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Gamification as a tool for supporting Entrepreneurship Education in South Africa

Research Paper submitted by

Student Name: Kelebogile Sephoti

Student Number: 359198

Supervisor: Professor Boris Urban

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ABSTRACT

The significance of entrepreneurship as a vital economic factor has tremendously burgeoned in the past decades as it aided in curbing the impact of unemployment and the global economic downturn. With its scope proliferating in every field, educational institutions have started incorporating it into their learning system as Entrepreneurship Education (EE). To enhance the effectiveness of EE, educators are employing diverse strategies. Among these techniques, gamification is seen as a major one. Gamification as a tool uses game-based design in non-game settings, making it a captivating practice which helps improve students' engagement in innovative learning.

The purpose of this study is to assess the impact of game-based learning on entrepreneurship education in South Africa. The required data is collected from an Entrepreneurship Education Foundation based in South Africa, which aims to foster a community of responsible entrepreneurs and collaborates with beneficiaries who study in secondary as well as tertiary educational institutions.

The collected data is interrogated using quantitative analysis for further interpretation and the results suggest that gaming, when used as a tool for entrepreneurship education, increases the chances of an individual becoming an entrepreneur.

Key Words: Gamification, Entrepreneurship Education, Game-Based Learning, Entrepreneurship, Education, South Africa

DECLARATION

I, Kelebogile Dikato Sephoti, declare that this dissertation is my own unaided work. It is submitted in partial fulfilment of the requirements for the degree of Masters of Management in Entrepreneurship and New Venture Creation at Wits Business School in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Signed at Carletonville on the 21st day of October 2022.



Kelebogile Dikato Sephoti

DEDICATION

This dissertation is dedicated to my family, ba kwa Sephoti, all those who came before me and reminded me that my *WHY* should be so big that it changes the dynamics of my entire family tree. Particularly, ke leboga Dinoko, Basebo, Barokologadi. Ka lebaka la bona, ke nna ngwana wa mmala wa sebilo, kgoro ya matebe a masilo. Kelebogile-Dikatso-a-Sephoti, wa Thaba-a-Sephoti le Mputsi-a-Meselane-a-Thoboke. Setlogolo sa Matalane-a-Phiri le Motshabaesi-Kaizer-a-Sephoti. Setlogolwana sa Tebogo-a-Nkwe le Eliasara-Monke-a-Sephoti, Baikedi-a-Sephoti le Sana-a-Setou. Ijaa, nwela mosebo!

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LIST OF ABBREVIATIONS

1. EE - Entrepreneurship Education
2. EEP - Entrepreneurship Education Programme
3. TEA - Total Entrepreneurial Activity
4. SMME - Small, Medium and Micro Enterprises
5. SG - Serious Games
6. AI - Artificial Intelligence
7. GEM - Global Entrepreneurship Monitor
8. 4IR - The Fourth Industrial Revolution
9. JACP - Junior Achievement Company Programme
10. GDP - Global Domestic Product
11. SPSS - Statistical Package for the Social Sciences

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CHAPTER ONE: INTRODUCTION

1.1. Background

Entrepreneurship is a set of personal skills that a person employs to align his abilities and struggles to create new products and services through innovative ideas (Bellotti *et al.*, 2012). For centuries, entrepreneurship has been acknowledged for its contribution to sustainable economic progress and employment (Langevang and Gough, 2012). In recent years, entrepreneurship has been recognised as one of the most vital fields across the globe. A renewed emphasis on its importance was placed after the economic stagflation in the 1980s which amplified job losses (Toma *et al.*, 2014).

The unpredicted nature of economic crises that have hit the global market over the years reiterates the strategic importance of entrepreneurship to combat the economic downturns (Galvão *et al.*, 2018). Entrepreneurship is widely celebrated for its potential to curb unemployment and its ability to mobilise any local and global market economies resulting in the promotion of sustainable growth and social prosperity (Díaz-García *et al.*, 2015).

In South Africa, socio-economic challenges are not a new phenomenon. Unemployment rates have escalated to new highs, exceeding 34.9% nationally with a population size of approximately 60 million people (StatsSA, 2020). In 2016, the poverty and intensity rates were recorded as a headcount of 4.6% and 44.1% respectively. However, due to the forces at play with unemployment, particularly in the youth segment, entrepreneurship is seen as a more viable option as the skills gap widens in the corporate and professional spaces. As entrepreneurship theory would have it, this proffers immense opportunities for problem solving and for new venture creation to take place (Venter and Urban, 2015).

Moreover, a higher level of entrepreneurship activities in a country depicts a higher level of social stability and capital accumulation along with the development of innovation (Barba-Sánchez & Atienza-Sahuquillo, 2018). For these and more reasons, entrepreneurship is regarded as one of the most crucial factors for the contemporary world.

The flourishing importance of entrepreneurship has also carved out a niche for it in the education system. Entrepreneurship Education (EE) has been extensively explored over the recent years across most countries around the globe (Fox *et al.*, 2018), especially in higher educational institutions (Blenker *et al.*, 2011). Many empirical studies have suggested that gamification can be an invaluable tool for promoting entrepreneurship education in higher education institutions (Fellnhofer *et al.*, 2015).

The Entrepreneurship Education Programmes (EEPs) began on the backdrop of a well-established theoretical foundation. Lent *et al.* (1994) provided a solid foundation on the Social Cognitive Career Theory. This studied the association between educational experiences (both curricular and extracurricular) as well as the motivational progressions underlining a student's inclination towards entrepreneurial attitude. At its very core, is a theory of motivation that is driven by “self-efficacy, outcome hopes, and goal-oriented activities” (Vanevenhoven and Liguori, 2013).

As Entrepreneurship Education Programmes are on the rise across the world, educators in institutions face a challenging task of developing these EEPs. However, this issue can be combated by employing various EE teaching techniques and methods that would aid in creating a suitable environment for EE (Pittaway and Hannon, 2008).

One such technique is gamification which entails the use of game design in contexts other than games (Deterding, 2011). Various studies suggest gamification as an effective and innovative method of teaching, especially in terms of EE (Subhash and Cudney, 2018). Subhash and Cudney, (2018) also explored the impact of gamification on university students and concluded that it had a positive impact on their entrepreneurial behaviour. Silpasuwanchai *et al.* (2016) claimed that there is some controversy regarding the effectiveness of gamification in educational settings. However, a growing body of recent literature affirms that gamification is an effective strategy to promote learning in students in an educational setting (Fernandes *et al.*, 2012; Ibanez *et al.*, 2014; Riva *et al.*, 2014; González *et al.*, 2016; Osipov *et al.*, 2016; Stanculescu *et al.*, 2016; Rai and Beck, 2017).

1.2. Research problem

Most of the peer reviewed literature acknowledges the vitality of the incorporation of gamification in EE, especially in higher educational institutions. Although there is enough theoretical work done on gamification and its role in EE, there is a yawning gap of empirical research in this field (Subhash and Cudney, 2018). There are many factors that are subjected to little or no research such as teachers' barriers and drivers to utilise game-based learning in an educational environment (Ozcinar et al., 2019). Moreover, despite significant research on gamification, its impact on entrepreneurial intention and entrepreneurial behaviour still needs to be explored within the context of secondary and tertiary education for student entrepreneurs.

Subhash and Cudney, (2018) studied the impact of gamification on students and concluded that it had a positive impact on their entrepreneurial behaviour. There is still a need to establish if the interaction between gamification and EE has an impact on entrepreneurial intent and/or behaviour, especially for secondary education student entrepreneurs.

1.3. Context of the study

There is widespread consensus that entrepreneurial activity is an essential ingredient in today's robust economy, and the importance of this phenomenon may without a doubt never have been greater than it is right now. The persistent global economic crisis has yielded the emergence of novel employment patterns and contexts for innovative activity. The crisis has also birthed the necessity of entrepreneurialism in breaking the cycle of economic stagnation and fostering both growth and social welfare as a means of achieving these goals. Due to their capacity to generate new employment opportunities, advance sustainable development, fuel economic progress, and improve social well-being, entrepreneurs are widely acknowledged as playing a critical role in

both domestic and international free-market economies. This is largely because entrepreneurs can help improve social well-being. When compared to countries with lower rates of entrepreneurship, countries with greater rates of entrepreneurship tend to have better rates of economic growth, development, and innovation in their respective economies. People frequently consider entrepreneurship as a social development engine because of its capacity to dispense innovation and sustainability to different regions and countries.

Education and training in entrepreneurship as a method of promoting economic growth, eliminating unemployment, and generating social capital has risen to the pinnacle of policy agenda around the world. This shift in emphasis reflects a global shift toward the importance of entrepreneurship as a driver of innovation and job creation. It is often assumed that one must possess the capacity to think creatively and act independently in order to be successful in the entrepreneurial environment. It's possible that if we teach kids how to think and behave like entrepreneurs, it will pave a way for their creation of new companies, initiatives, and programmes. This is a fundamental idea in the field of entrepreneurship education, which is based on the premise that students may be encouraged to develop their own business ideas through instruction. Multiple studies have shown that the process of becoming an entrepreneur is something that can be taught and trained. This is the case despite some characteristics that may make it simpler to generate new business ideas and manage a startup company.

1.4. Purpose of the study

The rate of Total Entrepreneurial Activity (TEA) in South Africa is low, the country's unemployment rate is high, and its economic progress is average (Swanepoel, Strydom & Nieuwenhuizen, 2010). Both governmental and commercial entities are making significant strides to find answers to these problems because of the crippling blows that they unleash to the nation's economy. Experts in every area of the economy agree that improving the knowledge and skills of those who own and manage small and medium-sized enterprises (SMMEs) is essential to both the growth of the national

economy and the enhancement of SMMEs' ability to compete on a global scale and to sustain long-term expansion.

Although many governments prioritise the education of entrepreneurs, very little is known about the success of such education (Von Gravenitz et al, 2010). Despite considerable support for entrepreneurial education, very little is known about the impacts of receiving a business education (Von Gravenitz et al, 2010). There are still lingering issues over whether education in entrepreneurship has any impact on the performance of SMMEs or if it contributes significantly to the development of these businesses (Devins, Johnson & Sutherland, 2004).

This project focuses on developing a framework and game design that may be utilised to increase the efficacy of entrepreneurial education courses because gamification and game based learning play such a significant role in the overall success of Entrepreneurial Education Programmes (EEPs). Consequently, students attending secondary schools in South Africa should have access to both the gaming and educational components of EE. Additionally, the purpose of this research is to fill a gap in the existing empirical research by exploring several ways in which gamification strategies might be implemented in Entrepreneurship Education (EE).

1.5. Research Questions

The research question is a critical component of any study and the framing of research questions must assist the researcher in adequately addressing the problem statement (Pardede, 2018). Consequently, in understanding the impact of gamification in Education, the study seeks to address the following research question:

- How does the gamification technique assist in EE in South Africa?

In narrowing the various themes in the research question, the following sub-question will be used to guide the study:

1. What is the relationship between gaming and an individual becoming an entrepreneur in South Africa?
2. Is there an association between gamification and an individual rating on his/her ability and efficacy in various areas of interest?
3. Is there an association between success in EE and frequency of gaming?
4. Does gamification help improve understanding on various academic subjects related to entrepreneurship?

1.5.1. Hypotheses

Given the above research question and sub-questions, the following hypotheses are evaluated:

- **H1:** There is a direct relationship between gamification and entrepreneurship in South Africa.
- **H2:** There is a significant association between gamification and an individual rating on his/her ability and efficacy in various areas of interest.
- **H3:** There is a significant association between success in EE and frequency of gaming.
- **H4:** There is a direct relationship between Gamification and an individual's understanding of various academic subjects related to entrepreneurship.

1.6. Research Objectives

The proposed research has the following objectives:

- To evaluate the relationship between gaming and an individual becoming an entrepreneur in South Africa.
- To establish an association between gamification and an individual rating on his/her ability and efficacy in various areas of interest?

- To examine the association between success in EE and the frequency of gaming?
- To evaluate the impact of gamification on the understanding of various academic subjects related to entrepreneurship.

1.7. Structure of the Study

The study presents the literature review in Section 2, which provides a comprehensive survey of studies conducted within the fields of gamification, education and more specifically EE. Section 3 of the study will detail the methodology, research design and analysis techniques which will be used to assess the research question. Section 4 will present the results of the analysis with a robust discussion of the results. Section 5 will present the conclusion of the study as well as recommendations based on the findings.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The objective of this research is to evaluate the impact of gamification techniques on EE in educational institutions. To this end, literature germane to this study and previously researched papers are explored, studied, and analysed with a particular focus on key topics that are at the heart of this research. The study extracts its literature from numerous gaming journals on the studies conducted in the related knowledge areas. The Chapter begins with a conceptual framework of gamification and gamified learning, highlighted by:

- entrepreneurship education
- gamification in education
- factors affecting gamified entrepreneurship learning in South Africa
- factors impeding gamified entrepreneurship learning in South Africa

2.2. Entrepreneurship Education

Lorz *et al.* (2013) defined EE as a pedagogical process of education that entails incorporating the entrepreneurial attitudes among students resulting in the development of certain critical skills. Salzano *et al.* (2006) argued that EE provides students with the skill and motivation necessary to acquire a successful entrepreneurial career in a variety of professional settings. In another context, it alludes to the teaching of those individuals who aim to participate in the socio-economic development of society through entrepreneurship projects and awareness programs. In another study, Onu (2008) highlighted that EE aims to produce self-reliant individuals in society. Okiti (2009) further posits that EE is a “gateway” to job opportunities and argues that it would make individuals in a society self-employed and self-reliant.

Von Graevenitz *et al.* (2010) reported that EE is one of the most prominent policy agendas in most countries in this century. EE creates a learning environment for students which helps them to achieve long-term entrepreneurial goals. The authors conducted a study to evaluate the impact of entrepreneurship on students'

entrepreneurial attitudes. Von Graevenitz *et al.* (2010) extracted certain signals from students from which they drew specific conclusions. Using pre- and post-survey responses from students, they observed that the course of EE had a significant positive impact on the entrepreneurial aptitude and overall personality as well as skills of the students.

The authors concluded that such studies would be helpful in outlining the EE policies for educators and institutions. Elert *et al.* (2015) undertook a study to evaluate the long-term effect of EE on high school learners. They compared three groups of Junior Achievement Company Programme (JACP) alumni with similar students by using propensity score matching. The researchers discovered that JACP inclusion caused a certain augmentation in the successful prospects of starting a firm depicting a strong tendency of positive entrepreneurial attitude. Moreover, it also exhibited the potential of increasing incomes from such ventures.

Nowiński *et al.* (2019) argued that in countries where EE was adopted, it had a direct positive and significant impact on students. It helped enhance entrepreneurial self-efficacy among students, yielding a better scope of entrepreneurial intentions.

Buzady and Almeida (2019) reported that several studies reveal that entrepreneurship education programs entrench and embed a greater positive impact on those individuals who participate in these EEPs. Their entrepreneurial intent is far greater than those who do not participate. Those who engage in EEPs develop higher belief and confidence in achieving entrepreneurial goals.

However, the impact tends to differ across different countries depending upon the quality of EE. Belitski and Heron (2017) rightly argued that most EEPs use traditional educational techniques which are devoid of the potential to train students for establishing the future of business.

Central to the learning process is the manner in which learners or students are able to utilise the information to be able to create value (Bruyat and Julien, 2001). Laukeus (2015) states that learning, and value creation are the two critical elements of EE. The author further states that the goals of an entrepreneurship student are to be able to learn and consequently apply these teachings in their environment with the goal of creating value (Laukeus, 2015).

It is this premise of EE that places the debates around the appropriate pedagogies in its apt context. Thus, it is critical to review the literature on these pedagogies.

Concerns over the EEPs' applicability and value are continuously voiced, despite their usage becoming increasingly widespread (Fayolle & Gailly, 2008). As Mayer et al., (2014) argue, in spite of the fact that the vast majority of earlier research has demonstrated that EEPs are helpful in developing entrepreneurial skills and motivation in students (Lorz et al., 2013), additional research has demonstrated that traditional and mandated EEPs are ineffective in developing entrepreneurial skills and motivation in students (Oosterbeek et al., 2010). This probably owes to the fact that it can be difficult for educators to determine the most effective strategies when teaching future business executives (Bellotti et al., 2014). Researchers have unearthed an array of strategies that might be deployed to educate aspiring company owners. For instance, in the course of his research, Samwel Mwasalwiba (2010) uncovered and evaluated twenty-six unique approaches of instructing people who are interested in starting their own businesses. The author concluded that lectures, case studies, and group discussions were the three most effective strategies that were utilised in EEPs. On the other hand, academics have observed that these methods are not even close to being as effective as others when it comes to equipping students with the skills they require to run profitable businesses in the future (Bennett, 2006). According to Fiet (2001), instructors of entrepreneurship place a great emphasis on these strategies because of their cheap cost and ease of implementation. This is further supported by the fact that these strategies are rather unsophisticated and simple. In the field of Engineering Education (EE), recent findings suggest that using games, simulations, and gamification as instructional tools might be beneficial (Samwel Mwasalwiba, 2010). On the other hand, there is a significant

knowledge vacuum about the methods that are most successful when teaching entrepreneurship (Phan et al., 2009).

2.2.1 Learning Pedagogies in Entrepreneurship Education

The nature in which knowledge is transferred is critical to its use. It is from this basis that Biggs (1999) argues that pedagogy is critical to the realisation of the respective objectives. The author contrasted Instructional and Constructivist designs on the performance of learners in achieving their learning objectives. Biggs (1999) further outlines that the constructive approach aids learners in creating their own meaning of taught principles.

EE has developed from this same element, moving from Instructional Design to Constructivism, which has led to the emergence of Alternative pedagogies from the traditional pedagogies (McKeown et al., 2006; Mwasalwiba, 2010). As Mwasalwiba (2010) finds in a systematic literature survey, there has been a journey in research to be able to define what EE is supposed to achieve.

EE, especially in the secondary as well as tertiary education level, has been designed to increase entrepreneurial awareness as well as to foster entrepreneurial intentions on the part of the students (Mukesh et al, 2020). Accordingly, the nature and structure of the EEPs is to equip students with the apparatus to start businesses by nurturing self-efficacy and entrepreneurial intent (Mukesh et al, 2020). The authors outline the differences in varying approaches to EE, by contrasting the traditional classroom teaching methodologies to that of the action learning approaches (Mukesh et al, 2020).

Research in the field of EE has developed and with it has been an extensive review of existing pedagogies to EE. This subsection of the literature review will discuss the two prominent views identified in the literature, notably being the traditional and alternative pedagogies.

2.2.1.1. Traditional Pedagogies

Historically the traditional-based pedagogical approaches had focused on the design and delivery of the curriculum to students. These methodologies of teaching were based on lectures, videos, and case studies (Mukesh, 2020; Hagg and Gabrielsson, 2019); Laukeus, 2015). The teacher-centred pedagogy relied on educators presenting passive students with the required information, with an assessment being provided to evaluate their understanding of the theoretical concepts (Hagg and Gabrielsson, 2019).

EE has historically been anchored in the traditional methodology of teaching, and these methods employed lectures and assessments to obtain entrepreneurial outcomes (Lourenco and Jones, 2006). The traditional methodology relies on the successful transfer of knowledge by the facilitator (Lourenco and Jones, 2006).

In an investigation of United Kingdom Business Schools, McKeown et al (2006) established that although the institutions had not applied more technological and action learning programmes, the traditional method was found to be effective in students starting enterprises, though the author notes that the respondents in the study could not provide sufficient evidence of these claims.

However, there is consensus in extant literature on the insufficiency and ineffectiveness of traditional methods (Mukesh, 2020; Higgins, Smith, and Mirza, 2013; Blenker et al., 2008; McKeown et al., 2006; Rasmussen and Sørheim, 2006). The traditional methodology of lectures, case studies and examinations have been found to be ineffective, relative to alternative approaches, in being able to bring about the desired outcomes of education programs, notably being the moulding of entrepreneurial attitudes (Mwasalwiba, 2010).

The evolution of these pedagogies resulted in gravitation towards more action-based learning instruments, with the emergence of the constructivist perspectives. The following subsection will provide an overview of alternative pedagogies.

2.2.1.2. Alternative Pedagogies

Kuratko (2005) states that the Entrepreneurial perspective is a critical component of the entrepreneur's journey to starting and managing a business. This perspective advises

and guides the entrepreneur through the challenges they experience and the decision that they need to make (Kuratko, 2005; Mwasalwiba, 2010). EE moved to incorporate the perspective, along with the constructivism framework such as to only teach concepts but also to incorporate and build entrepreneurial behaviour (Mwasalwiba, 2010).

It follows from this that EE requires a creative and dynamic approach to be able to realise the objectives; notably resilience, opportunity seeking and problem-solving entrepreneurs (Blenker et al., 2008). Consequently, the field of research has stepped up to investigate the effectiveness of teaching methodologies resulting in the emergence of alternative pedagogies.

Alternative Pedagogies or an action learning perspective has been a recent development in EE, with researchers placing much focus on the ability of these techniques to enhance the entrepreneurial ability of students. Alternative pedagogical approaches are anchored on the philosophy of action, where learning occurs through doing (Lourenco and Jones, 2006). Blenker et al. (2008) argues that the way EE is taught needs to be orientated around elements of personal development requiring EEPs to include Blenker et al. (2008:57):

- Processes and Activities that enable learners to reflect on their strengths and weaknesses with the intention of acknowledging them from an economic and non-economic sense.
- To develop personal skills such as communication, self-motivation, and idea development.

Alternative pedagogies to EE have been able to achieve this, with action-based learning and experiential learning gaining traction (Rasmussen and Sørheim, 2006). In an analysis of action-based teaching methodologies, the researchers discovered that

engagement and learning outcomes were improved when Norwegian institutions adopted alternative teaching methodologies for EE. Neck and Greene (2011) noted that the use of serious games as well as design-based learning teaches students to manage and cope with real life challenges and subsequently enhances their ability to create opportunities.

Table 1:

Comparison of the Traditional and Alternative Pedagogies

TRADITIONAL APPROACH		ALTERNATIVE APPROACH
KNOWLEDGE	In this analysis of marketing curricula, learners are <i>instructed</i> when it comes to the adoption of knowledge transfer	However, given the alternative approach, the learners are encouraged to construct the knowledge
PARTICIPANTS - THIS INCLUDES LEARNERS AND STUDENTS	In the traditional approach, participants receive and contain knowledge	However, given the alternative approach, participants are constructors, discoverers, and creators of knowledge
EDUCATIONAL INSTITUTIONS - THIS INCLUDES UNIVERSITIES, COLLEGES, SCHOOLS, AND DEVELOPMENTAL INSTITUTIONS	In traditional institutions, the participants are classified and sorted	However, given the alternative approach, the focus is on developing the competencies and talents of the participants
RELATIONSHIPS	Relationships within the traditional approach tend to be impersonal between an institution and its participants as well as the relationship amongst peers	However, in an environment that embraces an alternative approach, the relationship among participants is personal including the relationship between institutions and participants
THE DIFFERENT TYPES OF ACTIVITIES	Within the traditional approach, the activities tend to be very Individualistic in nature and static	However, given the alternative approach, participants are encouraged to explore with a mixture of individualistic and interactive learning activities - the environment tends to be a lot more dynamic in nature

TEACHING METHODS	Typically, these would include lectures, readings, question, and answer sessions, advice, and feedback through tutoring, and so forth	Given an alternative approach, the teaching methods include various activities, presentations, simulations, role-play sessions, scenarios, games and so forth
ASSUMPTIONS	A major assumption that is made is that teaching and learning ought to be a 'top-down' instructive approach – i.e., transmissive methodology	However, teaching and learning within the alternative approach is through a 'bottom-up' constructive approach – i.e., transformative methodology

Note: Adopted from Wright, Bitner and Zeithami (1994)

In an analysis of Marketing curricula, Wright, Bitner and Zeithami (1994) contrasted teaching methodologies, referring to the positive contribution that action-based learning offered. Wright, Bitner and Zeithami (1994) provide a comparative view of the traditional and alternative pedagogies to teaching, as presented in the table above.

This section of literature has provided insight into the spectrum of discourse with respect to the pedagogy of EE. It detailed the evolution of approaches and the current consensus in literature which points to the positive contribution of action-based learning approaches. One is the use of Serious Games (SGs) in EEPs as a tool of realising critical entrepreneurial behaviours, perspectives, and competencies. Expanding from this, Subsection 2.4 will provide an overview of the conceptual framework of gamification.

2.3. Entrepreneurship Education in South Africa

Since crime, bad management, corruption, and high unemployment has devalued the country to its current position, South Africans worry about their economy (North, 2002).

Von Broembsen et al. (2005) discovered that South Africa had a far lower rate of entrepreneurship and further established that most young South Africans lack the skills to start a business. South Africa also has very few high school graduates. The South African education and training system was the biggest barrier to new business creation in 2001 and 2002 (GEM, 2002). The low percentage of entrepreneurship among small, medium and sized enterprises (SMMEs) in South Africa - the continent's economic powerhouse - might be improved by underscoring entrepreneurship in the classroom. South Africa's economy has driven Africa's Gross Domestic Product (GDP) for a number of years before being overtaken by Nigeria with Egypt coming in at a strong third (Kamer, 2022). Davies (2001) observed that South Africa's formal sector integration rate had dropped from 62% to 4% in over four decades which makes it much higher than before. Co and Mitchell (2006) reason that entrepreneurial education is necessary for young people to conquer unemployment. It is commonly accepted that the best way for South Africa to reduce unemployment and rejuvenate the economy is to rediscover the entrepreneur who is willing to take measured risks, break new ground, and be innovative (Co and Mitchell, 2006). This opinion enjoys collective approval. South Africa's economy requires the aid of company owners to ease the country's high unemployment rate (Co and Mitchell, 2005). To become successful business owners, people must be taught and trained and if they are taught about entrepreneurship and are given the resources they need, people will desire to be entrepreneurs. Given the country's struggles, it is regrettable that South Africa's entrepreneurial base remains weak (Davies, 2001). Most South Africans lack confidence in their business skills since their families have little or no entrepreneurial involvement.

Herrington and Wood (2003) say South Africa needs to raise consciousness of entrepreneurship and promote the development of critical entrepreneurial skills including commercial, administrative, and financial skills. Herrington and Wood (2003) advise having an entrepreneurial attitude. This mindset involves self-confidence and candidness to entrepreneurship as a vocation. Experts criticise South Africa's slow economy on a lack of education investment (Fatoki and Garwe, 2010). Umsobomvu (2002) recommended adding entrepreneurship education into K-12 curricula to develop

a culture of innovative problem-solving and business formation. Entrepreneurship is a fresh academic area proliferating in worldwide business (Alberti et al., 2004:4). Thus, entrepreneurial courses have exploded in popularity. Bear in mind that entrepreneurship is a new and expanding sector. Mitchell (2006) thinks entrepreneurship education is still in its preliminary stages, even though South African educational institutions have been involved since the early 1990s. According to North (2002), it is imperative to bridge the gap in the present systems of educating and equipping young people for work as entrepreneurs. Starting and running a business requires education. He thinks entrepreneurial training would help unearth as much South African potential as possible. It might boost the number of people who can attain this goal. To cultivate an entrepreneurial culture in developing nations, training in firm establishment and management is critical (Burger et al., 2005). Many activities in South Africa strive to stimulate entrepreneurship but seeing actual effects can be challenging. This research is vital since present firms may not have developed adequately internally to reduce unemployment (Bbenkele & Ndedi, 2010). Today's youth lack entrepreneurship training that prompts them to become entrepreneurs due to the overshadowing ethos of working for others and the long-standing practice of deterring entrepreneurship (Agupusi, 2007). Bbenkele and Ndedi (2010) posit that universities teach entrepreneurship. They also stressed the significance of addressing post-secondary challenges related to entrepreneurship training to effectively solve youth unemployment. According to Karimi et al. (2010), entrepreneurship education may play a critical role in changing South Africans' opinions regarding self-employment and learning the foundations of running a corporation. Most South African entrepreneurship programmes do not consider the most principal factor— the mindset and behaviours needed to set up a business, according to Ndedi and Bbenkele (2010). The government's capability to equip residents to establish their own enterprises and create jobs for themselves and others will ascertain South Africa's entrepreneurial culture (GEM, 2005). A strong education is essential, and

teaching entrepreneurship may help Africa become more adventurous and enterprising. South Africa's full economic growth potential can only be unleashed by harnessing and bolstering its citizens' entrepreneurial energy and ability. Thus, all South Africans may live better (North, 2002). Entrepreneurship education at all levels and for all individuals will help South Africa achieve economic growth, job creation, and increased Total Entrepreneurial Activity (TEA).

2.4. Conceptual framework of gamification

Dyer (2015) contended that the gamification technique could be evaluated first by approaching it from traditional perspectives by making use of theories such as Four Level Theory by Kirkpatrick (1975), Experiential Learning Theory by Kolb (1984) and the Cognitive Load Theory by Sweller (1988). These theories were considered as the basis for measuring gamification metrics. The researcher reasoned that these theories were strongly attached to learning cognition which suggests their use in devising a framework for gamified learning.

The researcher further submitted four approaches constituting the framework of gamification learning which included Play Assessment Diagnostic, Gamification Scorecard, Pre- and Post-experimental Knowledge as well as Gamification Performance Assessment. The researcher resolved that these four approaches will assist in creating a model that will be vital in assessing the benefits of the gamification technique in learning.

Piteira and Costa (2017) claimed that gamification attracted researchers from every field of life due to its ability to impart learning attitudes. It helps to engage a person in a learning environment, promoting a learning cognitive attitude. The researchers proposed a theoretical framework to assist in incorporating gamification in learning environments and to further assist educators mainly in terms of online education. In the model framework, the researchers emphasised these dimensions: “target audience, general goals, learning outcomes, topics, contents, gamification, cognitive absorption, flow, and personality” (Piteira and Costa, 2017).

Salen *et al.* (2004) maintained that gamification is crucial in influencing learning and there are certain principles that must be considered while inventing a game design including an understanding of the design, deep study of rule-making, and a strong link between game rules and the game to augment the interest of individuals in the game leading towards increased learning. Kim and Lee (2015) also conducted a study to propose a dynamic model regarding educational gamification and its possible effectiveness. The researchers concluded that at the beginning, the effectiveness of gamified learning is usually low due to certain hurdles such as adaptation, insecurities, and technology among other reasons. However, it starts to expand and permeates traditional techniques.

2.5. Gamification in entrepreneurship education

It is widely acknowledged that the integration of innovative and latest techniques in EE programs is necessary to increase their effectiveness and efficiency in promoting sustainable long-term goals (Wu *et al.*, 2018). According to Kapp (2012), gamification is a process of learning using game-based mechanics, rules, and frameworks to engage and motivate people in learning and problem-solving. Gamification involves certain key elements that are not typically games. Gamification in education is the use of these game elements and mechanics in educational settings.

The use of modern information communication technologies facilitates the creation of a suitable environment. Kiryakova *et al.* (2014) contended that gamification in education enjoys critical significance because students or learners tend to lose motivation to partake and learn new techniques. Therefore, educators seek the use of gamification to induce interest in students to learn innovative techniques and ideas. Shane and Venkataraman (2000) identify opportunity identification and idea development as being

critical components of the EE framework, thus gamification which enriches these competencies is beneficial to the learning process.

Iscenco and Li (2014) reasoned that gamification enhances learning benefits and helps in the attainment of desired results by stimulating active involvement in the target audience. Glover (2013) underscored that it is necessary to determine the level of knowledge and skill that students have accumulated through a learning process like gamification. Similarly, Belitski and Heron (2017), established that game-based designs should be used to extract greater benefit from these EEPs. Moreover, gender comparison depicted that men had higher entrepreneurial intentions and self-efficacy than women in general. However, women tend to extract greater benefits from EE than men.

However, gamification is not directly linked to skill accumulation but is associated with the students' ability to acquire entrepreneurial attitude and behaviour which eventually places them on a path of skills development.

Stott and Neustaedter (2013) made a vital contribution towards the role of gamification in education and learning by suggesting certain dynamics and concepts that tend to have a more positive impact than other factors in a game design. These included freedom to fail, rapid feedback, storytelling, and progression. Deci and Ryan (2004) claimed that the use of various gaming strategies in EE is based on Self-Determination Theory. In this, not games but game-like designs are used. Ruiz-Alba *et al.* (2019) underlined that the use of such gamified designs in EE can enhance interest and creativity in students. Fox *et al.* (2018) performed a comparative study to gauge the impact of gamified learning on EE. They established that it is an interesting approach to learning for EE.

A systematic mapping study conducted by Dicheva *et al.* (2015) revealed that there is a lack of empirical research regarding gamification use in education and learning. This also created hurdles in recognising certain game elements that would be useful in an educational setting. However, as a general and limited assessment, gamification showed a positive impact on education. Huebscher and Lendner (2010) claimed that

various research work related to the use of gamified learning in EE emphasised that student entrepreneurs can employ digital games as a valuable practice, leading towards greater knowledge and skill on entrepreneurship.

Given the advancements in digitisation and digital technologies, Briel *et al.* (2018) contend that there are six mechanisms (Appendix A) that facilitate the effectiveness of entrepreneurs and that digital technologies are a significant external enabler due to their capability to shift entrepreneurship paradigms by making boundaries a lot more fluid. Furthermore, Chalmers *et al.* (2021) claim that digitisation enables a great environment for automation to take place, which would replace the need for human input with certain activities and potentially reduce human intensive related costs.

Chalmers *et al.* (2021) also underscore the fashionability of AI, its innovative nature and productivity benefits which are advantageous factors in teaching practices. Notably, with the reduced costs afforded by the developments in AI (Chalmers *et al.*, 2021), the use of AI for decision making processes (Agrawal *et al.*, 2018), the prospect exploitation and endless scaling potential given the fourth industrial revolution (Sarason *et al.*, 2006), the reduction of geographical barriers for collaboration, the deep learning and teaching potential offered by augmented reality (Zhai *et al.*, 2021), as well as the increased use of augmented reality within the education sector with a projected increase of 75% by 2025 (Kaviyaraj, 2021); using gamification within the delivery of EE could be an efficacious and progressive instrument to exploit.

2.6. Factors impacting the effectiveness of gamification for Entrepreneurship Education

Luo (2021) reported that many empirical studies revealed that gamified learning has been proved to be a promising tool in EE. Fox *et al.* (2018) argued that although gamification is an exciting approach for EE, it still needs improvements in terms of

efficacy. A study conducted by Sánchez Mena and Martí Parreño (2017) showed that there were four main barriers and four main drivers that affected educators' adoption of gamification in their educational institutes. The four drivers included: “attention and motivation, entertainment, interactivity and ease of learning” (Sánchez Mena & Martí Parreño, 2017). While the four main barriers identified included: “lack of resources, students’ apathy, subject fit and classroom dynamics” (Sánchez Mena & Martí Parreño, 2017).

The same researchers resolved that educators’ perceptions regarding the use of gamification were a combination of feelings with respect to being a beneficial tool and a potential risk for the classroom environment deteriorating into chaos. There are distinct stages that formulate an effective framework for gamification. Along this line of thought, Ploum *et al.* (2018) stressed that educational institutions are most significant in this regard as they comprise young people who need to be motivated.

Wangi *et al.* (2018) conducted a study to devise a gamification strategy aimed at improving EE and learning in students. The authors’ study revealed 4 main elements to focus on to enhance the adoption of gamified learning in EE in students which include: rules, feedback, goals, and challenges. The study showed that such a model will be vital in increasing the efficiency of gamification by enhancing the students' passion and satisfaction for entrepreneurial learning.

Another study by Hidayat (2017) suggested a gamification system in which he referred to three main elements for the gamification for entrepreneurial education including lecturers, courses, and students. The author concluded that the effectiveness of gamification can be enhanced if the educators plainly explain the EE course instruction to the students before the commencement of the course. Moreover, certain factors such as points, levels, winners and so forth are critical in making gamification interesting for all students, including passive students. Denny (2013) said that not all students are motivated by gamified learning in education. Therefore, while executing gamification in education, it must be born in mind that there could be chances of some students not being motivated.

The reviewed literature suggests that the evolution of EE away from traditional teaching pedagogies towards the practice-based pedagogies has created a platform where EE can be instructed and assessed through the practical application of these skills within the framework of a game. Gamification in EE has been discovered to offer benefits to outcomes such as self-efficacy and entrepreneurial intent.

CHAPTER THREE: RESEARCH DESIGN

3.1. Introduction

This chapter aims to define the research design that was adopted to respond to the key research questions of this study. The following elements are discussed in relation to the aforementioned: population, sampling frame and sample, data collection, research instrument, data analysis and ethical considerations.

Mackey and Gass (2015) intricately define research as “the systematic investigation into, and study of materials and sources in order to establish facts and reach new conclusions”. There are two common approaches to conducting research, a qualitative and quantitative approach. However, research can also include a mixed method approach which refers to the use of both the qualitative as well as the quantitative approaches on a gamut (Mackey and Gass, 2015).

For this study, a quantitative approach was followed. Some of the characteristics of a quantitative study include (but not limited to) an outcome based and verification orientation, obstructive (involving controlled measures), objective and removed from the data, reliable (involving replicable data), it is generalised and assumes a stable reality (Mackey and Gass, 2015). Quantitative research uses an experimental design where the hypothesis precedes the numerical analysis given the data being quantified.

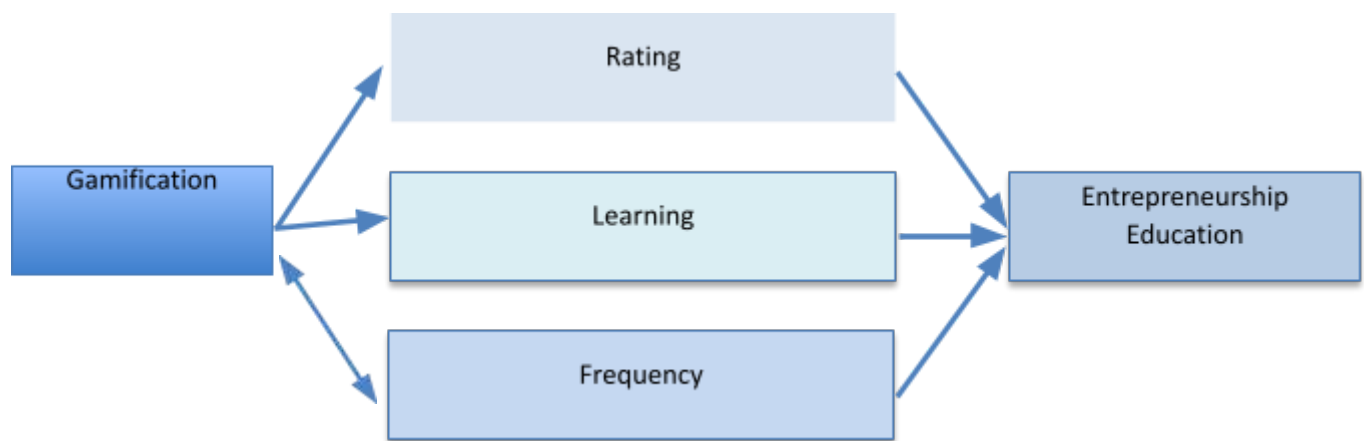
As such, this is a deductive investigation with a positivism epistemological consideration. The appeal to data is underpinned by a distinction between facts and values, the former being a goal where data collection is directed and leading to the development of a conceptual framework made up of analytical constructs that can be used for analysis (Bryman and Bell, 2015). Furthermore, the ontological consideration is centred on an objectivism position, which implies that standardised procedures are followed, and variables have an existence that is independent or separate from actors.

There are varied ways to name a cross-sectional analysis, these can include a cross-sectional study, a transversal study, and a prevalence study. Typically, this type of study involves an analysis of data that is collected from a population, or a representative

subset, at one point in time. In this case, a subset of approximately 3,979 students was used for this investigation as provided by the Entrepreneurship Education Foundation.

Research approach and design

A 'positivism' logic was explored as theories under this logic are generated through reasoning and evaluated empirically through dataset observations. This logic separates science from philosophy and metaphysics. A deductivism and systemic approach was adopted as theory informs data. In this case, explicit hypotheses were stated, and they need to be confirmed or rejected.



3.2. Population

A population is commonly defined as “A complete set of individuals, cases, or objects with some common observable characteristics” (MUT, 2020). The target population for this research was the high school learners in South African educational institutions who experienced EE through an online-based game. Secondary datasets were used from a formidable Foundation in South Africa that has experimented with gamification techniques to enhance their EE efforts across all provinces of South Africa. The dataset comprised of 3,979 unique participants.

3.3. Sampling frame and sample

Sampling refers to a full process of selecting some elements from a population to represent that population (Cooper *et al.*, 2006). The dataset for this study includes national participants from various high schools and provinces in South Africa. The sample was drawn using simple random sampling. The sample size was kept within the recommended limit with similar studies. By province, the sample was comprised of 30% of the participants being from Gauteng, 23% from the Western Cape, 21% from KwaZulu Natal, 13% for the Eastern Cape, Limpopo had 5% representation, 3% for Mpumalanga, 2% for the Free State, 2% for the North West Province, and 1% for the Northern Cape. Furthermore, the sample identified a split of 58.48% for the female sample population and 41.52% for the male sample population.

3.4. Research instrument

The information gathered about the targeted population from the different high school institutions in South Africa served as the research instrument. Different elements of entrepreneurial behaviour such as self-efficacy, entrepreneurial intention, value creation ability, problem-solving and the identification of opportunities were the research variables.

3.5. Data collection

Data for the proposed research was sourced from one organisation in South Africa, which focuses on EE and uses different methods such as gamification, online learning, peer learning, contact and experiential learning to teach entrepreneurship competencies. The available dataset included pre- and post-survey questionnaires, game and platform data with aggregated outcome and profiles for the 2021 national entrepreneurship game for high school learners. For the purposes of this study, it was necessary to treat the data source anonymously as requested by the Foundation and as led by the Ethics Committee of the University of the Witwatersrand.

3.6. Data analysis

Data analysis for the present research unpacked quantitative research. The quantitative approach was used to conduct statistics to interpret data collected from the Foundation. The data was analysed using correlation analysis, measuring the strength of relationship among all predicting variables in respect to the dependent variable. On evaluating the hypotheses of the study, a hierarchical regression analysis was used. The data analysis was conducted on the SPSS software platform.

3.7. Internal Validity and Reliability

Central to the analysis was the issue of reliability and internal ability, which is critical to the generalisability of the results. Internal construct validity is used to describe the accuracy of scale constructs, focusing on their differences as well as the effect that the instrument scale constructs account for changes to the variance in the sample (Kayes, 2005). On the other hand, reliability refers to the measure of internal consistency of an instrument scale in comparison to comparable items in the sample (Kayes, 2005). In this study, the Cronbach Alpha was used to assess the internal consistency of the scale constructs, as will be seen in the coming chapter.

3.8. Ethical Considerations

As the research used secondary data, approval from the Foundation's Compliance Manager as well as the Department was required. Approval from both was acquired, given the following policies: Data Usage Approval Policy, Privacy Policy, Breach Reporting Policy, and Process for Privacy, as well as the Code of Conduct Policy. All literature sources used in this research are also acknowledged through citations and references as per the University of the Witwatersrand standards. Finally, the identity of the respondents was kept anonymous, and their confidential information kept in a highly

confidential manner as per the Protection of Personal Information Act (POPI-A). All data collected was used only for academic and research purposes as mentioned in this document.

CHAPTER FOUR: RESULTS AND DISCUSSION

Performing a reliability analysis of the scale used on the different items to investigate H1, we conducted an independent sample t-test to compare the disparity in means of the likelihood to start a business between individuals who participated in the game and those who did not. Moreover, we compare the likelihood to start a business pre-gaming with the likelihood to start a business post-gamification.

To conduct an independent sample t-test, we check for the assumptions of normality, homogeneity of variance and independence of observations of the dependent variable (likelihood to start a business). The normality test is examined employing the Shapiro-Wilk test and normality plots. We use the Laverne's (for homogeneity and testing of the groups) test to examine the homogeneity of variances. If the dependent sample fails the assumption test, we rope in a non-parametric test. To investigate H2, H3, and H4 we create $n \times n$ contingency tables and calculate chi-square test of independence on the various groups of interest. We detect a significant association when the null hypothesis of the chi-square test is rejected, otherwise, there is no correlation between the two variables.

4.1. Sample description

We conducted our study using two samples. The first sample was collected before the participants participated in gaming (pre-gaming). This sample constituted 3979 participants ($n=3979$) from different provinces of South Africa. The second sample comprised of 144 participants ($n=144$) collected after the participants had engaged in gaming (post-gaming). No information (post-gaming) was provided about the participants' gender and age.

Table 2: Descriptive statistics of pre gaming and post gaming scenario

	N	Mean	Standard Deviation
Pre-test	3979	4.891	0.76
Post-test	144	8.558	0.82

4.2. Diagnostic Test Statistics

In assessing the constructs before the game, the Cronbach alpha for the constructs suggests that there exists internal validity for the Areas of Interest and Ability constructs with 0.959 and 0.922 values, respectively. 15 survey questions on areas of interest were administered and used to measure ability of the respondent before participating in the game. The results of the pre-game test statistics are presented in table 3 below.

Table 3: Reliability Statistics of the sample Constructs before the game

	<i>Items</i>		
	Areas of Interest	Ability	Subject
<i>Cronbach α</i>	0,959	0,922	
<i>N</i>	15	8	

The constructs post the game experience exhibit a decline in the respective Cronbach alpha, declining to 0.914 and 0.9 for Areas of Interest as well as ability, respectively. The reliability statistic indicates that the subject constructs lack internal consistency with $\alpha = 0.62$. The results are indicated in table 4 below.

Table 4: Reliability Statistics of the sample constructs after the game

	<i>Items</i>		
	Areas of Interest	Ability	Subject
<i>Cronbach α</i>	0,914	0,902	0,619
<i>N</i>	21	8	5

4.3 Results

H1. Gaming increases the chances of an individual becoming an entrepreneur.

To conduct an independent sample t-test to identify the likelihood of starting a business among the individuals who participate in gaming and those who do not. To evaluate Hypothesis 1, a normality test is conducted prior to evaluating the hypothesis that the game has had a statistically significant effect on the respondents to start an enterprise. For the normality test, the Shapiro-Wilk and Kolmogorov-Smirnov test statistics are calculated. The Shapiro-Wilk test has a Null hypothesis that the variable is normally distributed, whilst the Kolmogorov-Smirnov has the null hypothesis that the distribution of the variable is normally distributed.

Normality Test

Table 5. Normality test table.

<i>Tests of Normality</i>							
	Have you participated in other online learning games/competitions?	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Likelihood of starting business	No	.147	115	.000	.901	115	.000
	Yes	.257	26	.000	.768	26	.000

The variable likelihood of starting a business after gamification does not follow a normal distribution (Shapiro-Wilk <0.05). The normality test assumption is not met. Accordingly, a Mann-Whitney U-test is conducted which is a non-parametric test. The corresponding test statistic evaluates if there are statistical differences in the distribution of the two groups (i.e., between the groups that would or would not start a business after participating in the game).

The rank test is used to test the Mann-Whitney U-test assumption that the two population groups are independent. The sum of the ranks is not similar with respondents that will not start a business having a mean rank of 67.73 and those that have an intent to start a business after the game having a mean rank of 85.46. In satisfying the assumption, the test is conducted.

Table 6. Ranks table

<i>Ranks</i>				
	Have you participated in other online learning games/competitions?	N	Mean Rank	Sum of Ranks
Likelihood of starting a business	No	115	67.73	7789.00
	Yes	26	85.46	2222.00
	Total	141		

Table 7. Test Statistics

Test Statistics ^a	
	Likelihood of starting a business
Mann-Whitney U	1119.000
Wilcoxon W	7789.000
Z	-2.021
Asymp. Sig. (2-tailed)	.043
a. Grouping Variable: Have you participated in other online learning games/competitions?	

The Mann-Whitney test ($z = 2.021$, $p < .05$) suggests a significant difference in the mean ranks of the two groups. The results reveal that respondents that have played a similar online game are likely to start a business. In addition to this, the results indicate that playing the entrepreneurship game influences the intention of players to start a business. For robustness, a means test is conducted across the sample, before and after the respondents had played the game. Results indicate that there is a difference in the scores between the two groups, with an increase in the likelihood of starting a business post playing the game.

Table 8. Means table

Report		
	Likelihood of starting business (pre test)	Likelihood of starting a business (post-test)
Mean	70.31	79.2778
N	3979	144
Std. Deviation	24.770	20.07832

The mean likelihood of starting a business pre-gamification is ($M=70.3$, $SD = 24.77$) which is lower than the mean of the likelihood of starting a business post-gamification ($M = 79.28$, $SD= 20.08$). We examine whether this difference is statistically significant.

Table 9. t-test.

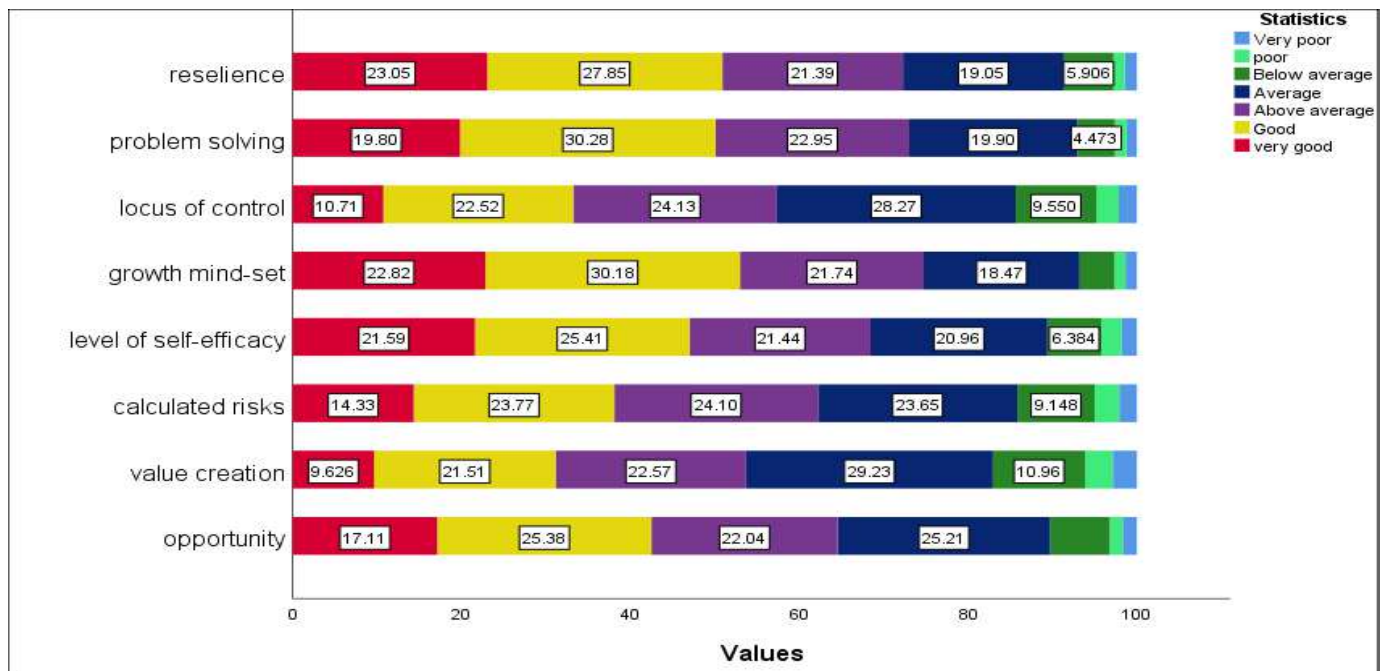
<i>One-Sample Test</i>						
Test Value = 70.31						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Likelihood of starting business	5.360	143	.000	8.96778	5.6604	12.2752

The one sample t-test indicates a significant variation between the two means of likelihood to start a business pre and post gaming ($t = 5.360$, $p < .001$). The above tests suggest that entrepreneurship games and other online learning games increase an individual's likelihood of becoming an entrepreneur. We, therefore, accept the hypothesis H1, that gamification has an impact on Entrepreneurial Intention.

H2. There is a significant association between gamification and an individual's rating on his ability and efficacy in various areas of interest.

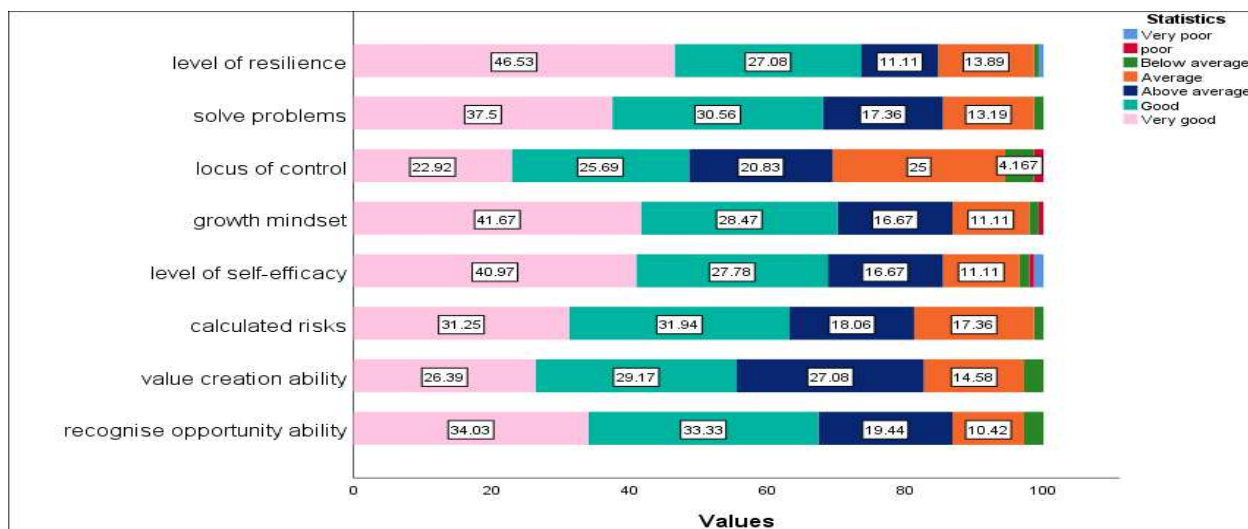
Before gamification, we observed a slightly lower proportion of respondents who were very good in ability in various sectors. Before gamification, the respondents whose level of resilience was very good was about 23%, in problem solving the proportion was about 20%, locus of control 11%, growth mindset 23%, self-efficacy 22%, calculated risks 14% value creation 10% and the ability to recognize opportunity, 17%. However, under every area more than 50% of the respondents were above average, good, or very good.

Figure 1. A bar graph Pre-gaming



After gaming, the proportion of the respondents who were exceptionally good at various ability areas increased significantly, almost doubling the pre-gaming proportions. The proportion of the respondents who described their level of resilience as very good after gamification was about 47%, problem solving was 38%, locus of control 23%, growth mindset 42%, level of self-efficacy 41%, calculated risks 31%, value creation ability 26%, and the ability to recognize opportunity 34%. After gamification, more than 65% of the respondents described their abilities as above average, good, or very good.

Figure 2. Bar graph post gaming



We investigate using contingency tables and chi-square statistics whether this increase in proportions after gamification is due to chance or attributed to gamification. We measure gamification by the frequency of gaming. The bar graphs suggest that the more an individual participates in gaming, the higher they rate their ability.

From the contingency table, Table 9, about 76% of the respondents who have been playing the game for the full duration rate their abilities as either good or very good. Only about 1% of them rate their ability as below average. About 60% of the respondents who have played the game for more than one month rate their ability as good or very good. However, this proportion is lower than those who played between one and three weeks, 60%. It is also equivalent to those who played for one day, 50%. Therefore, the duration of gaming has no effect on an individual's rating of his ability. To ascertain, we observe the chi-square statistics in the chi-square table.

Table 10. Contingency table - cross tabulation.

<i>How long have you been playing the game for?</i>							
% within How long have you been playing the game for?							
		Ability					Total
		Below average	Average	Above average	Good	Very good	
How long have you been playing the game for?	Full duration	0.9%	8.2%	15.5%	39.1%	36.4%	100.0%
	More than 1 month		20.0%	30.0%	30.0%	20.0%	100.0%
	1 month		22.2%	33.3%		44.4%	100.0%
	between 1 and 3 weeks		10.0%	30.0%	30.0%	30.0%	100.0%
	started a weekend after week 2				100.0%		100.0%
	less than 1 week			100.0%			100.0%
	1 day			50.0%	50.0%		100.0%
Total		0.7%	9.8%	19.6%	35.7%	34.3%	100.0%

Table 11. chi-square table.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.662 ^a	24	.770
Likelihood Ratio	21.311	24	.620
Linear-by-Linear Association	2.472	1	.116
N of Valid Cases	143		
a. 31 cells (88.6%) have expected count less than 5. The minimum expected count is .01.			

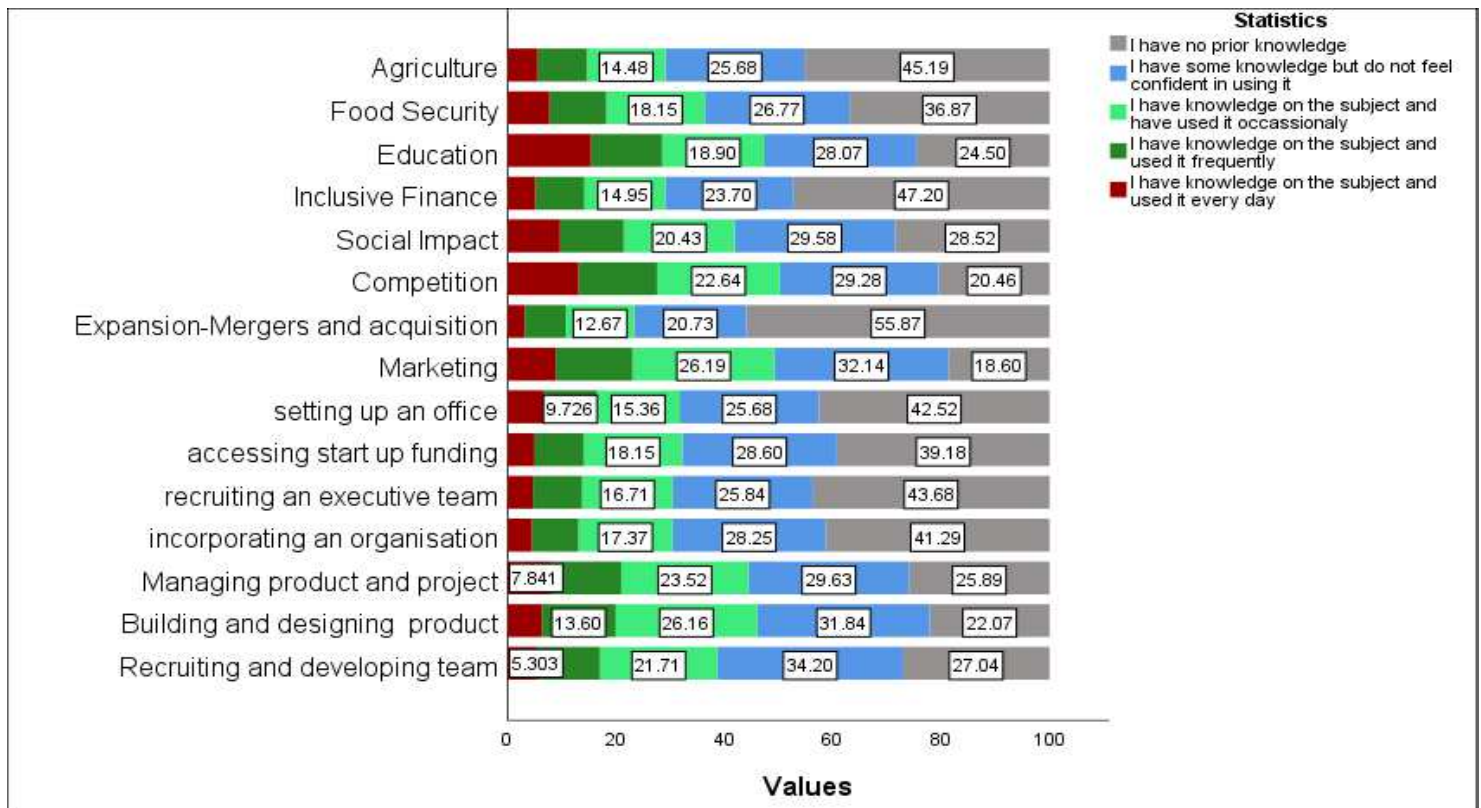
The chi-square statistics ($\chi^2(24) = 18.66, p > .05$) indicate that we do not reject the null hypothesis of independency. Therefore, there is no significant association between frequency of gaming and an individual's ability. We therefore reject our hypothesis H2 and conclude that there is no significant association between gamification and an individual's rating of his ability.

H3. There is a significant association between success in entrepreneurship education and frequency in gaming.

Before gamification, we observed a higher proportion of respondents who had no prior knowledge on various areas of interest. The knowledge on expansion, mergers and acquisitions recorded the highest number of respondents, 56% who had no prior knowledge before gamification, closely followed by inclusive finance, 47%, and agriculture, 45%. Overall, more than 50% of the respondents had some knowledge but

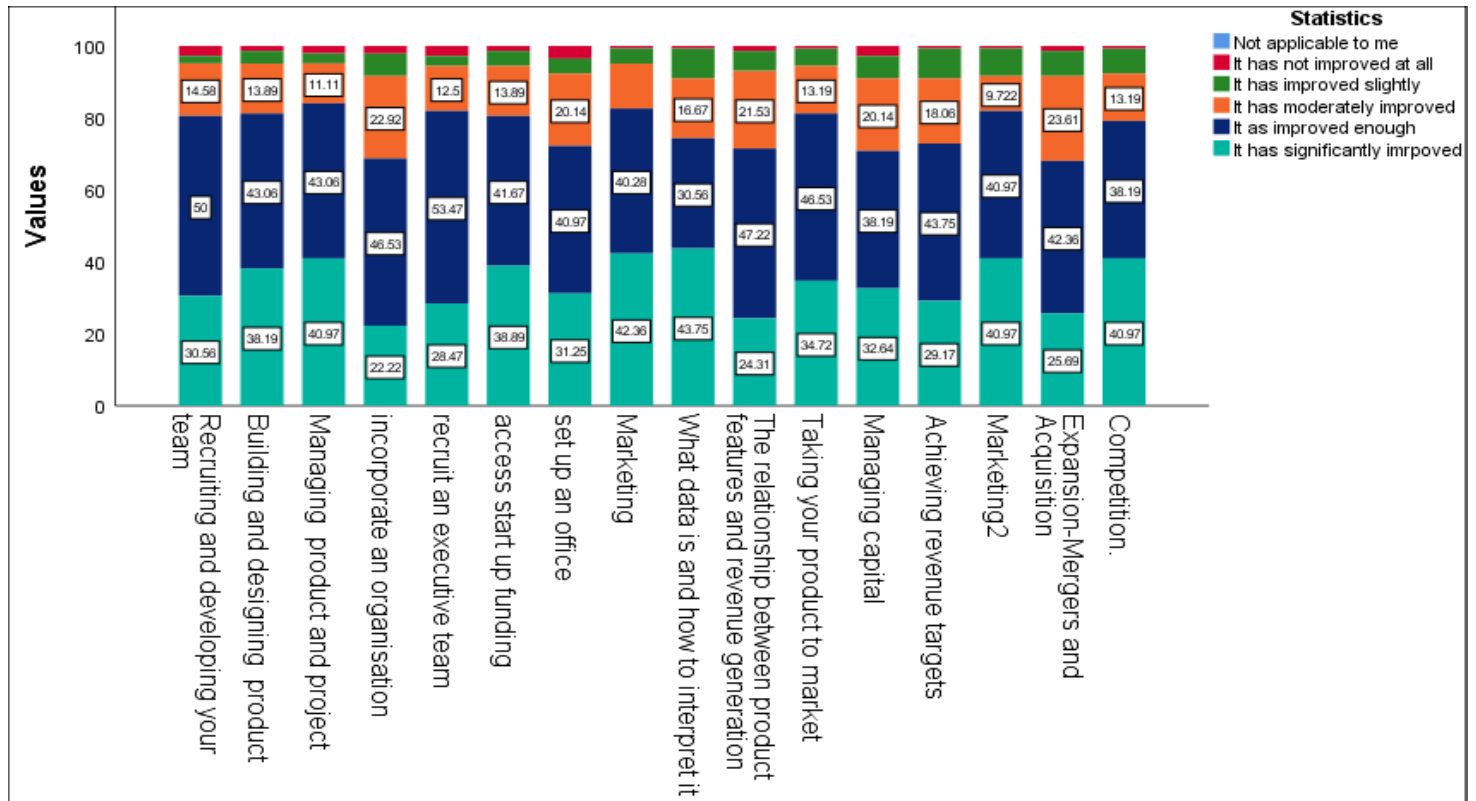
lacked confidence in using it or had no prior knowledge on various aspects of entrepreneurship before playing the game.

Figure 4. A bar chart pre-gaming.



After gamification, many of the respondents, more than 60%, claimed that their knowledge on various sectors of entrepreneurship had improved enough or it had improved significantly. The improvement in the gained knowledge could be attributed to the effects of gaming. To investigate this, a chi-square test of independence was conducted to explore the association between gamification and the improvement of knowledge on the various sectors of entrepreneurship.

Figure 4. A bar chart post-gaming



The following contingency table assesses the impact of the Areas of Interest of the respondent as well as the time spent playing the game, to assess the relationship between engagement with the game and its relative effect on the perceived impact of entrepreneurial competency. Respondents that only engaged with the game for two weeks or less indicated a slight improvement in their respective entrepreneurial

competency. This is in stark contrast to respondents that played the game for 1 day and experienced improved performance.

Table 12. Contingency table - Cross tabulation.

<i>How long have you been playing the game for? * areas_of_interest</i>							
% within How long have you been playing the game for?							
		Areas touching on entrepreneurship					Total
		It has not improved at all	It has improved slightly	It has moderately improved	It has improved enough	It has significantly improved	
How long have you been playing the game for?	Full duration	0.9%	3.6%	9.1%	49.1%	37.3%	100.0 %
	More than 1 month			10.0%	60.0%	30.0%	100.0 %
	1 month			11.1%	33.3%	55.6%	100.0 %
	between 1 and 3 weeks			20.0%	50.0%	30.0%	100.0 %
	started a weekend after week 2		100.0%				100.0 %
	less than 1 week			100.0%			100.0 %
	1 day				100.0%		100.0 %
Total		0.7%	3.5%	10.5%	49.0%	36.4%	100.0 %

From the contingency table above, about 37% of the respondents who engaged in gaming for the full duration recorded that their knowledge had improved enough or significantly. About 90% of the respondents who had been playing for one month

recorded that their knowledge had improved significantly or just enough. Gaming exhibited a quick effect as evidenced by improving the knowledge of all the respondents who had been gaming for one day, just enough.

The chi-square statistics ($\chi^2 (24) = 42.44, p < .05$) indicates that we reject the null hypothesis of independence. Therefore, the two variables are associated. There is a statistically significant association between gaming time and improvement of EE.

Table 13. Chi-square table.

<i>Chi-Square Tests</i>			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	42.444 ^a	24	.012
Likelihood Ratio	19.263	24	.738
Linear-by-Linear Association	1.322	1	.250
N of Valid Cases	143		
a. 32 cells (91.4%) have expected count less than 5. The minimum expected count is .01.			

Table 14. symmetric measures.

<i>Symmetric Measures</i>				
		Value	Asymptotic Standard Error ^a	Approximate Significance
Nominal by Nominal	Phi	.545		.012
	Cramer's V	.272		.012

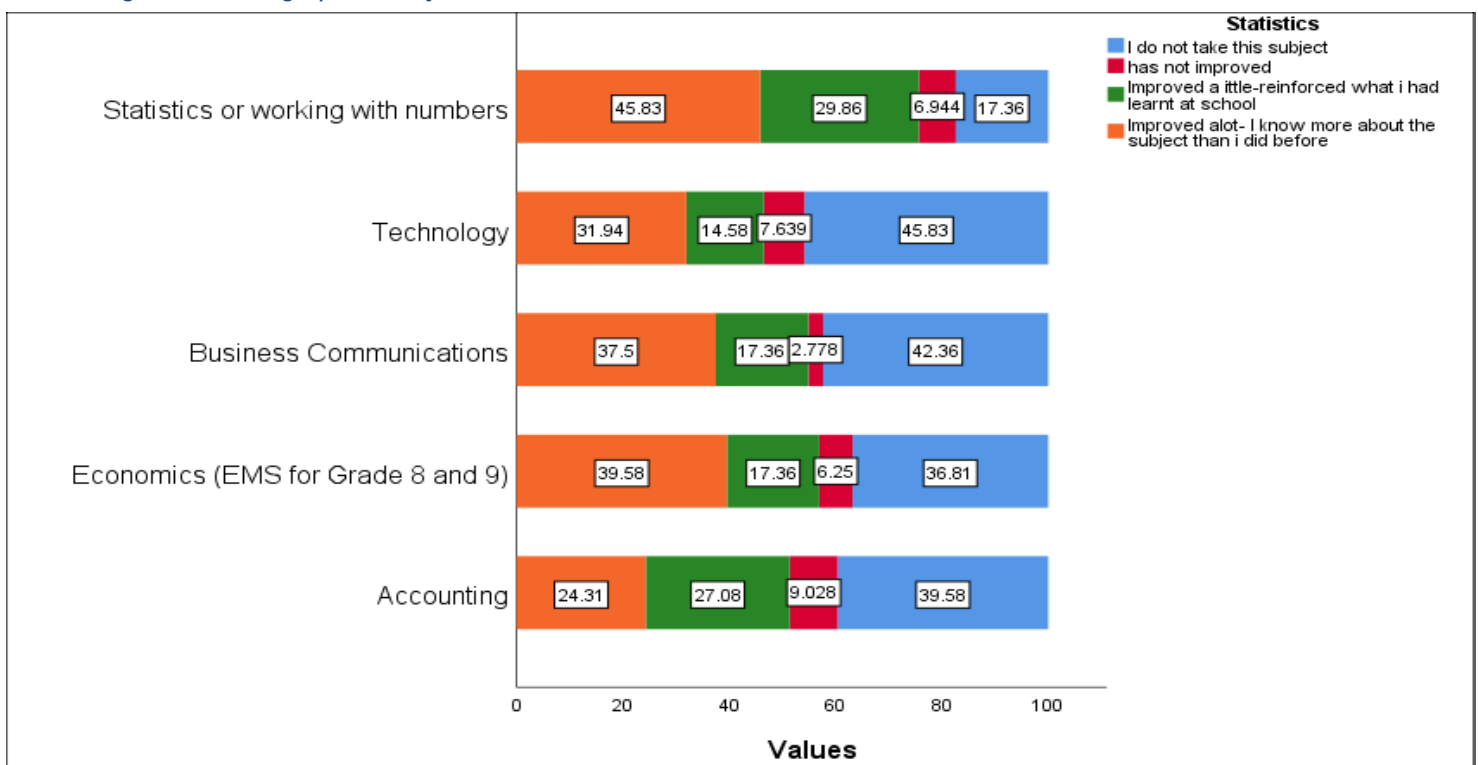
- Using the asymptotic standard error assuming the null hypothesis.
- Based on normal approximation.

From the symmetric measure table, it is evident that an association between the two constructs is modest, with the Phi value being 0.545. Similarly, the Cramer's V value of 0.272 indicates a weak association between the two variables. Both test statistics are statistically significant with 0.12 values. The results indicate there is no definite association in the sample between entrepreneurial competencies and the amount of time that participants spend playing the game.

H4. Gamification helps improve understanding on various academic subjects related to entrepreneurship.

After participating in the game, more than 50% of the respondents improved a lot or reinforced what they had learnt in school in all the subjects relating to entrepreneurship except for Technology that recorded about 47%. Accounting recorded the highest number of respondents, only 9% were recorded as individuals who had not improved after participating in the game.

Figure 5. A bar graph of subjects.



We conduct a chi-square test to investigate whether there exists any association between the time one spends gaming and the improvement on various academic subjects among the respondents who take those subjects.

Table 15. Cross tabulation table

<i>How long have you been playing the game for? * subjects Cross Tabulation</i>					
% within How long have you been playing the game for?					
		Subjects			Total
		has not improved	Improved a little - reinforced what I had learnt at school	Improved a lot - I know more about the subject than I did before	
How long have you been playing the game for?	Full duration	14.7%	41.2%	44.1%	100.0%
	More than 1 month	12.5%	25.0%	62.5%	100.0%
	1 month		71.4%	28.6%	100.0%
	between 1 and 3 weeks		50.0%	50.0%	100.0%
	started a weekend after week 2	100.0%			100.0%
	1 day		50.0%	50.0%	100.0%
Total		13.0%	42.4%	44.6%	100.0%

About 85% of the respondents who engaged in the game for the full duration had a little or major improvement. This is a lower figure compared to the respondents who had only spent one day gaming. This group recorded a 100% improvement whether it was by a little or major improvement. This difference proves that spending more time in gaming or

engaging in gaming does not translate into improved understanding of the subjects. We observed the results of the chi-square test.

The chi-square statistics ($\chi^2 (10) = 11.9, p > .05$) suggests that we accept the null hypothesis of independency. These results indicate that there is no significant association between gaming and improvement of understanding on various academic subjects related to entrepreneurship. Therefore, we reject our hypothesis H4 and conclude that there is no association between the two variables.

Table 16. Chi-square table.

<i>Chi-Square Tests</i>			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.900 ^a	10	.292
Likelihood Ratio	11.104	10	.349
Linear-by-Linear Association	.026	1	.871
N of Valid Cases	92		
a. 15 cells (83.3%) have an expected count less than 5. The minimum expected count is .13.			

4.4 Discussion of Results

Results of the experimental investigation provided unique and insightful evaluations into the learning and expansion of students' knowledge. The outcomes of the study shed light on how to improve educational opportunities for entrepreneurs as well as the overall learning environment. The data cast some light on the extent to which the students were engaged, motivated, and content for the entirety of their educational experience.

Based on their previous involvement with the game, respondents to the poll either indicated if they were interested in beginning their own business or stated that they were not interested in doing so. After playing the game, participants were given the choice of responding "Yes" or "No" to the question of whether they would consider

launching a business, and the findings reveal a statistical difference between the two groups of people who responded to the question. The findings provide credibility to the hypothesis that longer periods of time spent playing a game would result in increased player interest in company ownership. After participating in game-based learning activities, students' understanding of entrepreneurial principles significantly improved, as demonstrated by the outcomes of the research study. Students were given an opportunity to participate in simulations of real-world settings, in which they were tasked with analysing complex problems, collaborating with their classmates to find solutions, assuming professional roles, and making sound decisions. After receiving the intervention, students' learning, performance, and overall comprehension all significantly improved as compared to the results of the exams they had taken before receiving the intervention (8.558 score for GroupB vs. 6.535 score for GroupA). Findings from this study suggest that students who take part in learning activities that are gamified have a greater understanding of and respect for the concept of entrepreneurship.

Data also reveals that the proportion of students who intend to start a business is much higher than the number of students who do not intend to start a business. This indicates that the proportion of students who intend to start a business is significantly higher than the number of students who do not intend to start a business. Because respondents came from divergent backgrounds and may have varying degrees of opportunity perception, it is reasonable to assume that their perspectives on the advantages of the game may also differ. These findings only reflect a small portion of all that has been uncovered.

After playing the game, participants' confidence in their own ability to pursue entrepreneurial opportunities increased, as reflected by the descriptive analysis presented in Subsection 4.3. According to the findings, the utilisation of gamification has

been linked to positive outcomes that have to do with how capable an entrepreneur is regarded to be.

After playing the game, respondents exhibited improvements in areas such as their ability to bounce back from setbacks and their confidence in their own abilities. According to statistical data, however, there was no considerable statistical improvement in the respondents' judgments of their own entrepreneurial skills. The conclusions of the study are challenged by this conclusion. In addition, the amount of time spent playing the game did not influence the participants' perceptions of their own level of gaming expertise in any way (measured in terms of time spent).

Because of this study, people who participated in the research had a more optimistic perspective on their capacity to produce value. This further affirms what has been found in prior studies, which emphasised the importance of value creation to the success of entrepreneurs. This is also true for the participants, who claimed that they became better at recognizing new opportunities.

Findings from this research further point to a significant connection between the use of gamification and the growth of essential business skills and competencies. The results of this sample, on the other hand, do not give any evidence that is statistically significant enough to support the idea that gamification can boost participants' perceptions of their own talents.

The third hypothesis builds on the first two by examining how well prospective business owners understand important aspects of entrepreneurship and how successfully they can apply that knowledge. To be successful, entrepreneurs need to have a comprehensive understanding of all the moving parts. Before diving in headfirst, it is vital to have a solid understanding of the purpose of marketing, the process of developing products and projects, and the method of locating and recruiting new people for the team.

The collaborative attitude inside the firm was helped along by the interactive aspects of the game. The players, on the other hand, did not expect to have the competence to develop the product, market it, and maintain it with a professional crew before the game

began. Findings from previous studies, such as the one conducted by Neck and Greene (2011), indicated that traditional entrepreneurial techniques do not give adequate exposure to the dynamic issues of organising an organisation, lending legitimacy to the gains made in these areas. Results from this study provide credence to the contention that advancements have been made in the aforementioned domains.

The outcome of this study suggests that gamifying the classroom aids students in achieving their learning goals, which leads to increased levels of success for EEPs. The research indicates that participating in the game facilitates a more expedient acquisition of the fundamentals of entrepreneurship, such as the industry's guiding principles and fundamental building pieces.

However, there is no data to suggest that gamifying EE courses leads to statistically significant increases in performance when dealing with themes associated with entrepreneurship. Because there is no association between the two, a fascinating paradox is produced. If participants can increase their entrepreneurial learning outcomes and broaden their exposure to the entrepreneurial sector, their academic performance in classes linked to entrepreneurship should also improve as a result. This provides a potential problem in which individuals have difficulty differentiating between the effects of specialised learning and the outcomes of other areas.

This section focuses on the educational economics literature that provides support for the alternative pedagogy that Blenker et al. suggest (2008). The authors of this body of research highlight the importance of self-reflection as a key competency for successful business owners and executives. This collection of abilities has been emphasised for the sake of precision. It is possible that business owners tend to view their activities in isolation from those taking place in other contexts or fields because they have come to the realisation that success in a variety of their interconnected fields can be achieved

through the application of an economic mechanism such as the market. To explain this further, a business owner may engage marketing specialists so that they do not exhibit their own experience in the field. This is done so for business owners not to demonstrate their own competence. Instead, individuals just need to demonstrate that they have a fundamental comprehension of the different disciplines that are involved. Putting such a concept to the test might be an important part of future studies.

According to the findings of the research, students who take part in gamified learning activities that put them in situations as close to real life as possible and evaluate their ability to put what they have learned in the classroom into practice have a more positive attitude toward their education and acquire a deeper grasp of entrepreneurial principles. The application of students' theoretical knowledge is made possible as a direct result of their participation in these activities. Concisely, the primary finding of the research was that one of the most efficient ways to instruct students about entrepreneurship is to have them participate in game-like simulations that are based on real-world scenarios and require them to function as professionals, collaborate with their classmates, evaluate predicaments, and make appropriate decisions. This was the conclusion that emerged as the most important takeaway from this study. In fact, this was the most significant discovery made by the study. The primary conclusion of the research was that one of the most successful ways to train students and learners to think critically is to place them in gamified environments that simulate real-world happenings and push them to interact in reaction to those situations. Students benefit in a broader sense from participation in these kinds of activities since they enhance not just their knowledge but also their self-esteem and their motivation to pursue business objectives.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

This study adopted a pedagogical approach to assess the effect of alternative teaching methods in advancing the learning process of students to entrepreneurship. The evaluation of EE looked at the effectiveness of the alternative pedagogies in realising key entrepreneurial outcomes of EEPs. The objective of the study was to evaluate the effect of gamification as an alternative EE pedagogy in improving the effectiveness of the EEPs amongst a sample of students in secondary educational institutions.

The study assessed the primary research question on the impact of gamification on EE effectiveness and investigated the underlying improvements in elements such as entrepreneurial intention and competencies. It deployed a quantitative approach to study the survey data prior to and post the engagement of the entrepreneurial game. The first finding of the study is that the respondents indicate increased entrepreneurial intention after playing the game. With respondents the intentions construct, identified as being statistically significant for those that chose to start a business after playing the game.

The second finding of the study indicates that gamification has an impact on the outcomes of the EEPs as well as improvements in the overall understanding of the entrepreneurial operating environment, especially given the enhancements in digital technologies. Respondents were able to indicate that in playing the game, they experienced an improvement in the dynamics of operating an enterprise especially in the elements of products and projects; marketing; inclusive finance and recruitment as well as building a team.

The study also established that the perceived ability of the respondents does not improve after playing the game, speaking to the perceptions around the respective

respondents. The study, however, did not investigate the underlying drivers to this result and this a critical component to realising entrepreneurial intent.

Given the results of the study, it is recommended that gamification be considered in EEPs for student entrepreneurs within educational institutions. Moreso, the game can be opened to all other students, as literature has indicated that entrepreneurship can be taught.

There is potential for innovative pedagogical techniques such as game-based learning, gamification, and virtual reality to both enhance and maintain entrepreneurial education. In this study, we propose the development of a virtual learning environment for business education that capitalises and leverages on the immersive and productive properties of 3D gaming simulations. This 3D gaming environment would be intended to teach students how to conduct business. Students can acquire a conceptual comprehension of entrepreneurship by enrolling in one of the many different entrepreneurship classes that have been conceived and developed specifically for this objective. Students can further study through immersive as well as game-based learning activities on real-world challenges that are experienced in business contexts, thanks to educational infrastructure and pedagogical methodologies that are built on the concepts of gamification. This is made feasible by gamifying the educational infrastructure and adopting pedagogical techniques inside a learning environment that are based on three-dimensional virtual reality. Students can practice skills that will be helpful to them when addressing issues that they will undoubtedly experience as business owners, thanks to the realistic nature of the situations in which they are placed. The purpose of this experiment was to investigate the ways in which the setting and the gamified learning activities influenced the levels of motivation and attitude displayed by the students, as well as their overall learning experiences.

The research on evaluation produced several exciting outcomes, all of which point to the framework's potential to deliver successful gamified learning activities that boost students' motivation and help in the development of an entrepreneurial mentality, skills, and competencies. Findings suggest that gamified learning experiences, which place students in realistic scenarios and motivate them to apply theoretical knowledge,

increase students' comprehension of entrepreneurial concepts and make their entire learning experience better. This is because practical applications that students are required to complete put the academic information they have gained to test.

The focus of work to come will be narrowed down to one of the many feasible options. One of the most significant areas of research to look at is how gender roles are addressed in educational programming for entrepreneurs. As a direct consequence of this, one of the objectives is to explore the different approaches that individuals of different genders assume to activities and the environment. Additional research may be undertaken to determine how beneficial group study sessions are. Young people benefit from this kind of group activity because they develop important "soft skills" like working together as a team, communicating effectively, and listening attentively. This is significant as it points to a potential route that can be further explored after this one.

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APPENDICES

APPENDIX A

Mechanisms and their definitions:

Mechanism	Definition	Effect category
Compression	Reduces the amount of time that is required to perform an action	Preserve
Conservation	Reduces the resources that are required to perform an action	Preserve
Expansion	Increases the availability of a resource	Modify
Substitution	Replaces one resource with another	Modify
Combination	Bundles different resources to create new artifacts, such as devices, functionalities, and business models	Create
Generation	Creates new artifacts, such as devices, functionalities, and business models, by changing existing ones	Create

Note. “Effect category” refers to Malone et al.’s (1999) generic types of effects.