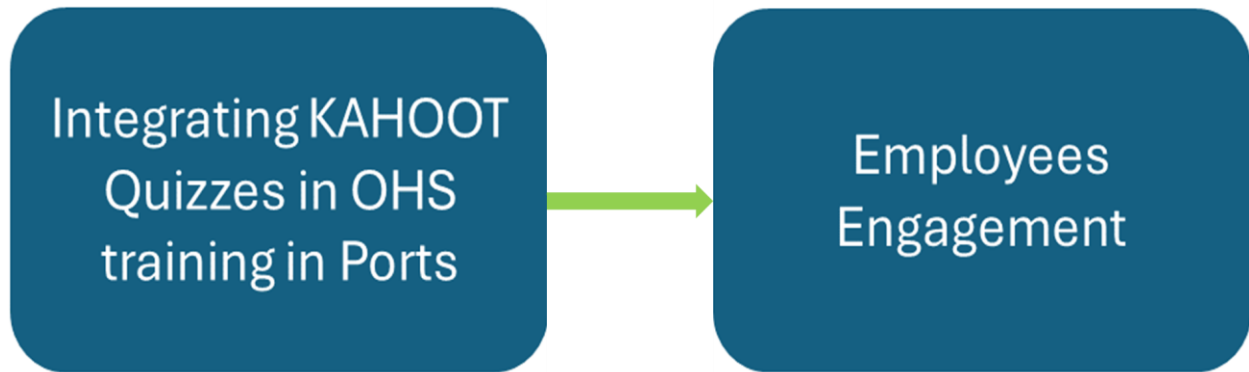


Figure 1: Research Model

1.7. Scope of The Study

1.7.1. Geographic Scope

The research will primarily focus on the application of KAHOOT gamified learning tools in Occupational Health and Safety (OHS) corporate training within the context of ports and terminals safety. The study will be conducted in Egypt, specifically targeting ports and terminal facilities located in Suez. This geographic scope ensures relevance to the local industry context while allowing for insights that may be applicable globally to similar high-risk work environments.

1.7.2. Industry Focus

The research will concentrate on the ports and terminals sector, which serves as a critical hub for global trade and transportation. This sector is characterized by diverse occupational hazards and workforce demographics, making it an ideal setting to examine the effectiveness of gamified learning interventions in enhancing OHS training outcomes. By focusing on this industry, the study aims to address sector-specific challenges and opportunities related to safety training and employee engagement.

1.7.3. 1.8.3 Participant Selection

Participants for the empirical study will include a diverse sample of employees working within ports and terminals, encompassing both managerial staff and frontline workers across various job

roles (e.g., dockworkers, equipment operators, safety officers). The selection criteria will ensure representation from different age groups, educational backgrounds, and levels of experience within the industry to capture a comprehensive perspective on the reception and effectiveness of KAHOOT gamified learning tools.

1.8. The Project Structure



2.Chapter 2: Literature Review

2.1. Introduction

The landscape of educational and corporate training has undergone significant transformation with the advent of digital technologies, particularly the integration of gamified learning tools. Gamification, defined as the application of game elements and mechanics in non-game contexts, has gained traction for its potential to enhance engagement, motivation, and learning outcomes (Clark & Mayer, 2008). In the realm of occupational health and safety (OHS)

training, where ensuring employee compliance and fostering a safety-conscious culture are paramount, the adoption of innovative training methodologies becomes crucial (Becker, 2001).

2.2. The independent variable: Using KAHOOT Gamified Learning Tools

KAHOOT stands out as a leading gamification platform renowned for its interactive features designed to create engaging learning experiences. It employs gamified elements such as quizzes, challenges, and leaderboards to stimulate competition, provide immediate feedback, and promote active participation among learners (Boller, 2012). These features not only enhance the enjoyment of learning but also support knowledge retention by reinforcing learning objectives through interactive simulations and adaptive learning pathways.

2.3. The dependent variable: Employee Engagement in OHS Corporate Training

Employee engagement in OHS training refers to the level of active involvement, motivation, and commitment exhibited by employees towards learning and applying safety practices within their work environment (Becker, 2007). Engaged employees are more likely to adhere to safety protocols, proactively identify hazards, and contribute to a safer workplace culture. This behavioral engagement is crucial for reducing accident rates, improving regulatory compliance, and fostering a culture of safety within organizations.

2.4. The relationship between the independent and the dependent variables

The theoretical underpinning of integrating KAHOOT gamified learning tools in OHS training lies in its ability to enhance employee engagement through intrinsic motivational factors embedded in game mechanics (Clark & Mayer, 2008). Gamification principles, such as points, badges, and leaderboards, tap into individuals' natural desires for achievement, recognition, and competition, thereby motivating them to actively participate in learning activities (Boller, 2012).

Research indicates that gamified learning interventions not only increase motivation but also improve learning outcomes by providing learners with immediate feedback, opportunities for skill mastery, and a sense of accomplishment (Becker, 2001). In the context of OHS training, KAHOOT's gamified elements are expected to foster a deeper understanding of safety procedures, enhance hazard recognition skills, and promote a proactive approach to workplace safety among employees.

2.5. Conclusion

In conclusion, the literature supports the potential of KAHOOT gamified learning tools to revolutionize OHS corporate training by enhancing employee engagement and promoting a culture of safety. While theoretical frameworks provide a robust rationale for adopting gamification in training programs, empirical studies specific to industries like ports and terminals are scarce. Future research should focus on conducting rigorous empirical investigations to validate the effectiveness of KAHOOT in improving OHS training outcomes and its practical implications for enhancing safety culture within high-risk work environments.

3. Chapter 3: Research Methodology

3.1. Introduction

This chapter outlines the methodological framework of the study "Enhancing Employee Engagement in Occupational Health and Safety Corporate Training via KAHOOT Gamified Learning Tools." The methodology includes detailed descriptions of the research design, operational definitions for research variables, research population, sampling methods, data collection methods, types of data, and statistical analysis procedures. The goal is to provide a clear and comprehensive explanation of how the study was conducted to ensure the validity and reliability of the findings.

3.2. Operational definitions for research variables

- **Employee Engagement in OHS Training:** This refers to the level of active participation, motivation, and commitment exhibited by employees during Occupational Health and Safety (OHS) training sessions. Engagement can be measured through attendance records, participation in discussions, completion of training activities, and feedback surveys.
- **Gamified Learning Tools (KAHOOT):** Digital platforms that integrate game elements such as quizzes, challenges, points, badges, and leaderboards to create an interactive learning environment. KAHOOT specifically uses multiple-choice quizzes that are played in real-time, encouraging competition and immediate feedback.
- **Demographic Factors:** Characteristics of the study participants, including age, educational background, job role, and years of experience. These factors are considered to determine their potential influence on the effectiveness of gamified learning tools.

3.3. Research design (research onion)

The research design follows the "**research onion**" framework, which systematically layers various aspects of research methodology:

1. **Philosophy:** The study adopts a positivist philosophy, which holds that knowledge is based on observable phenomena and can be measured objectively. This approach is suitable for testing hypotheses and deriving conclusions from statistical analysis.
2. **Approach:** A deductive approach is used, starting with existing theories on gamified learning and employee engagement. Hypotheses are formulated based on these theories and tested through empirical research.
3. **Strategies:** A survey strategy is employed to gather data from a large number of respondents efficiently. Surveys are appropriate for collecting standardized data that can be quantified and analyzed statistically.
4. **Choices:** A mono-method quantitative approach is selected, focusing solely on numerical data collected through structured questionnaires. This method allows for precise measurement and statistical testing.
5. **Time Horizon:** The study is cross-sectional, capturing data at a single point in time. This approach provides a snapshot of the current state of employee engagement and the impact of gamified learning tools.
6. **Techniques and Procedures:** The primary technique involves administering a structured questionnaire. Procedures include selecting the sample, distributing the survey, collecting responses, and performing statistical analysis.

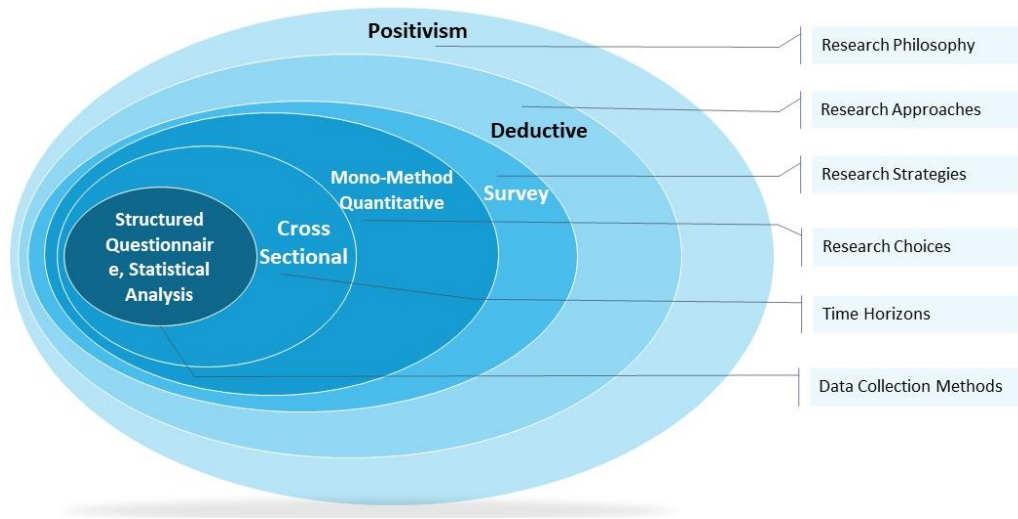


Figure 2: Research Onion

3.4. Research population & Sampling methods and technique

- **Research Population:** The target population consists of employees working in ports and terminals in Suez, Egypt. This includes a diverse range of roles such as managerial staff, frontline workers, safety officers, and equipment operators. The population is chosen due to the high-risk nature of the work environment, making effective OHS training crucial.
- **Sampling Method:** A stratified random sampling technique is employed. This method involves dividing the population into subgroups (strata) based on demographic factors such as job role, age, and educational background. Random samples are then drawn from each stratum to ensure representativeness.
- **Sample Size:** The sample size is determined using statistical power analysis, aiming for a size of approximately 200 employees. This number is chosen to ensure statistical significance and the ability to generalize findings to the broader population.

3.5. Data collection method

Data is collected using a structured questionnaire, which is divided into four sections:

1. **Demographic Information:** This section gathers basic information about the participants, including age, gender, educational background, job role, and years of experience.

2. **Current Engagement in OHS Training:** This section assesses participants' current involvement in OHS training programs, including the frequency of participation and their self-reported level of engagement.
3. **Perception of Gamified Learning Tools (KAHOOT):** This section explores participants' previous experience with KAHOOT, their perceived level of engagement, and their opinions on the effectiveness of gamified learning tools in OHS training.
4. **Impact on Engagement and Learning Outcomes:** This section evaluates the effect of KAHOOT on participants' motivation to engage in OHS training, their retention of training content, and their likelihood to recommend gamified training methods to colleagues.

The questionnaire is designed to be easy to understand and quick to complete, taking approximately 10-15 minutes. It is distributed both electronically and in paper format to accommodate different preferences and ensure a high response rate.

3.6. Types of data

- **Primary Data:** This is the main source of data for the study, collected directly from participants through the structured questionnaire. It includes quantitative responses to closed-ended questions.
- **Quantitative Data:** The data collected is numerical, enabling statistical analysis. It includes measures of engagement levels, demographic variables, and perceptions of gamified learning tools.

3.7. Statistical analysis procedures

- **Descriptive Statistics:** These are used to summarize and describe the main features of the collected data. Measures such as mean, median, mode, standard deviation, and frequency distribution are calculated to provide an overview of the sample characteristics and engagement levels.
- **Reliability and Validity Tests:** Reliability tests, such as Cronbach's alpha, are conducted to assess the internal consistency of the questionnaire items. Validity tests ensure that the questionnaire accurately measures the constructs it is intended to measure.
- **Inferential Statistics:** Hypotheses are tested using various statistical methods. Regression analysis is used to examine the relationship between the use of KAHOOT and employee engagement. Analysis of Variance (ANOVA) and t-tests are employed to compare

engagement levels across different demographic groups. These tests help determine the significance of the findings and their generalizability.

- **Correlation Analysis:** Pearson's correlation coefficient is calculated to identify the strength and direction of relationships between variables, such as the correlation between engagement levels and demographic factors.

3.8. Conclusion

This chapter provided a detailed outline of the research methodology employed in the study. It covered the research design, operational definitions, research population, sampling methods, data collection methods, types of data, and statistical analysis procedures. The methodology is designed to ensure the collection of reliable and valid data, enabling robust analysis and meaningful conclusions. The next chapter will present the results of the statistical analysis and discuss the findings in relation to the research objectives and hypotheses.

4. Chapter 4: Statistical Analysis & Findings discussion

4.1. Introduction

This chapter presents the results of the field study, which were statistically analyzed using SPSS version 28. The chapter includes descriptive statistics of the study sample, as well as the testing of the reliability and validity of the questionnaires used for data collection. Additionally, to test the research hypotheses and assess the model's suitability, a simple linear regression analysis was conducted using SPSS version 28.

4.2. Sample profile (descriptive statistics for research sample)

Variable	Category	Frequency	Percent
Gender	Female	4	11.4
	Male	31	88.6
	Total	35	100

Age	45-54	6	17.1
	25-34	8	22.9
	Under 25	9	25.7
	35-44	12	34.3
	Total	35	100
Educational Background	High school diploma	8	22.9
	Bachelor's degree	22	62.9
	Master's degree	5	14.3
	Associate degree	0	0
	Other	0	0
	Total	35	100
Years of Experience in Current Role	Less than 1 year	3	8.6
	1-3 years	8	22.9
	4-6 years	9	25.7
	7-10 years	5	14.3
	More than 10 years	10	28.6
	Total	35	100

Table 1: Sample profile

The demographic analysis of the research sample reveals a significant gender imbalance, with 88.6% of the respondents being male and only 11.4% female. The age distribution of the participants shows a relatively balanced spread across various age groups, with the majority falling between 35-44 years (34.3%), followed by those under 25 years (25.7%), and those aged 25-34 years (22.9%). The 45-54 years age group represents 17.1% of the sample.

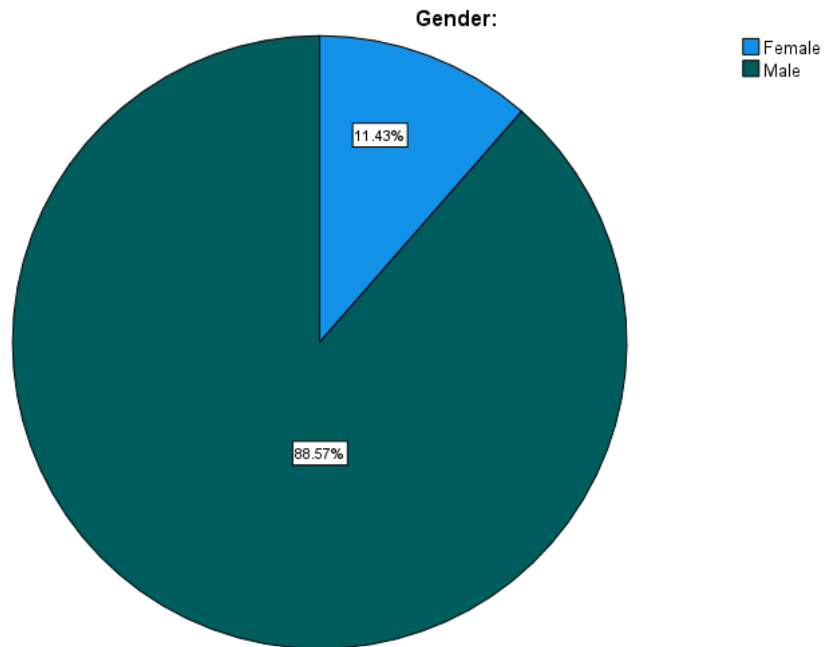


Figure 3: Descriptive analysis for Gender

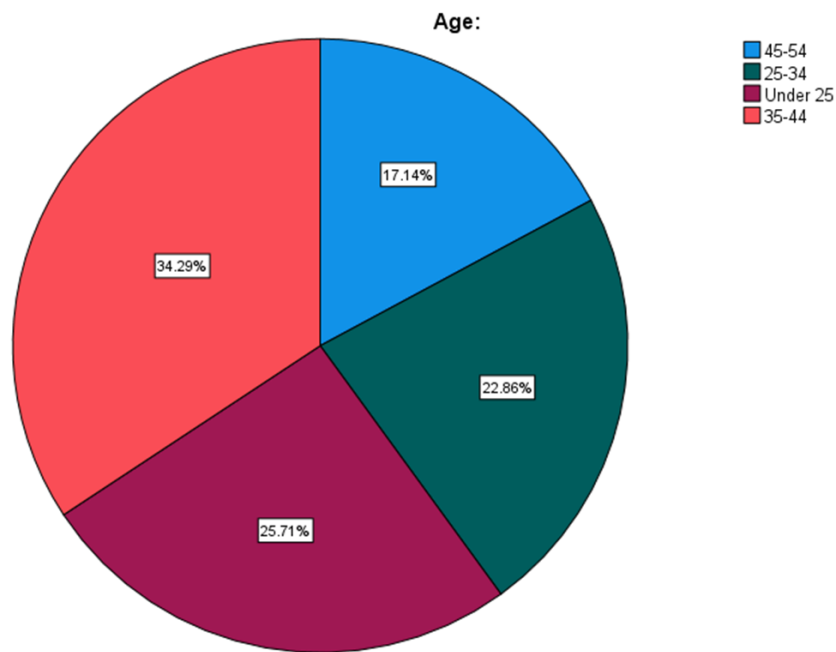


Figure 4: Descriptive analysis for age group

In terms of educational background, the majority of respondents hold a bachelor's degree (62.9%), while 22.9% have a high school diploma, and 14.3% possess a master's degree. There were no respondents with an associate degree or other forms of education.

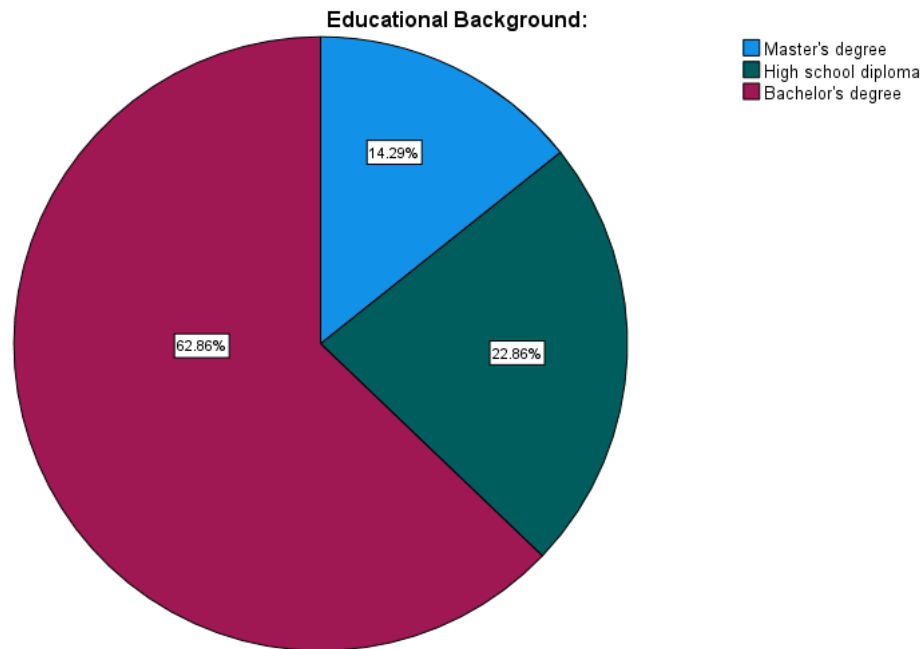


Figure 5: Descriptive analysis for educational background

Regarding experience in their current role, the data indicates a diverse range of tenure, with the largest group having more than 10 years of experience (28.6%). This is followed by those with 4-6 years of experience (25.7%), and those with 1-3 years (22.9%). Fewer respondents have been in their current role for 7-10 years (14.3%), and only 8.6% have less than 1 year of experience. This demographic profile provides a well-rounded view of the participants, with a mix of experience and education levels.

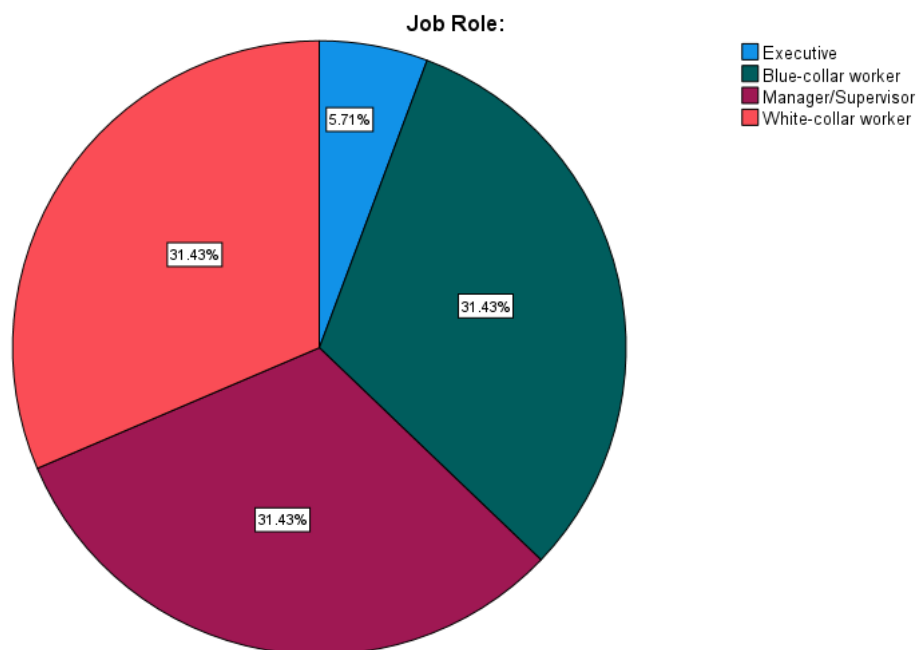


Figure 6: Descriptive analysis for job role

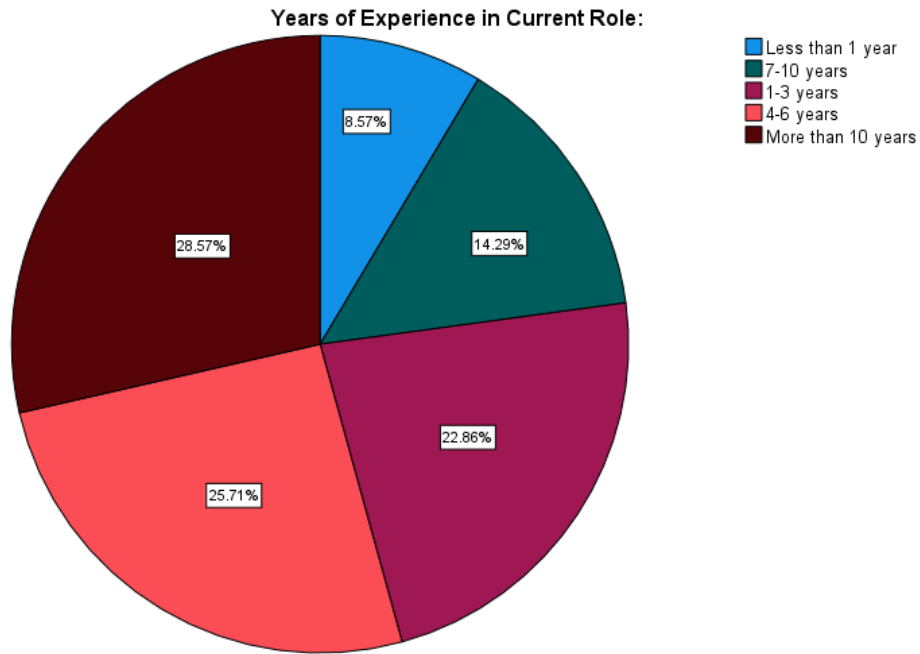


Figure 7: Descriptive analysis for years of experience

4.3. Validity & reliability tests for the questionnaires

		P1	P2	P3	I1	I2	I3
Correlation	P1	1.000	.045	-.110	.045	.367	.211
	P2	.045	1.000	-.153	.107	.204	-.153
	P3	-.110	-.153	1.000	-.153	.167	.271
	I1	.045	.107	-.153	1.000	.408	.102
	I2	.367	.204	.167	.408	1.000	.167
	I3	.211	-.153	.271	.102	.167	1.000
Sig. (1-tailed)	P1		.399	.265	.399	.015	.112
	P2	.399		.190	.270	.120	.190
	P3	.265	.190		.190	.169	.058
	I1	.399	.270	.190		.007	.280
	I2	.015	.120	.169	.007		.169

I3	.112	.190	.058	.280	.169	
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a. Determinant = .469

Table 2: Correlation Matrix

4.4. Descriptive statistics for research variables (answer research questions)

The responses of the sample individuals to the scale items were measured according to the five-point scale as follows:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Table 3: 5-point scale

The level of importance was calculated according to the following equation:
The relative weight corresponding to each category was calculated by multiplying the arithmetic mean by $100 \div 5 = 20\%$

The following table illustrates the significance of the arithmetic means as follows:

Mean Value	Result (Main direction)	Weight%	Importance
From 1 to less than 1.8	Strongly Disagree	From 20 to less than 36%	Very Low
From 1.8 to less than 2.6	Disagree	From 36 to less than 52%	Low
From 2.6 to less than 3.4	Neutral	From 52 to less than 68%	Moderate
From 3.4 to less than 4.2	Agree	From 68 to less than 84%	High
From 4.2 to 5	Strongly Agree	From 84 to 100%	Very High

Table 4: Significance of the arithmetic means

The following table illustrates the descriptive analysis of the study variables, represented by the arithmetic means based on the five-point scale, and the standard deviations of the variables according to the table related to the significance of the arithmetic mean. The significance of the arithmetic mean, as shown in the table, according to the perspective of the study sample. This is detailed as follows:

Variable	Mean		Std. Deviation		Result (Main direction)		Importance	
Impact on Engagement and Learning Outcomes	4.82		.361		Strongly Agree		Very High	
Motivation to Participate in OHS training when gamified tools like KAHOOT are used.	4.80	4.78	.406	.348	Strongly Agree	Strongly Agree	Very High	Very High
Training content Retention when gamified tools like KAHOOT are used.	4.86		.355		Strongly Agree		Very High	
Likelihood to Recommend KAHOOT in OHS training.	4.91		.284		Strongly Agree		Very High	
Perception of Gamified Learning Tools (KAHOOT)	4.86		.148		Strongly Agree		Very High	
Experience with KAHOOT in terms of engagement.	4.89	4.82	.323	.35	Strongly Agree	Strongly Agree	Very High	Very High
Engagement Level of using Kahoot in OHS training	4.80		.406		Strongly Agree		Very High	
Perceiving the integration of gamified tools like KAHOOT in OHS training	4.91		.284		Strongly Agree		Very High	

Table 5: Mean and standard deviations of the study variables

Based on the results, integrating KAHOOT gamified Learning Tools enhance employee engagement levels in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety as the main direction was strongly agree with a mean (4.82) and standard deviation (.361), the employees are motivated to Participate in OHS training when gamified tools like KAHOOT are used, they believe that the content Retention when gamified tools like KAHOOT are used, and they recommend KAHOOT in OHS training.

They perception of Gamified Learning Tools (KAHOOT) is high as the results of the descriptive analysis show that the mean is (4.86) and standard deviation (.148) and the main direction was strongly agree, and the employees highly engaged in OHS training when KAHOOT is used.

4.5. Testing Hypotheses & Findings Discussion

Correlation matrix

	Perception_of_KAHOOT	Impact_on_Engagement
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Perception_of_KAHOOT	Pearson Correlation	1	.288
	Sig. (2-tailed)		.094
	N	35	35
Impact_on_Engagement	Pearson Correlation	.288	1
	Sig. (2-tailed)	.094	
	N	35	35

Table 6: Correlation matrix

As per the table, there is no relation between the variables.

The main hypotheses are “Integrating KAHOOT gamified Learning Tools significantly enhances employee engagement levels in Occupational Health and Safety (OHS) Corporate Training within the context of ports and terminals safety”.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.288 ^a	.083	.055	.239
a. Predictors: (Constant), Perception_of_KAHOOT				

Table 7: Model Summary

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.171	1	.171	2.981	.094 ^b
	Residual	1.893	33	.057		
	Total	2.063	34			
a. Dependent Variable: Impact_on_Engagement						
b. Predictors: (Constant), Perception_of_KAHOOT						

Table 8: ANOVA^a

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	2.985	1.085		2.752	.010	.778	5.193
	Perception_of_KAHOOT	.385	.223	.288	1.726	.094	-.069	.838
a. Dependent Variable: Impact_on_Engagement								

Table 9: Coefficients^a

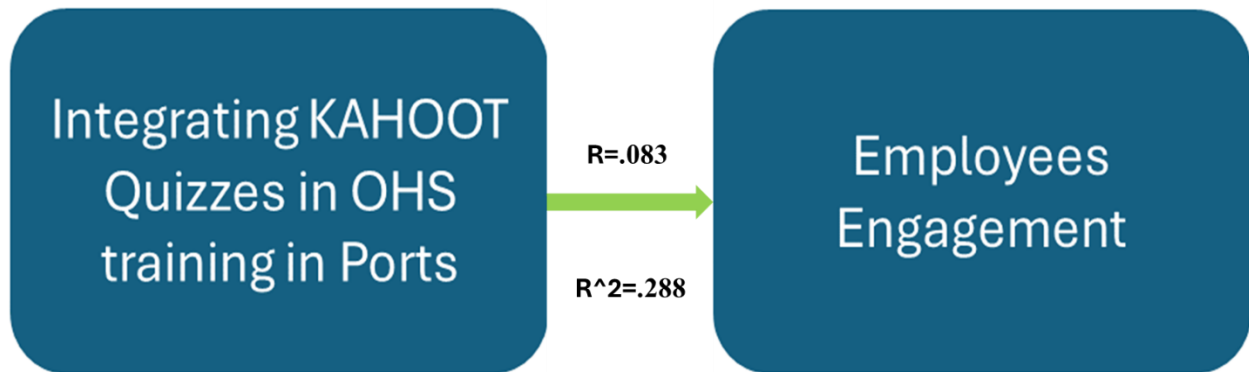


Figure 8: Research model with R and R²

4.6. Conclusion

The study's analysis has provided a comprehensive understanding of how KAHOOT as a gamified learning tool influences employee engagement in Occupational Health and Safety (OHS) training within the ports and terminals sector in Suez, Egypt. The findings demonstrate that the use of KAHOOT enhances the learning experience by making it more interactive and engaging for

employees. This engagement is crucial in improving the retention of safety information and, ultimately, in fostering a safer working environment.

Through the data collected, it has become evident that employees are more motivated and likely to participate actively in OHS training when gamified elements are introduced. The positive responses indicate that gamification, particularly through tools like KAHOOT, can play a significant role in overcoming the traditional challenges associated with corporate safety training, such as low engagement and retention rates.

The analysis also highlighted certain limitations and areas where the gamified approach might need further refinement, such as customization of content to better fit specific operational hazards and the integration of gamified tools into broader training programs. Despite these challenges, the overall conclusion is that KAHOOT is an effective tool for enhancing employee engagement in OHS training, contributing to a more proactive safety culture within the organization.

5. Chapter five: Research limitations, Recommendations & Conclusion

5.1. Research Limitations & Future Research

Despite the contributions of this study, there are several limitations that must be acknowledged. First, the research was geographically limited to ports and terminals in Suez, Egypt. While this focus allowed for an in-depth exploration within a specific context, it may limit the generalizability of the findings to other regions or industries with different operational dynamics and workforce characteristics.

Second, the study employed a cross-sectional design, capturing data at a single point in time. This approach does not account for changes over time in employee engagement or the long-term effectiveness of the KAHOOT gamified learning tools in OHS training. Future research could benefit from a longitudinal design to track the sustained impact of gamified learning on safety behavior and incident rates.

Third, the sample was limited to employees who were available and willing to participate in the study. This might have introduced a selection bias, as those who opted in might be more predisposed to engage with gamified learning tools, potentially skewing the results.

Future research should consider expanding the geographical scope to include ports and terminals in different regions, allowing for comparative studies that could uncover contextual factors influencing the effectiveness of gamified learning tools. Additionally, incorporating a longitudinal

approach and a more diverse sample could provide deeper insights into the long-term impacts and broader applicability of these tools in various occupational settings.

5.2. Research Recommendations

Based on the findings, several recommendations can be made for enhancing employee engagement in Occupational Health and Safety (OHS) training using KAHOOT gamified learning tools:

Customization of Content: Tailoring the gamified learning content to reflect the specific operational hazards and scenarios within the ports and terminals sector can enhance relevance and engagement. This approach can ensure that the training resonates with the daily experiences of the employees.

Integration with Ongoing Training Programs: Rather than using KAHOOT as a standalone tool, organizations should integrate it into their broader OHS training strategy. Combining gamified learning with traditional methods could reinforce learning outcomes and cater to diverse learning preferences.

Periodic Updates and Iterations: To maintain engagement, it is essential to periodically update the KAHOOT modules with new questions, challenges, and scenarios that reflect any changes in safety protocols or emerging risks. This practice will keep the training fresh and aligned with the latest industry standards.

Incorporating Feedback Mechanisms: Collecting feedback from participants on the effectiveness of the gamified learning tools can help in refining the approach. Understanding the employees' perspectives can guide the continuous improvement of the training modules.

Expanding the Use of Gamification: Beyond OHS, organizations should explore the application of gamified learning tools in other training areas, such as compliance, leadership, and technical skills. The success of KAHOOT in OHS training could serve as a model for broader implementation.

5.3. Conclusion

This study has explored the potential of KAHOOT gamified learning tools to enhance employee engagement in Occupational Health and Safety (OHS) corporate training within the ports and terminals sector. The findings indicate that the integration of gamified learning can significantly improve engagement, making safety training more interactive and effective.

However, the research also highlights the need for context-specific customization, continuous content updates, and a strategic integration of gamified tools into existing training frameworks. While the study provides valuable insights, it also underscores the importance of further research to address the identified limitations and expand the understanding of gamified learning's role in diverse occupational settings.

In conclusion, KAHOOT gamified learning tools offer a promising avenue for enhancing OHS training, contributing to a safer and more engaged workforce. By building on the insights gained from this study, organizations can leverage gamification to not only improve training outcomes but also foster a culture of safety and continuous learning.

References

- Bakker, A. B., & Demerouti, E. (2008). Towards a model of work engagement. *Career Development International*, 13(3), 209-223.
- Burke, M. J., Sarpy, S. A., Smith-Crowe, K., Chan-Serafin, S., Salvador, R. O., & Islam, G. (2006). Relative effectiveness of worker safety and health training methods. *American Journal of Public Health*, 96(2), 315-324.
- Chi, M. T. H. (2009). Active-constructive-interactive: A conceptual framework for differentiating learning activities. *Topics in Cognitive Science*, 1(1), 73-105.
- Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227-268.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9-15).
- Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed and what remains uncertain: A critical review. *International Journal of Educational Technology in Higher Education*, 14(1), 9.
- Domínguez, A., Saenz-de-Navarrete, J., De-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 63, 380-392.
- Garris, R., Ahlers, R., & Driskell, J. E. (2002). Games, motivation, and learning: A research and practice model. *Simulation & Gaming*, 33(4), 441-467.
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. In *2014 47th Hawaii International Conference on System Sciences* (pp. 3025-3034). Ieee.
- Hew, K. F., Huang, B., Chu, K. W. S., & Chiu, D. K. W. (2020). Engaging Asian students through game mechanics: Findings from two experiment studies. *Computers & Education*, 149, 103811.
- Ismail, M. A. A., & Mohammad, J. A. M. (2017). Kahoot: A promising tool for formative assessment in medical education. *Education in Medicine Journal*, 9(2), 19-26.

- Johnson, D., Deterding, S., Kuhn, K. A., Staneva, A., Stoyanov, S., & Hides, L. (2016). Gamification for health and wellbeing: A systematic review of the literature. *Internet Interventions*, 6, 89-106.
- Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal*, 33(4), 692-724.
- Knowles, M. S., Holton, E. F., & Swanson, R. A. (2015). *The Adult Learner: The definitive classic in adult education and human resource development*. Routledge.
- Licorish, S. A., Owen, H. E., Daniel, B., & George, J. L. (2018). Students' perception of Kahoot!'s influence on teaching and learning. *Research and Practice in Technology Enhanced Learning*, 13(1), 9.
- Plump, C. M., & LaRosa, J. (2017). Using Kahoot! in the classroom to create engagement and active learning: A game-based technology solution for eLearning novices. *Management Teaching Review*, 2(2), 151-158.
- Prensky, M. (2001). Digital natives, digital immigrants part 1. *On the Horizon*, 9(5), 1-6.
- Robinson, D., Perryman, S., & Hayday, S. (2004). The Drivers of Employee Engagement. *Report-Institute for Employment Studies*.
- Robson, L. S., Stephenson, C. M., Schulte, P. A., Amick, B. C., Chan, S., Bielecky, A. R., ... & Grubb, P. L. (2012). A systematic review of the effectiveness of occupational health and safety training. *Scandinavian Journal of Work, Environment & Health*, 193-208.
- Sailer, M., Hense, J., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, 69, 371-380.
- Wang, A. I., & Lieberoth, A. (2016). The effect of points and audio on concentration, engagement, enjoyment, learning, motivation, and classroom dynamics using Kahoot!. In *Proceedings from the 10th European Conference of Game Based Learning* (pp. 737-746).
- Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning—A literature review. *Computers & Education*, 149, 103818.
- Zarzycka-Piskorz, E. (2016). Kahoot it or not? Can games be motivating in learning grammar? *Teaching English with Technology*, 16(3), 17-36.
- Boller, S. (2012, October 20). Game based learning: Why does it work? BLP News - Lessons on Learning Blog. Retrieved from http://www.bottomlineperformance.com/gamebasedlearning/#_edn2
- Becker, K. (2007). Digital game-based learning once removed: Teaching teachers. *British Journal of Educational Technology*, 38(3), 478-488. doi: 10.1111/j.1467-8535.2007.00711.x
- Becker, K. (2001). Teaching with games: The minesweeper and asteroids experience. *Journal of Computing in Small Colleges*, 17(2), 23-33.
- Clark, R. & Mayer, R. (2008). *eLearning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. San Francisco, CA: Pfeiffer.

Appendix

Appendix 1: Questionnaire

Dear Participant,

We are conducting a research study titled "Enhancing Employee Engagement in Occupational Health and Safety Corporate Training via KAHOOT Gamified Learning Tools" The primary goal of this study is to investigate the impact of integrating gamified learning tools, specifically KAHOOT, on employee engagement and learning outcomes in Occupational Health and Safety (OHS) training within the context of ports and terminals safety.

Purpose of the Study: The purpose of this study is to enhance our understanding of how gamified learning interventions can improve engagement and effectiveness in OHS training. Additionally, we aim to explore how demographic factors such as age, educational background, and job role influence the reception and effectiveness of these tools.

Why Your Participation Matters: Your participation is crucial to the success of this study. By sharing your experiences and perceptions, you will help us gain valuable insights into the effectiveness of gamified learning tools in OHS training. This, in turn, will enable us to make informed recommendations for improving training programs and enhancing workplace safety.

Confidentiality: Please be assured that all information you provide will be kept strictly confidential and will be used solely for the purposes of this research. Your responses will be anonymized, and no identifying information will be linked to your answers.

Instructions: The questionnaire is divided into **Four sections:**

- Demographic Information - This section collects basic information about your background.
- Current Engagement in OHS Training - This section assesses your current level of engagement in OHS training.
- Perception of Gamified Learning Tools (KAHOOT) - This section gathers your views on the use of KAHOOT in training.
- Impact on Engagement and Learning Outcomes - This section evaluates the impact of KAHOOT on your motivation and knowledge retention.

The questionnaire should take approximately 10-15 minutes to complete. Your honest and thoughtful responses are greatly appreciated.

Consent: By proceeding with this questionnaire, you consent to participate in this study voluntarily and understand that you may withdraw at any time without penalty.

Thank you for your time and valuable contribution to this research.

Section 1: Demographic Information

Question	Options
1. Age:	Under 25 - 25-34 - 35-44 - 45-54 - 55 and above
2. Gender:	Male - Female
3. Educational Background:	High school diploma - Associate degree - Bachelor's degree - Master's degree - Doctorate - Other
4. Job Role:	Blue-collar worker - White-collar worker - Manager/Supervisor - Executive - Other
5. Years of Experience in Current Role:	Less than 1 year - 1-3 years - 4-6 years - 7-10 years - More than 10 years

Section 2: Current Engagement in OHS Training

Question	Options
1. How often do you participate in Occupational Health and Safety (OHS) training?	Never - Rarely (Once a year or less) - Occasionally (2-3 times a year) - Frequently (4-6 times a year) - Very Frequently (More than 6 times a year)
2. How would you rate your current level of engagement in OHS training sessions?	Very Low - Low - Moderate - High - Very High

Section 3: Perception of Gamified Learning Tools (KAHOOT)

Question	Options
1. Have you ever used KAHOOT in any training or educational setting?	Yes – No
2. If yes, how would you rate your experience with KAHOOT in terms of engagement?	Very Poor - Poor - Average - Good – Excellent
3. How do you perceive the integration of gamified tools like KAHOOT in OHS training?	Strongly Negative - Negative - Neutral - Positive - Strongly Positive
4. Do you believe that using KAHOOT can enhance your engagement in OHS training?	Strongly Disagree - Disagree - Neutral - Agree - Strongly Agree

Section 4: Impact on Engagement and Learning Outcomes

Question	Options
1. How motivated are you to participate in OHS training when gamified tools like KAHOOT are used?	Not Motivated at All - Slightly Motivated - Moderately Motivated - Highly Motivated - Extremely Motivated
2. Do you feel that KAHOOT helps in better retention of OHS training content?	Strongly Disagree - Disagree - Neutral - Agree - Strongly Agree
3. How likely are you to recommend KAHOOT-based OHS training to your colleagues?	Very Unlikely - Unlikely - Neutral - Likely - Very Likely

Questionnaire Link: <https://forms.gle/Bct2jyxC2qPBBibv6>

Research Instruments:

Variable	Variable Dimensions	Number of Statements	Source
Employee Engagement in OHS Training	- Frequency of Participation - Level of Engagement - Motivation	5	Developed for the study based on literature review
Perception of Gamified Learning Tools (KAHOOT)	- Previous Experience - Engagement Level - Perceived Effectiveness	5	Developed for the study based on literature review
Impact on Engagement and Learning Outcomes	- Motivation to Participate - Content Retention - Likelihood to Recommend	5	Developed for the study based on literature review
Demographic Factors	- Age - Gender - Educational Background - Job Role - Years of Experience	5	Standard demographic questions for survey research

Variable	Variable Dimensions	Number of Statements	Source
Employee Engagement in OHS Training	- Frequency of Participation - Level of Engagement - Motivation	5	Developed for the study based on literature review
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Variable	Variable Dimensions	Number of Statements	Source
Impact on Engagement and Learning Outcomes	- Motivation to Participate - Content Retention - Likelihood to Recommend	5	Developed for the study based on literature review
Demographic Factors	- Age - Gender - Educational Background - Job Role - Years of Experience	5	Standard demographic questions for survey research

Employee Engagement in OHS Training					
Frequency of Participation in Occupational Health and Safety (OHS) training?	5	4	3	2	1
Current Level of Engagement in Occupational Health and Safety (OHS) training	5	4	3	2	1
Perception of Gamified Learning Tools (KAHOOT)					
Experience with KAHOOT in terms of engagement.	5	4	3	2	1
Engagement Level of using Kahoot in OHS training	5	4	3	2	1
Perceiving the integration of gamified tools like KAHOOT in OHS training	5	4	3	2	1
Impact on Engagement and Learning Outcomes					
Motivation to Participate in OHS training when gamified tools like KAHOOT are used.	5	4	3	2	1
Training content Retention when gamified tools like KAHOOT are used.	5	4	3	2	1
Likelihood to Recommend KAHOOT in OHS training.	5	4	3	2	1

Appendix 2: Correlation Matrix

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.388
Bartlett's Test of Sphericity	Approx. Chi-Square	23.578
	df	15
	Sig.	.073