A Theory and Process Evaluation of the Allan Gray Entrepreneurship Challenge (AGEC)

Ismail Ombo Michael Dumutu

(DMTISM001)

A research dissertation submitted in partial fulfilment of the requirements for the award of the

Degree of Master of Philosophy in Programme Evaluation

Faculty of Commerce

University of Cape Town

2024

Supervisor: Associate Professor Adiilah Boodhoo

COMPULSORY DECLARATION:

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this research proposal from the work, or works of other people has been attributed, cited, and referenced.

Signature: Ismail Ombo Michael Dumutu Date: 21/11/2024

Table of Contents

List of Figures

List of Tables

List of Acronyms

AGEC	Allan Gray Entrepreneurship Challenge
AGOF	Allan Gray Orbis Foundation
TVET	Technical and Vocational Education and Training
COVID-19	Coronavirus Disease of 2019
GDP	Gross Domestic Product
SDGs	Sustainable Development Goals
NDP 2030	National Development Plan 2030
TEA	Total Entrepreneurial Activity
PBO	Public Benefit Organisation
AGUT	Allan Gray Unit Trust Fund
SWOT	Strengths, Weaknesses, Opportunities, and Threats
FAQ	Frequently Asked Questions
Q&A	Question and Answer

Abstract

Youth unemployment remains a pressing concern in South Africa, with an alarming unemployment rate of 44.7% recorded among individuals aged 15 to 34 in the fourth quarter of 2021. This calls for urgent intervention due to the associated ramifications of poverty, social exclusion, inequality, crime, and social instability. Despite a positive attitude towards entrepreneurship, South Africa lags in entrepreneurial activity compared to other developing countries. Recognizing the pivotal role of entrepreneurial education, the Allan Gray Orbis Foundation (AGOF) launched the Allan Gray Entrepreneurship Challenge (AGEC) in 2017. This online simulation 'game' seeks to develop entrepreneurial competencies in primary, secondary, and Technical and Vocational Education and Training (TVET) college students in an interactive manner. Following an internal review, the programme was adapted in 2022 to enhance the gaming and learning experience of beneficiaries. This evaluation aimed to surface and assess the plausibility of the theory of change underlying the adapted AGEC and assess the extent to which the game's design and implementation were adapted in line with the proposed recommendations.

To elicit the programme theory, the following questions were employed:

- What is the underlying logic and theory of AGEC?
- To what extent is the AGEC programme theory and logic plausible?
- What aspects of the AGEC programme can be altered to optimize the desired outcomes?

The following questions were used to assess implementation effectiveness:

- To what extent are the proposed changes to the AGEC game being implemented as planned?
- What are the potential barriers to successful implementation?
- Which, if any, improvements to the delivery of the AGEC game are recommended by participants?

Combining exploratory and descriptive research designs, the evaluator collected data through workshops, document reviews, and key informant interviews with seven champion teachers and seven students. The following key findings were identified (i) the AGEC theory and underlying causal

assumptions were plausible; (ii) while the extended gameplay period aligned with successful programmes, challenges arose in maintaining student focus; (iii) the original leaderboard with weekly prizes was found to be more motivating for students; (iv) technical issues hampered the user experience, leading to decreased interest and high dropout rates among students; (v) shifting from teacher-assessed weekly assignments to automated Built-in Assessment impacted debrief sessions negatively with fewer sessions being organized; (vi) insufficient organizational support was offered to teachers and students; and (vii) resource shortages, exacerbated by the COVID-19 pandemic, posed challenges, particularly in rural schools. Key recommendations include ensuring adherence to planned debrief sessions and peer-to-peer learning to sustain engagement, reintroducing weekly prizes alongside end-of-module quizzes to maintain motivation and engagement, improving teacher training and support to improve programme delivery, providing resources such as devices (computers, tablets, etc.) and internet connectivity to low-income schools, rigorous testing of the AGEC game before launch, and adding a live chat feature to strengthen technical support. This is meant to improve the overall learning experience for students, increasing the likelihood of attaining desired outcomes.

Chapter 1: Introduction

Background to Evaluation

With a median age of 20 and 60% of the population under the age of 25, Africa is the world's youngest continent (Ackah-Baidoo, 2016; Mendes, 2022). According to Rocca and Schultes (2020), Africa is estimated to have a billion people under the age of 35 (540.8 million 0-14-year-olds and 454.5 million 15-34-year-olds), accounting for 22.7 percent of the global youth population. Sub-Saharan Africa, the continent's largest region, is home to more than one billion people, half of whom will be under the age of 25 by 2050 (World Bank, 2022). If properly harnessed, the region's youthful population represents an unparalleled opportunity for economic growth and development (African Development Bank, 2016). According to the World Bank (2022), economic activity in Sub-Saharan Africa is expected to grow at 3.9 percent in 2023 and 4.2 percent in 2024.

Despite its enormous potential, Sub-Saharan Africa remains the world's poorest region. In 2015, 413 million of the 736 million people living on less than $1.90 per day were in Sub-Saharan Africa (United Nations Statistics Division, 2019). Additionally, an estimated 9% of the region's youth are unemployed and struggling to make ends meet (International Labour Organization, 2020). According to Page (2013) and the World Bank (2009), not enough is being done to engage the region's youth, and host governments' efforts to address the problem are tragically inadequate, failing to create enough jobs to accommodate the region's young people into labour markets.

South Africa, which has the continent's second-largest Gross Domestic Product (GDP), recorded its highest unemployment rate in years in the fourth quarter of 2021, at 35.3% (Statistics South Africa, 2021). This was especially prevalent among young people. Forty-four-point-seven percent (44.7%) of young people aged 15 to 34 were reported to be out of work, education, or training. The youth unemployment situation is concerning, as rising unemployment can result in socioeconomic problems. High levels of unemployment, according to Kitov and Kitov (2011) and Kingdon and Knight (2004), can have a disastrous effect, resulting in poverty, social exclusion, inequality, crime, and social instability.

Entrepreneurship is widely regarded as a catalyst for achieving economic and social development goals such as growth, innovation, employment, and equity (Acs, 2008; Naudé, 2010; Soni, 2014; Valerio et al., 2014; Van Praag & Versloot, 2007). According to Bowmaker-Falconer and Meyer (2022), entrepreneurship is an important driver of societal health, wealth creation, and a formidable engine of economic growth. It fosters the necessary innovation required to capitalize on new opportunities, increase productivity, and create jobs. It also has the potential to address society's most pressing issues, such as the United Nations Sustainable Development Goals (SDGs) or the recovery from the economic shock wave caused by the COVID-19 pandemic.

Even though South Africans have positive attitudes toward entrepreneurship, the country has consistently low levels of entrepreneurial activity in comparison to other countries (Herrington et al., 2010; Herrington et al., 2017; Maswanganyi, 2014; Meyer, 2017; South African Reserve Bank, 2016). When Herrington et al. (2010) asked 36 South African experts to identify the three most significant factors impeding entrepreneurial activity in South Africa, entrepreneurship education and training in primary and secondary schools was ranked as one of the three most significant inhibitors. This concurs with Msimango-Galawe and Majaja's findings from 2022, who also identified entrepreneurship education as a roadblock to creating an optimal entrepreneurial ecosystem in South Africa. An entrepreneurial ecosystem is crucial for fostering more entrepreneurial activity, which in turn promotes economic growth and job creation (Msimango-Galawe & Majaja, 2022).

Recognising the critical role of entrepreneurial education in encouraging entrepreneurial activity, the South African government developed the National Development Plan 2030 (NDP 2030), with the goal of instilling a "spirit of entrepreneurship" in students from the start (National Planning Commission, 2012). This includes reviewing the national school curriculum to ensure that it is capable of cultivating an "entrepreneurial mindset" and skills required for start-ups, such as adaptability, problem-solving, and initiative (National Planning Commission, 2012, p. 143; Smith, 2018). Cleveland and Cleveland (2006) provide a succinct summary of the benefits of entrepreneurship education for young people: To begin with,

it can boost student engagement and academic performance while also raising awareness of entrepreneurship as a career option. Secondly, it can assist young people in developing their life and employment skills as they transition into a workforce that demands more collaboration, innovation, and creativity as well as increased interpersonal and teamwork skills. Lastly, it may lead to businesses that generate income and create jobs.

In this context, the Allan Gray Entrepreneurship Challenge (AGEC), a novel education game that is the focus of this evaluation, was developed by the Allan Gray Orbis Foundation to teach entrepreneurship skills to primary, secondary, and technical vocational education and training (TVET) college students across South Africa.

Entrepreneurship Education in South African Schools

Higher levels of entrepreneurial activity have been linked to higher educational levels. Graduates, according to Bowmaker-Falconer and Meyer (2022, p. 63), have a higher likelihood of starting their own businesses than non-graduates. This is because foundational skills like reading, writing, and computation are largely established through education. Additionally, cognition—including reasoning, information processing, critical thinking abilities, paying attention and memorising—is extremely important. Higher levels of education may also increase one's self-confidence, propensity for taking risks, ability to spot opportunities, and technological expertise—all of which are essential elements of the entrepreneurial process (Bowmaker-Falconer & Meyer, 2022; Jiménez et al., 2015).

According to Von Broembsen et al. (2005), most South African youths do not believe they have the skills to start a business, which may be due to the low proportion of South Africans who have completed secondary school. As such, Wood and Herrington (2003) contends that there is a need in South Africa to raise entrepreneurial awareness and provide a solid foundation in entrepreneurial skills such as basic business, administration, and financial skills. Additionally, Wood and Herrington (2003) underscored the significance of developing an entrepreneurial mindset, which includes believing that one can succeed as an entrepreneur and that entrepreneurship can be a rewarding career path.

Although subjects such as economics, business studies, and accounting are taught in secondary schools throughout South Africa, there is currently no emphasis on entrepreneurship (Bowmaker-Falconer & Meyer, 2022). The Department of Basic Education, to its credit, proposed three new subjects in 2021: Kiswahili, Entrepreneurship, and Robotics and Coding. Beginning in 2023, robotics and coding will be included in the curriculum for younger grades and will be gradually introduced to higher grades. However, it does not appear that entrepreneurship will be covered for the time being (Bowmaker-Falconer & Meyer, 2022).

Chimucheka (2014) asserts that improving and promoting entrepreneurship education in South Africa at all levels of education and to all people is critical if the country is to achieve its goals of increasing total entrepreneurial activity (TEA), economic growth, and job creation (Chimucheka, 2014).

Current Approaches to Entrepreneurship Education and Training

Few studies on the state of entrepreneurship education at the primary and secondary school levels have been conducted in South Africa, and those studies have revealed that entrepreneurship education at that level was largely infrequent and lacked depth or focus (Sathorar, 2009; Steenekamp et al., 2011).

At the tertiary level, there are many programmes aimed at fostering entrepreneurship, but it is difficult to see any real results (Chimucheka, 2014). According to Chimucheka (2014); O'Neill (2004), this may be because most programmes emphasize developing skills that will make the student employable. Making the student employable is a paradox of sorts. It is not and should not be the goal of training a "student entrepreneur" in the South African context. Every entrepreneurship training should aim to produce "job creators and not job seekers" (Bbenkele & Ndedi, 2010; Chimucheka, 2014; Sathorar, 2009).

Chimucheka (2014) contends that despite an emerging trend toward the use of more contemporary techniques like role-playing and computer simulations, South African higher education institutions still primarily adhere to traditional in-class methods of teaching. The most used in-class method at the undergraduate level is the lecture, followed by the creation of business plans, discussions, case studies, and guest speakers. The most common in-class methods used at the master's level are research projects,

discussions and case studies, and lectures. At the PhD level, the most common method is conducting research projects (Chimucheka, 2014). Exams, tests, and business plans are the most common forms of assessment used for undergraduate and diploma students enrolled in entrepreneurship courses. Master's and PhD students, on the other hand, are evaluated more on their research abilities through research papers and thesis/dissertations (Chimucheka, 2014; Jesselyn Co & Mitchell, 2006).

Such teaching methods, per Smith (2005); Van Vuuren and Nieman (1997), focus on virtual rather than real problems and are often disconnected from entrepreneurship practice. This is supported by O'Neill (2004, p. 4), who asserted that traditional entrepreneurship education does not prioritize imagination, creativity, or innovation. Furthermore, Botha (2006) points out that most programmes focus on knowledge but are lacking in skills and attitudes that are critical to the success of any potential or start-up entrepreneur. This is not good enough. As Dana (1993); O'Neill (2004, p. 5) correctly points out, the end result of entrepreneurship education should be a creative individual who understands how to take an idea from conception to starting and managing a business.

Given this context, new approaches to entrepreneurship education must be explored if positive results are to be realised.

Gamification

According to research, experiential learning and expeditionary learning—that is, learning as a social activity and a process of discovery—improve student learning and retention (Abrahams & Singh, 2013; Bruni-Bossio & Willness, 2016). Knowledge is created in this context through the transformation of experience (Kolb, 1984). Politis (2005) supports Kolb's (1984) theory and noted that knowledge develops through experiencing, reflecting, thinking, and acting during experiential learning.

Gamification, defined by Deterding et al. (2011) as "the use of video game elements to improve user experience and user engagement in nongame services and applications," is a form of experiential learning. Gamification includes a variety of game elements such as points, badges, levels, leaderboards, status, trophies, rewards, and progress bars (Deterding et al., 2011; Seaborn & Fels, 2015). Deterding (2012)

asserts that these components are used in tasks to engage, motivate, and reward users for learning new skills or changing behaviours (Deterding, 2012). Additionally, Hamari et al. (2014) conceptualized gamification as a motivational affordance that results in behavioural and psychological outcomes. Motivational affordance is an idea that comes from the self-determination theory Ryan et al. (2006), which states that "human beings seek out (and continue to engage in) activities if these promise (and succeed) to satisfy motivational needs, such as competence, autonomy, or relatedness" (Deterding et al., 2011). Points, leaderboards, and badges are the most widely used gamification elements among the motivational affordances (Hamari et al., 2014).

According to Kim et al. (2018), because of its fun and playful nature, gamification can be a good solution to help solve student engagement and participation issues in the classroom, which has been a pain point in the education sector. Lovelace et al. (2016); Ranchhod et al. (2014) concurs, noting that because students receive real-time information and feedback while playing games, gamification generates more interest and participation among students than traditional approaches and is better suited for teaching skills like critical thinking and teamwork. The longer the simulation, the more students can engage in deep thinking and knowledge integration (Cavanaugh et al., 2016). Additionally, if a debriefing discussion session is held after the simulation, it aids students in making the connection between their experience and performance (DuHadway & Dreyfus, 2017).

Research has shown that gamification is rapidly gaining use in entrepreneurship education (Bagheri et al., 2020; Grivokostopoulou et al., 2019; Isabelle, 2020; Kriz & Auchter, 2016).

In one study, Isabelle (2020) explored the efficacy of gamification in entrepreneurship education. The research found that gamification had a positive impact on students' motivation, learning outcomes, and performance. Specifically, incorporating gamification elements such as points, badges, and leaderboards increased students' interest in entrepreneurship and motivated them to participate more actively in the course. Additionally, feedback, progress tracking, and goal setting through gamification enhanced students' retention and application of course materials. Encouragingly, the study observed no adverse effects of

gamification on students' performance; instead, it found that grades and the quality of final projects improved with gamification. The research suggests that careful consideration of the design of gamification elements is crucial for their effectiveness, as games that better align with the course's learning objectives and offer more opportunities for practice and feedback are likely to be more successful.

In another study, Zulfiqar et al. (2019) investigated the impact of business simulation games on the attitudes and intentions of business school students towards entrepreneurship. The study revealed that business simulation games have a significant positive impact on the attitudes and intentions of students towards entrepreneurship. The experimental group, which played a business simulation game, exhibited a significantly more positive attitude towards entrepreneurship and a higher intention to engage in entrepreneurial activities compared to the control group. The study also found that the business simulation game was perceived as useful by students for developing skills such as decision-making, problem-solving, and critical thinking.

Furthermore, Kriz and Auchter (2016) investigated the long-term effects of a simulation game in entrepreneurship education in Germany. The study found that the long-term effects of gaming simulation were generally positive, with participants reporting increased entrepreneurial knowledge and skills, as well as a higher likelihood of starting a business – with participants starting startups at roughly twice the normal rate in Germany (around 16%).

Taken together, these studies found promising results demonstrating that gamification can indeed contribute to the development of successful entrepreneurs.

Implementing Organisation

The AGOF is a Public Benefit Organisation (PBO) funded by a generous donation from Allan Gray Limited. It was founded in 2005 as part of Allan Gray's vision to make a long-term, sustainable contribution to Southern Africa by nurturing the region's emerging entrepreneurial talent. AGOF is a major player in the Southern African entrepreneurship landscape, with operations in South Africa, Namibia, Botswana, and Swaziland. Recently, the foundation was recognised as one of the top organisations fostering

entrepreneurship in South Africa (Aspen Network of Development Entrepreneurs (ANDE) South Africa chapter, 2017; van Eck et al., 2021).

The Foundation takes a holistic approach to entrepreneurship development, focusing on three critical aspects: cultivating an entrepreneurial mindset, developing entrepreneurial skills, and remaining relevant in the African context while understanding global entrepreneurial ecosystems. This is accomplished through its flagship programmes: a Scholarship for high school students, a Fellowship for university students, and an Association for Fellowship alumni. The foundation's approach, according to van Eck et al. (2021), is unique and challenges conventional methods of business development because it places the entrepreneurs they support at the center of programme design.

To amplify its impact, in 2017, the foundation launched the Allan Gray Entrepreneurship Challenge (AGEC), which is the focus of this evaluation, to teach entrepreneurial competencies and skills such as resilience, adaptability, and the ability to spot opportunities to add value to society to primary school, secondary school, and Technical and Vocational Education and Training (TVET) college students in a fun, engaging, and sustainable way through an online simulation game.

The Evaluand

After signing a non-disclosure agreement with the Allan Gray Orbis Foundation (AGOF), the foundation's research specialist shared with the evaluator programme documents relevant to this evaluation, such as previous evaluation reports, annual reports, the monitoring and evaluation framework, and so on. The following programme description was derived from the documents above, the AGOF website, and meetings with programme staff conducted via Microsoft teams.

AGEC is a 2D simulation game that can be played online in a browser or via the AGEC mobile app. It was first launched in 2017 as a five-week competition for high school students (Grade 8 to 12). Different versions of the game were created for primary schools and TVET colleges in 2020. This evaluation will concentrate on the high school game, which is described in greater detail below.

A hybrid model is used to deliver the high school game. To begin, students play the game between Monday and Thursday on their own time. They learn how to identify a social problem to solve (opportunity identification), conduct market research, raise capital, pitch, recruit, product development, marketing, corporate social impact, mergers, and acquisitions, etc. This is followed by a guided, structured, and facilitated debrief session in the classroom led by a dedicated teacher also known as a champion (a teacher dedicated to helping students play and complete assignments). This allows students to gain a deeper understanding of the entrepreneurship concepts covered in the game. The foundation provides all teaching notes and guidelines for the debrief session to the teachers that support students to play the game. Students then complete a 30-minute assignment on Friday to test their understanding of the entrepreneurial concepts covered during the week. Champion teachers then grade the assignments that students turn in at the end of each week, giving them the opportunity to earn points. Students earn points by completing tasks in the game (for example, speaking with a mentor, reading an article, etc.) and correctly answering the weekly assignment. The students who have earned the most points at the end of each week are awarded prizes in the form of Allan Gray Unit Trust Fund (AGUT), International/Local 5-Star Trip, Gadgets (XBOX, PlayStations, Mobile Tablets, and more), and Cash Vouchers. The best support teacher, determined by how many students from their school make it to the top of the leaderboard and student participation or activity on the gaming network, also receives a similar prize package.

The Gaming Network

The AGEC game is available to students via the Gaming Network. The Gaming Network is an online hub developed by the AGEC staff. Its primary goal is to enable users (e.g., students, teachers, mentors, and even parents and siblings of students) to interact with one another in a meaningful way. The Gaming Network is a thriving community that remains active long after the game has ended. Users can search for friends, send friend requests, create private groups, chat, and even participate in a virtual classroom session with their champion teacher. They can also update their status and write blog posts about topics that interest them.

This means students can directly request assistance with their weekly assignments from their parents, teachers, or siblings during gameplay.

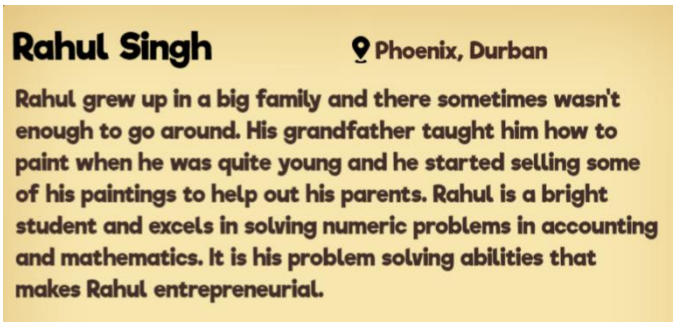
As previously stated, to play, students must first register with the gaming network. Registration takes place in a few simple steps: students fill out a registration form, providing a unique email address that is not shared with anyone else; after logging in, students must click on a verification link sent to the email address provided on the registration form; after verification, students are asked to create a password; students log in to the gaming network using their password; alternatively, after establishing a password, students can download the AGEC mobile app from Google Play or the Apple App Store. After registering, students must wait for the Gameplay button on the Gaming Network to become active before they can begin playing. While anyone can join the gaming network, only students can play the game.

Gameplay

The game is played over the course of five weeks. The AGEC game is divided into five stages, or quests: business setup, product testing, sales and profit, business upgrades and marketing, and business expansion. Each week is dedicated to a specific quest, which means that all business concepts and assignments completed during that week will be related to that week's quest. For example, because the first week is dedicated to setting up a business, all lessons and assignments covered in the gaming world in week one will be related to establishing a business.

The first step in the AGEC game is to select an avatar. A total of six avatars are available for participants to choose from. Each avatar has a short profile that describes their location, upbringing, interests, and aspirations, and so on. Students are encouraged to select an Avatar with whom they most identify. For example, while students are given a variety of races and genders to choose from, they may find that an avatar's specific way of thinking about entrepreneurship appeals to them. The avatar selection process is accompanied by stimulating music and sound effects. Figure 1 shows an example of an avatar from the AGEC game.

Figure 1: *Example of an avatar used in the AGEC game.*



Following that, with the help of a mentor in the gaming world, participants select their preferred business industry, such as fintech, edtech, healthtech, or foodtech from a list provided to them. Participants are advised to exercise caution when selecting a stream or industry because they will be committed to it for the duration of the game (usually 5 weeks). An example of a business stream in the AGEC game is shown Figure 2 below.

Figure 2:*Example of a business stream used in the AGEC game.*

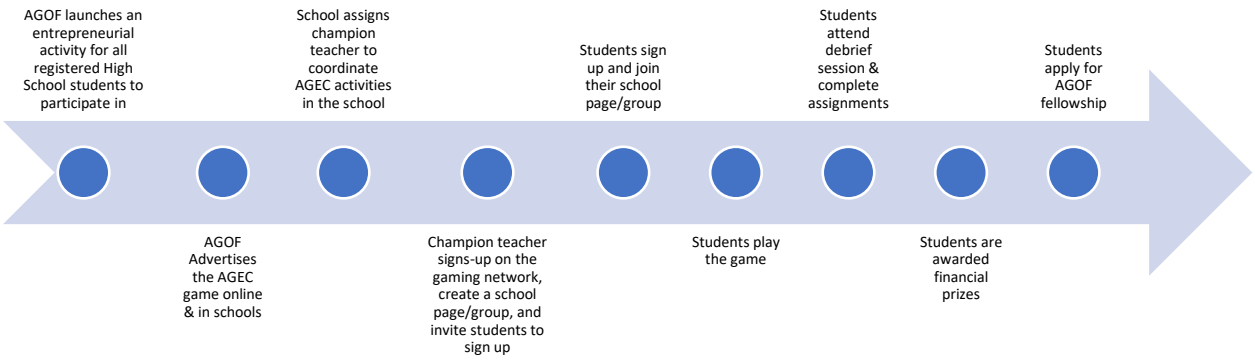
Following the selection of a business stream, participants must create a name for their start-up or business and register it at a lawyer's office in the gaming world.

After registering their business, participants then have the opportunity to grow their business over the next five weeks by meeting with various characters in the game and completing a series of business quests. For example, they can raise capital, develop their own product, set prices, and manage finances, hire new employees, launch a series of marketing campaigns, negotiate strategic revenue and profit/loss targets with the chairperson of the Board of Directors, acquire competitors, and so on. Students frequently make profitable and risky business decisions, giving them the opportunity to make money or, if they are careless, lose it.

Service Utilisation Plan

According to Rossi et al. (2004), a service utilisation plan is a flowchart that shows how clients become involved in the activities of a programme. This includes indicating the first contact with the client in order to recruit him or her to participate in the programme, the set of activities through which the client obtains information, and the follow-up activities that reinforce the learning process. Figure 3 depicts the AGEC programme's service utilisation plan.

Figure 3*:AGEC service utilisation plan.*

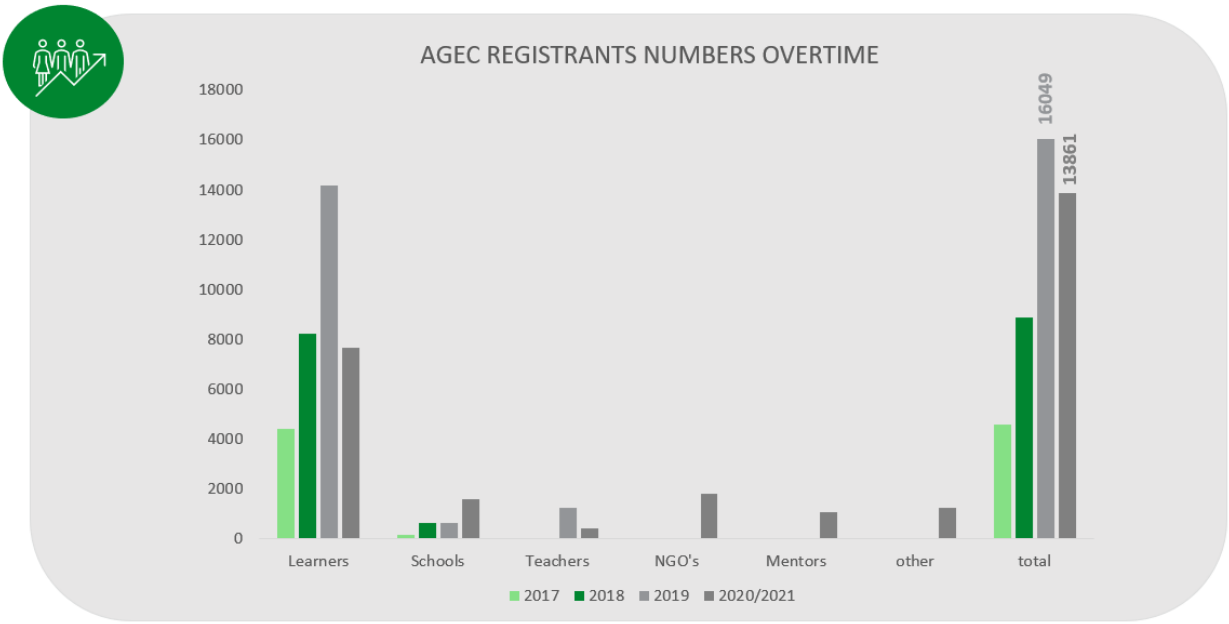


Before the five-week gameplay window opens, the upcoming competition is advertised in schools and social media platforms (AGOF website, Facebook, Instagram, and Twitter) to encourage schools to register and participate in the competition. All high schools in South Africa are eligible to participate in the programme. Once a school registers, one or two teachers self-select/are designated to coordinate the game in their school, referred to as the champion teacher. A comprehensive teacher's package is provided to the champion teacher, which includes notes and tips for teaching each week's module to their students and preparing them for the end-of-week assignments. They can also monitor their students' progress on the gaming platform. The champion teacher then signs up on the gaming network, creates a group for their school, and invites students to sign up to play the game. Students then attend a debrief session with their dedicated champion teacher, who explains the entrepreneurship concepts covered in the game in more detail and assists students in completing their end-of-week assignment, which allows them to earn points and win a financial prize. At the conclusion of the game, Grade 12 students who want to be entrepreneurs are encouraged to apply for the AGOF fellowship programme.

Target beneficiaries

The AGEC high school game is intended for students in grades 8 through 12. AGEC is not limited to any demographic or type of school, according to the foundation's Research Specialist. It is open to all South African high school students. This is because it aims to provide all children with an equal opportunity to participate in the game and learn how to become a high growth, high impact entrepreneur. Figure 4 shows the number of students, teachers, mentors, schools, and non-governmental organisations reached since 2017.

Figure 4:*Number of students, teachers, schools, NGOs, and mentors registered between 2017 - 2021.*



Modifications to the AGEC Game

In 2019, AGOF conducted a year-end review of the AGEC game. This review brought to light several issues, leading to the decision to overhaul the game in preparation for the 2022 gameplay period. The proposed changes aim to enhance accessibility, engagement, gameplay experience, and teacher support, thereby fostering a more inclusive and effective learning environment.

One of the key issues identified was the game's lack of device compatibility. The game could not be played on mobile devices such as tablets and cell phones, and students were required to use the same device throughout gameplay. This limitation hindered the game's inclusivity and reach. To rectify this, AGOF proposed the development of a mobile browser-friendly version of the game. This change would broaden the game's audience and make it more inclusive. Furthermore, by storing progress on students' profiles instead of devices, the game would offer more flexibility, allowing students to switch devices without losing their progress.

Another significant issue was the game's heavy reliance on continuous internet access. This resulted in high data usage due to the game's long playtime and the use of animations and infographics. Additionally, there was no offline version available outside of the competition period. To address these issues, AGOF planned to reduce gameplay time to lower bandwidth usage and extend the gameplay period. By extending the challenge duration to 2-3 months, students would be able to play at their convenience, easing the pressure on internet resources. Moreover, offering gameplay beyond the competition period would shift the focus towards the educational aspect, making the game more accessible and beneficial.

The Gaming Network also faced challenges, with low engagement and participation rates throughout the year. This was partly due to a limited search engine and restricted data access and admin rights. To boost engagement, AGOF planned to provide more activities and materials through the Gaming Network, keeping students engaged and motivated. An improved Gaming Network model, with updates to the search engine, would expand students' outreach options. Additionally, enhancing leaderboards and data categories would provide better insights, making the gaming experience more interactive and informative.

The website also had several issues, including duplicate profiles, frequent login troubles, and random crashes during gameplay. To tackle these problems, AGOF planned to include confirmation of details in the registration process to avoid incorrect registrations. Students would be given unlimited chances to improve their points and be eligible for prizes, eliminating the need to create multiple profiles for better odds. An improved backend system would be implemented to better support the game, and thorough game testing would be performed before launch to ensure the game was fully functional.

The game itself faced several challenges, such as the lack of built-in assessments, glitching and freezing during gameplay, and features that unnecessarily increased gameplay duration. Additionally, weekly assignment locks prevented students from submitting assignments past deadlines, even if they experienced lagging issues. To improve the user experience, AGOF planned to ensure the game was fully functional before launch and introduce updated features. Gameplay time would be reduced, and weekly

assignments would be removed to lessen restrictions, making the game more enjoyable and less frustrating for students.

Teacher participation in marking assignments was very low, with only 40 out of 447 teachers participating. This led to a major assignment backlog and delayed updates on points, causing panic among students. There was also the potential for unfair marking. To alleviate these issues, AGOF planned to eliminate weekly assignments, removing the need for teacher-marked assignments. Instead, points would be allotted by the system, and scalable built-in assessment tools would be implemented. This approach would streamline the process, reduce the burden on teachers, and ensure fair and timely updates on students' progress.

Table 1 summarizes the issues and the proposed approaches for 2022. The changes took effect in January 2023.

Table 1:*Proposed modifications to the AGEC game for 2022.*

Core Issues				Approach
1.	Accessibility	Device	• Cannot be played on mobile devices such as tablets and cell phones. • Student must have access to the same device from start and end of gameplay. • "Always On"	• A mobile browser friendly game = more inclusive and wider outreach • Storing progress on students' profiles, not devices to avoid device limitations
		Internet	• Gameplay heavily relies on internet access throughout gameplay. • Heavy data usage due to long play time and game's animations & infographics • No "offline" version of the game is available outside of competition period	• Reduce gameplay time to reduce bandwidth usage. • Longer challenge time (2/3months of gameplay) – students can play at will • Offer gameplay past the competition period – focus on edu aspect
2.	Gaming Network		• Low engagement and participation rate throughout the year • Limited search engine • Data Access & Admin rights	• Offer more activities and material through the Gaming Network to keep students engaged. • Improved Gaming Network model, with updates to the search engine to widen students outreach options • Improved leader boards and data categories to gain more insights
3.	Gameplay Troubleshoots	Website	• Duplicate Profiles and multiple user accounts • Frequent login troubleshoots. • Frequent website crashes – site randomly becomes unavailable during gameplay	• Add confirmation of details on registration to avoid incorrect registrations. • Students unlimited chances to improve points and be eligible to earn prizes – no need to create multiple profiles for better odds. • Improved backend system to better support the game. • Game testing performed before launch to ensure that the game is 100% functional before gameplay
		Game	• No built-in assessment (deeper level of learning) • Glitching and freezing occurs during gameplay and loss of progress. • Features that increase gameplay duration – i.e., Avatar walking from building to building • Weekly assignment lock – students cannot submit assignments past the deadlines - even after lagging occurs during this time	• Ensure that the game is 100% functional before launch. • Updated features for improved user experience. • Reduced gameplay time. • No weekly assignments – less restrictions during gameplay • THESE ISSUES ARE DISCOURAGING PARTICIPATION
4.	Facilitating Teachers		• 40 of 447 teachers participated in marking assignments. • Major assignment backlog • Delayed update on points – caused panic. • Unfair marking can occur	• No weekly assignments = no teacher marked assignments • System allotted points. • Built in Assessment tools (Scalable)

Evaluation Scope and Questions

Theory Evaluation

Rossi et al. (2004) assert that a programme's success largely relies on the quality of its design and the soundness of its underlying logic. This is important because it provides a framework for understanding and evaluating the effectiveness of the programme, enabling programme designers to clearly articulate their assumptions about how a programme is intended to work, the underlying logic or rationale behind the programme's activities and intended outcomes, and the contextual factors that may influence the programme's success or failure.

Considering the changes made to the AGEC game, the AGOF sought to understand how these changes would affect the overall gaming experience and its outcomes. In particular, the stakeholders wanted their programme theory to be clearly explained and reevaluated for the plausibility of its causal relationships in comparison to those in similar programmes. They were also keen on assessing the most effective methods of delivery to achieve the desired outcomes. Consequently, a theory evaluation was carried out to assess the conceptualization and design of the programme.

To elicit the programme theory, the following questions were employed:

1. What is the underlying logic and theory of AGEC?
2. To what extent is the AGEC programme theory and logic plausible?
3. What aspects of the AGEC programme can be altered to optimize the desired outcomes?

Process Evaluation

Moreover, AGOF sought to understand how well the changes were implemented to identify potential areas for future programme improvement. Therefore, an implementation evaluation was conducted, concentrating on delivery quality, participant responsiveness, and adherence to the game's implementation plan, to evaluate whether the service delivery and support functions adhered to the

programme's design specifications or other applicable standards. This was essential in determining whether the implementation of the new changes was carried out efficiently and effectively.

The following questions were used to assess implementation effectiveness:

1. To what extent are the proposed changes to the AGEC game being implemented as planned?
2. What are the potential barriers to successful implementation?
3. Which, if any, improvements to the delivery of the AGEC game are recommended by participants?

Chapter 2: Methods

In this formative evaluation, a theory evaluation was followed by a process evaluation. The rationale and assumptions underlying the AGEC programme was first extracted and subjected to a plausibility test. This was followed by a process evaluation to determine the extent to which the programme was implemented as intended. This was deemed critical to distinguish between implementation failure and theory failure, should its intended outcomes not be achieved (Rogers, 2000, pp. 210-211). After reviewing the programme documents, including the 2019/2020 programme review report and the AGEC Monitoring, Evaluation, and Learning Plan, the evaluator used two primary data collection methods for this evaluation: semi-structured interviews and focus group discussions. The methods used for theory evaluation and process evaluation are described in detail below.

Theory Evaluation

An exploratory evaluation design was used to gain insight into how the AGEC programme was conceptualized and the assumptions (values, beliefs, and experiences) that informed its design, and to assess whether these elements were plausibly and empirically associated with success (Rogers, 2000, pp. 210-211). Although the AGEC programme had a pre-existing theory of change, key stakeholders could not agree on what outcomes the programme could realistically achieve. As a result, a theory evaluation was necessitated to elucidate the expected outcomes and the mechanisms by which they will be achieved. Donaldson's (2007) five-step approach was modified to revise and develop a new theory of change for the programme.

The steps taken to extract the programme theory and assess its plausibility are outlined below.

Step 1: Stakeholder Engagement

During the stakeholder engagement phase, key stakeholders participated in a focus group discussion to gain a better understanding of the programme's activities, underlying assumptions, and expected outcomes. The study involved six purposively selected participants, including the

Director of Scholarships at AGOF, Research Specialist, AGEC Project Lead, AGEC Project Coordinator, AGEC Gaming Officer, and AGOF Monitoring and Evaluation Specialist. This stakeholder group encompasses a broad range of programme viewpoints, including programme design, intended operation, and current implementation.

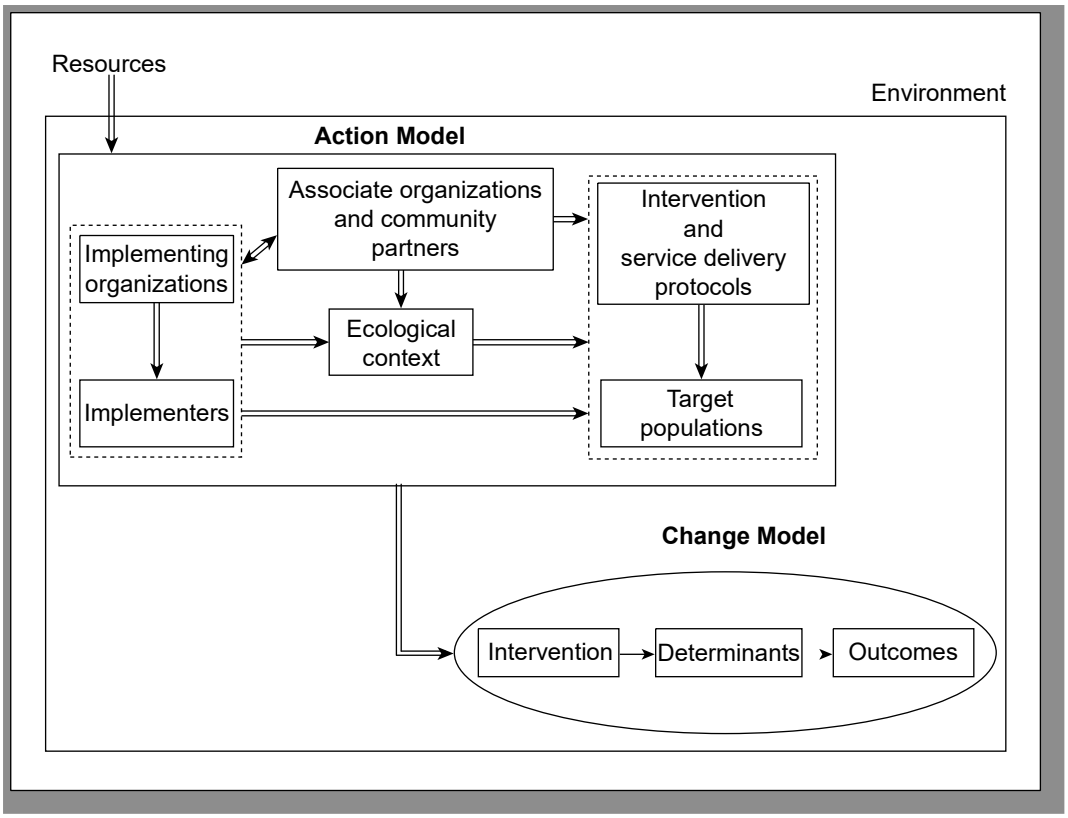
During the focus group, participants critically examined the existing AGEC programme theory and proposed new outcomes, outputs, or activities as needed during a three (3) hour workshop held at the Allan Gray Orbis Foundation Office in Cape Town. On the other hand, outcomes deemed to be outside the scope of the project were removed and replaced with more pertinent ones (see Appendix A for a detailed focus group guide). The focus group was recorded with an Olympus DS-2600 audio recorder, allowing the evaluator to transcribe and compare the audio to handwritten notes. By the end of the session, participants had outlined the objectives of the programme and how they plan to achieve them. This enabled the evaluator to create a first draft of the revised theory of change, based on the Markiewicz and Patrick (2015) logic model, which was then distributed to relevant stakeholders for feedback and approval.

The evaluator had planned to include champion teachers who coordinate and facilitate the classroom-based portion of the programme in their respective schools, but the community partner requested a separate session for their staff only. As a result, teachers' perspectives were captured in a separate 1-hour workshop during which the evaluator walked them through the revised AGEC theory of change and recorded their concerns and feedback, which was later incorporated into the final theory of change.

Step 2: Plausibility Check

Chen's conceptual framework of the action/change model was used to assess the plausibility of the AGEC programme theory, focusing mainly on the service delivery protocols and determinants. According to Chen (2005; 2014), understanding a programme's theory involves grasping the explicit or implicit assumptions held by stakeholders regarding the necessary actions to address a social problem and why those actions would be effective. These assumptions form the basis for the action model/change model framework formulated in 2014 to help stakeholders describe a programme (Chen, 2014), shown below (see Figure 5).

Figure 5: *Conceptual Framework of the Action Model/Change Model Schema*



Note. Adapted from *Practical programme evaluation: Theory-driven evaluation and the integrated evaluation perspective*, by Chen, H. T, (2014), P. 70, Sage Publications.

Within this framework, the change model (descriptive assumptions) deals with the causal processes underlying the social problem targeted by a programme, which are expected to occur for the programme to achieve its goals. Conversely, the action model (prescriptive assumptions) focuses on the actions required to bring about the desired changes (Chen, 2014).

To evaluate the plausibility of a programme's theory, it is crucial to analyze the underlying assumptions, both explicit and implicit (Chen, 2014). Accurate assumptions about the causal processes are pivotal for programme effectiveness. If flawed assumptions inform a programme's strategies, its chances of success diminish. Similarly, an action model built on invalid or unrealistic assumptions can hinder the programme's success. The evaluator used the approaches outlined below to assess the service delivery protocols and determinants of the AGEC programme for plausibility.

First, key elements of the AGEC programme, focusing on the programme and service delivery protocols, were compared with those of similar programmes. This comparison included programme details such as nature, content, activities, and steps for implementation in the field, including the process flow from client intake to screening, assessment, service delivery, division of labour, settings (both formal and informal), and communication channels.

Secondly, the determinants identified by stakeholders during the focus group discussion were scrutinized for validity.

Lastly, the desired outcomes of the AGEC programme were compared to those of similar programmes, and the causal linkages between them were assessed.

After the relevant stakeholders agreed on the AGEC programme theory, the evaluator assessed its plausibility through a critical review of social science literature and theories using the logic analysis guide developed by Brousselle and Champagne (2011). Relevant and peer-reviewed literature was compiled during this process from well-known databases such as Google Scholar, JSTOR, EBSCOhost, ProQuest, and Wiley Online Library. Keywords such as gamification, gamified learning, educational games, and entrepreneurship education were used in the search.

To determine whether or not the articles were relevant and should be included, the following criteria were used: (1) The study must include at least one condition where the effect of gamification, defined as "the use of game design elements in non-game contexts" Deterding et al. (2011), is studied on various learning outcomes. (2) The study must evaluate at least one learning outcome, including cognitive learning outcomes (knowledge of facts, principles, and concepts; procedural knowledge, strategic knowledge, and situational knowledge), motivational learning outcomes (intrinsic motivation, dispositions, preferences, attitudes, engagement, as well as feelings of confidence and self-efficacy), and behavioral learning outcomes (technical skills, motor skills, or competencies) (Ben-Zvi & Carton, 2007; MG, 1996; Sailer & Homner, 2020). (3) Only studies published within the last 10 years were included in the plausibility

assessment unless the study covers key theories and concepts to ensure the research is current and relevant. (4) The context in which gamification is applied should be specified, such as educational settings, corporate training, or healthcare, to ensure relevance to the research objectives. (5) Only studies published in English were considered. (6) Studies that do not provide sufficient data for analysis or those that are not peer-reviewed were excluded.

This allowed the evaluator to assess the model's strengths and weaknesses, as well as the strength of the causal chain toward the expected outcomes (Brousselle & Champagne, 2011). At this point, improbable connections were noted and discussed with stakeholders to determine whether further revisions to the programme theory were necessary.

Step 3: Final Draft

The programme theory was revised further to incorporate stakeholder feedback and the results of the plausibility assessment. Then, the final programme theory was sent to the community partner for approval.

Process Evaluation

Scheirer (1994) defines process evaluation as a type of evaluation that "verifies what the programme is and whether or not it is delivered as intended to the targeted recipients". According to Rossi et al. (2004) process evaluation is useful because it helps organisations answer important questions such as: 1) whether a programme is reaching the appropriate target population and 2) whether its service delivery and support functions are consistent with programme design specifications or other appropriate standards. AGEC dealt extensively with the question of reach in their 2019 review, raising several issues, some of which were addressed in the 2022 game restructuring. As such, this evaluation focused on determining the extent to which the new changes were effectively implemented to improve the programme design (Dietrich et al., 2019; Moore et al., 2015).

Carroll et al. (2007) conceptual framework for implementation fidelity (see appendix B) was used to determine whether the programme is being implemented as planned, identify potential barriers to

implementation, and recommend improvements to the AGEC game delivery to answer the process evaluation questions above. This was critical because evaluators and decision-makers can have greater confidence in the outcomes achieved when a programme is delivered consistently (Bragstad et al., 2019; Carroll et al., 2007; Moore et al., 2014).

Question 1 was addressed by closely examining how closely champion teachers followed the instructions provided in the teacher's packet for implementing the game in schools. Teachers were specifically asked to provide feedback on whether or not the instructions were easy to follow, the number and length of debrief sessions held, activities completed, teaching methods used, and the level of support provided by AGOF to enable them to effectively implement the game.

In addition, the evaluator sought the views of both teachers and students on whether the changes made to the game, such as reduced gameplay time, replacing weekly assignments with built-in assessment, students having unlimited chances to improve points and be eligible to earn prizes, improved backend system to better support the game, adding confirmation of details on registration to avoid incorrect registrations, and offering more activities and material through the gaming network, were beneficial.

Furthermore, both students and teachers were asked to provide feedback on whether the game was engaging and able to keep student attention to complete the game, whether students were able to understand and apply the concepts learned in the game to real-life situations, whether students received adequate feedback to improve their performance and understanding of entrepreneurship, and whether they would recommend the programme to other students interested in entrepreneurship.

Question 2 and 3 were addressed by directly asking teachers and students about the challenges and obstacles they encountered while implementing and playing the game, respectively, and how the game's effectiveness as a tool for teaching entrepreneurship can be improved.

Participants

The evaluator used the maximum variation sampling technique to select participants for the interview. Participants were selected to achieve a broad sample with regards to gender, grade, school quintile, and province. This enabled the evaluator to gain deeper insights into how the AGEC programme was implemented across schools in South Africa, identify potential barriers to implementation, and suggest ways in which the programme implementation could be improved. For a teacher to be considered for the interview, they had to have served as a champion for their school for at least two years, including the 2022/2023 academic year. Students were required to be repeat players, meaning they had to have played the AGEC game both before and after it was restructured. The AGEC team provided the evaluator with a list of students and teachers who had participated in the AGEC game over time, along with their contact information, which helped in determining whether a student or teacher was a repeat participant. Furthermore, only students over the age of 18 were considered.

The Lincoln and Guba (1985) principle of "informational redundancy" was used to determine the sample size. The evaluator started with 10 interviews (i.e., 5 students and 5 champion teachers), which were used to conduct the first round of analysis. Additional units were then invited for interviews until no new information or ideas were generated by sampling more units (Francis et al., 2010; Hennink et al., 2017). Saturation was reached with 14 participants (7 students and 7 teachers). The teachers and students who participated in the evaluation were from the following schools: Clarendon High School for Girls, New Forest High School, Khanyisa Secondary School, Coronation Secondary School, Durban Girls' High School, Mogomotsi Secondary School, Mmajane High School, Claremont High School, St. Dunstan's College, and Education Incorporated Fourways. These schools are located in the provinces of Western Cape, Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, Northwest, and Gauteng. All participants were recruited with the help of AGEC staff, who had a good working relationship with participating schools across South Africa. In collaboration with the staff, the evaluator identified and selected students and teachers who met the above selection criteria. All 14 participants took part in the restructured AGEC game.

Data Collection and Analysis

Semi-structured interviews were conducted with teachers to understand the level of support and training provided to them to be able to effectively facilitate debrief sessions, and whether the programme, as delivered by both the teachers and programme staff, was in line with the protocols laid out during the programme theory development process. Additionally, as detailed above, students who had played the AGEC game both before and after it was restructured were interviewed to gauge their satisfaction with the support provided by champion teachers, peer interaction on the gaming network, and the IT support provided.

A detailed interview guide was developed based on Carroll et al. (2007) conceptual framework for implementation fidelity, focusing on adherence, quality of delivery, and participant responsiveness, and was used to interview teachers and students (see Appendix C).

All interviews were conducted telephonically. According to O'Reilly and Dogra (2016), interviewing participants over the phone has several advantages, including: 1) balancing participant and evaluator busy schedules 2) eliminating the need for travel, which can be costly and, in some cases, dangerous, and 3) allowing the evaluator to reach out to respondents who are hesitant to communicate face-to-face. It gave the interviewee some anonymity by putting some distance between the interviewer and the interviewee, which could reduce their anxiety about participating.

Because the AGEC game was played and completed when schools were open, all interviews took place in the evening. All interviews were recorded after obtaining verbal consent from the participants and transcribed verbatim. The evaluator followed a rigorous process for cleaning and coding the qualitative data using NVIVO.

Ethical Consideration

The evaluator signed a memorandum of agreement with the Allan Gray Orbis Foundation (see Appendix D), which allowed the foundation to share programme documents. To ensure that only the

evaluator had access to the programme documents, they were stored in a password-protected folder. Additionally, once the thesis was completed, the documents were deleted from the evaluator's computer.

Prior to data collection, the evaluation proposal was submitted to the Faculty of Commerce Ethics in Research Committee for approval (see a copy of the ethics clearance letter in Appendix E). The evaluator acknowledged that gathering information on participants without their express willingness to participate in the study was unethical. Therefore, all participants were required to sign a consent form granting permission to participate in the study (see Appendix F). For those who could not be reached in person, the evaluator read aloud the consent form, and participants were asked to verbally consent before participating in any aspect of the research.

During the interviews, the evaluator explained the objectives of the research, how the data collected would be used, and assured participants that their data would be kept anonymous and confidential. All recordings were securely stored in a password-protected folder accessible only to the evaluator, and they were erased once transcribed. In addition, participants' personally identifiable information was not collected. The evaluator assigned a unique identifier to each participant to ensure their anonymity. Furthermore, all participants were informed of the length of the interview and given the opportunity to ask questions about the research. They were also informed at this point that the research was entirely voluntary and that they could opt out at any time. Additionally, they were informed that they were under no obligation to answer any questions with which they were uncomfortable.

Chapter 3: Findings

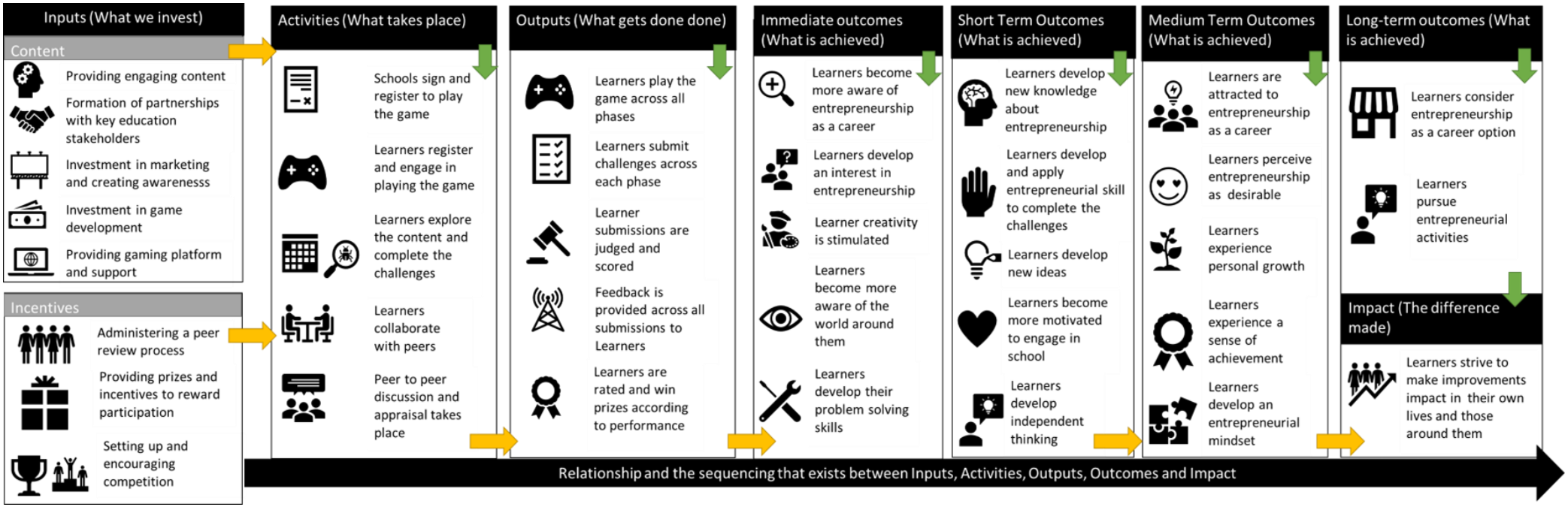
The results of this evaluation will be presented in the order in which it was carried out, as described in the methods section — the findings of the theory evaluation will be presented first, followed by the process evaluation results. The findings are organised according to the evaluation questions to ensure that each question has been adequately addressed.

Theory Evaluation

Theory Evaluation Question 1: What is the Underlying Logic and Theory of AGEC?

During the focus group discussion, stakeholders examined the original AGEC programme theory, as detailed in the methods section, to ensure that there is alignment between the activities and the goals and objectives of the programme. The original AGEC programme theory is shown in Figure 6, and the stakeholders' feedback is discussed below.

Figure 6: *Original AGEC Theory of Change*



While stakeholders generally agreed on the programme's activities, participants emphasised the importance of applied learning challenges in fostering the practical application of knowledge acquired through the AGEC game to real-world business scenarios.

When it comes to the objectives of the programme, there was consensus among stakeholders that the programme's primary goal is to inspire young students to become entrepreneurs rather than directly addressing unemployment. Unlike other AGOF programmes that target talented young people training them to become high-growth entrepreneurs, the AGEC programme aims to democratise access to entrepreneurship education, particularly for students from Lower Quintile schools, who lack such opportunities. It also aims to bridge the gap in the current educational system by providing effective delivery mechanisms for entrepreneurship education and associated skills. Moreover, it serves as a crucial pathway for entry into other AGOF programmes, offering participants the opportunity to apply for university bursaries and additional entrepreneurship development opportunities.

Although the programme's expected short-, mid-, and long-term outcomes remained largely unchanged, participants expressed a desire to align these outcomes with the overarching goal of inspiring young students to pursue entrepreneurship as a career. Participants identified two major causal pathways to achieve this goal. The first pathway involves the programme instilling a perception of entrepreneurship as desirable in students, leading to them developing an interest in entrepreneurship and considering it a viable career option. The second pathway involves students acquiring new entrepreneurship knowledge and skills, such as problem-solving, creativity, and critical thinking, through the programme, which in turn motivates them to come up with new venture ideas and engage in entrepreneurship-related activities.

A more detailed discussion of the outcomes of interest and the underlying preconditions and assumptions is provided below. Preconditions refer to the essential prerequisites that must be in place to facilitate the effective implementation of the programme and the attainment of the intended outcomes.

Outcomes of Interest.

Stakeholders reported that implementation of the AGEC game in schools fosters students' engagement in various aspects, such as peer interaction, networking, feedback provision, and rating. This engagement leads to heightened awareness of entrepreneurship as a viable career path and generates a genuine interest in the subject. Additionally, the game stimulates curiosity and creativity among students while equipping them with essential entrepreneurship skills and competencies like problem-solving, critical thinking, growth mindset, and self-efficacy. As a result, students become more adept at recognizing entrepreneurial opportunities in their surroundings and are motivated to participate in entrepreneurship-related activities within their school and community, including the Allan Gray applied learning challenges held after the gameplay. These initial and intermediate programme outcomes play a crucial role in cultivating student interest in entrepreneurship, ultimately influencing their career choices.

Equipped with vital entrepreneurial skills, a burgeoning interest in entrepreneurship, and enhanced self-confidence, students endeavour to create a positive impact in their personal lives and communities by generating and pursuing novel and innovative ideas.

Preconditions and Assumptions.

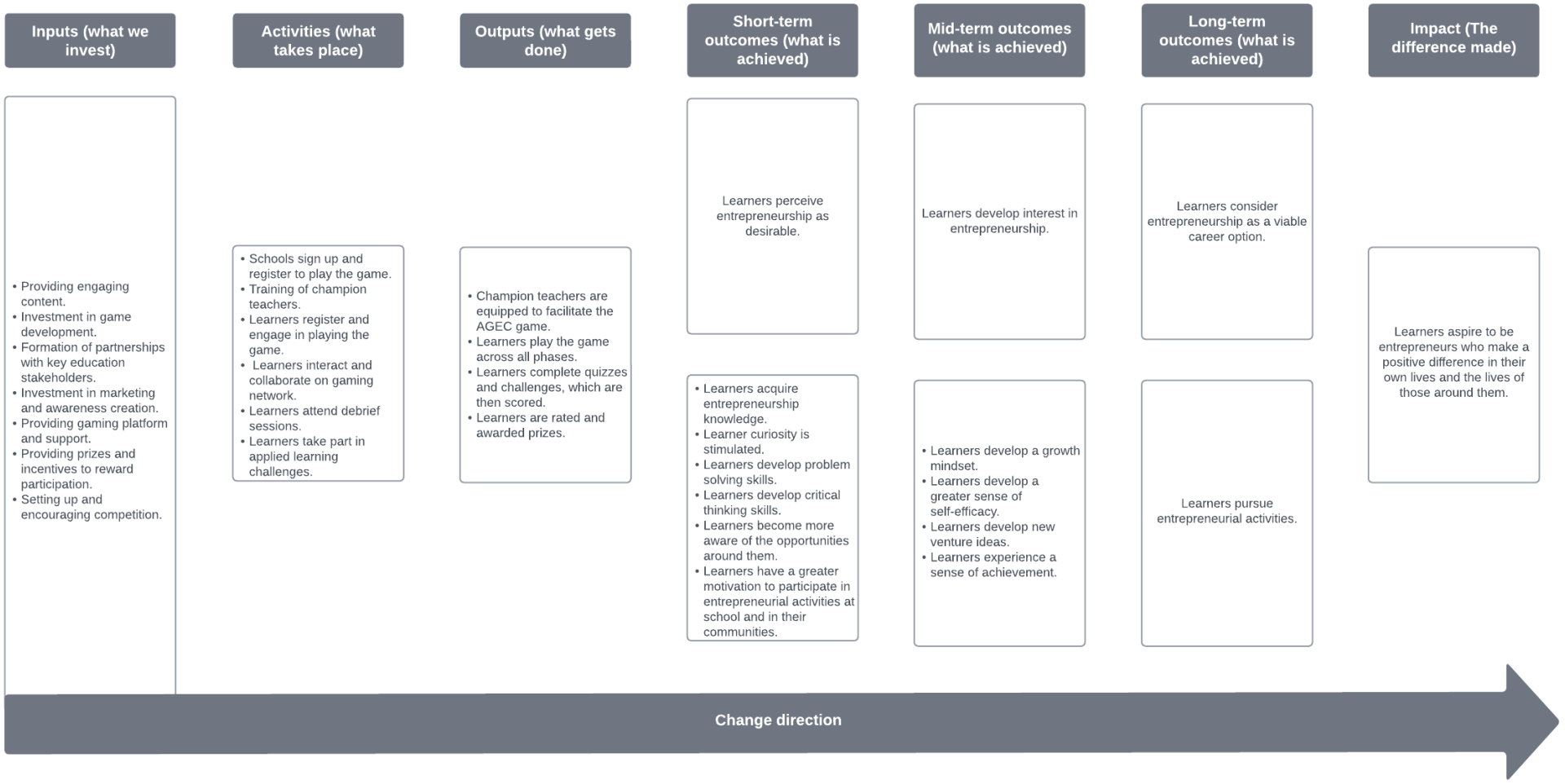
In the context of AGEC, the main precondition identified by stakeholders is that teachers, educators, and schools believe in the importance of entrepreneurship and are willing to dedicate their time, effort, and resources to promote the game as a valuable tool for fostering entrepreneurship among high school students. Another essential precondition is that all students have access to phones, tablets, computers, and the internet, which are necessary for playing the game. Additionally, students must show interest and enthusiasm for participating in the game.

Similarly, the assumptions are as follows: the game can foster ambition, generating enthusiasm and involvement among players, inspiring them to view entrepreneurship as a viable career path and contemplate future entrepreneurial endeavors. Additionally, playing this game leads to learning, indicating that its design, mechanics, and content offer a well-organized educational experience that enables players

to grasp diverse aspects of entrepreneurship. Moreover, the game's design and content are captivating, ensuring that players are enticed to return for more.

In light of the feedback gathered during the focus group discussion, the original programme theory shown in Figure 6 was revised to reflect stakeholders' perceptions of the programme. The revised programme theory outlines how the AGEC programme activities lead to the desired short-, medium-, and long-term outcomes as agreed upon by stakeholders (see Figure 7). As discussed in the introduction (page 16), weekly student challenges were replaced with end-of-module quizzes that are automatically scored and ranked. Consequently, several activities, such as the peer review process and teacher participation in marking challenges, were removed. Additionally, periodic applied learning challenges were added to the programme theory. Furthermore, the desired outcomes were divided into two causal pathways leading to the overarching goal of inspiring young students to become entrepreneurs.

Figure 7: *Revised AGEC Theory of Change*



Theory Evaluation Question 2: To What Extent is the AGEC Programme Theory and Logic Plausible?

Plausibility of Programme and Service Delivery Protocols.

Activities.

The AGEC programme activities align with other similar programmes (Almeida, 2017a; Antonaci et al., 2015; Bellotti et al., 2014; Costin et al., 2018; Isabelle, 2020; Kriz & Auchter, 2016; Williams, 2015; Zulfiqar et al., 2021). All programmes used for benchmarking purposes in this plausibility assessment used a 2D/3D simulation game that can be played online in a browser or via a mobile app to foster entrepreneurship. In addition to the simulation game itself, Williams (2015) showed that teacher or tutor training and professional accreditation for the use of simulation games in teaching is essential in order for them to be able to support students effectively. Stakeholders mentioned during the focus group discussion that the AGEC programme provides training for champion teachers. However, the programme documentation reviewed by the evaluator did not include details such as the number of training sessions conducted or any professional certification to show that teachers were well-equipped to facilitate the AGEC game in schools.

Moreover, Antonaci et al. (2015); Bellotti et al. (2014); Williams (2015) demonstrated that incorporating short theoretical introductions, delivered either through traditional lectures or by featuring guest speakers sharing their practical experiences in establishing and managing companies, particularly addressing relevant entrepreneurship topics, proves instrumental in establishing a robust theoretical groundwork for students. This foundation enhances their capacity to comprehend and apply entrepreneurial concepts covered in the game. Although this component was missing in the AGEC programme, the programme compensates for it through providing detailed reading materials within the game. It remains to be seen the extent to which these materials are able to be provide students with a solid foundation in entrepreneurship. In line with this, Isabelle (2020) provided students with additional learning resources, which helped them to build on the knowledge from class and game material to enable them to ideate, validate business opportunities, and develop sound business models.

Another component of the AGEC programme that aligns with other similar programmes is the debriefing session. Antonaci et al. (2015); Bellotti et al. (2014); Kriz and Auchter (2016); Williams (2015) all included debrief sessions in their gamification project. During the debrief sessions, participants discuss the differences and similarities between the game and reality and define the key lessons they learned from the simulation game (Kriz & Auchter, 2016). This helps students to retain the information they have learned. To this end, Cavanaugh et al. (2016) argues that providing students with a strong exercise debrief encourages them to engage in deep thinking, which fosters learning.

A number of the comparable programmes included in this study offered the simulation game as part of a course. This enables instructors to customize and tailor the game to the specific learning needs of their students. Additionally, it allows the instructor to link their own Web or Windows-based content, such as documents, video, audio and web-links, to pages within the game in order to inform, support and enhance the student's experience of the simulation game (Williams, 2015). Currently, the AGEC programme is not offered as part of a course and does not allow for instructor customization, which may limit the game's true potential in cultivating entrepreneurship among young South Africans.

During the focus group discussion, stakeholders emphasised the importance of the post-game applied learning challenges in assisting students in applying their newfound knowledge. Although this component was not emphasised in the comparative programmes, with the exception of Isabelle (2020), where students established and managed online Shopify stores as an extension of the gamification programme, with proceeds donated to a charity of their choice, it demonstrates that the programme is forward-thinking and has the potential to provide students with practical entrepreneurial knowledge and skills.

Table 2 summarises the components of the AGEC programme in comparison to similar programmes. All eight comparative programmes included a 2D/3D simulation game, making it the most common feature across the board. Debrief sessions were present in half of the programmes, while introductory briefing sessions, team organization, and lectures or seminars were offered by three

programmes each. Some activities, such as training and certification for instructors, the provision of additional learning resources, and customization of game elements, were less common, with only one programme offering each. Interestingly, none of the comparative programmes included applied learning challenges after gameplay. Overall, Table 2 shows that while AGEC includes several components of other successful gamification programmes, such as a 2D/3D simulation game, training for teachers, and debrief sessions, it lacks some elements found in other programmes, including introductory briefing sessions, the organization of student teams, and lectures or seminars.

Table 2*: Components of AGEC programme in comparison to similar programmes.*

Activities	Gamified entrepreneurship education programmes									
	AGEC Programme	Kriz and Auchter (2016)	Isabelle (2020); Slavtchev et al. (2012)	Zulfiqar et al. (2021)	Williams (2015)	Almeida (2017b)	(Antonaci et al., 2015)	(Bellotti et al., 2014)	(Costin et al., 2018)	Count
2D/3D simulation game played online in a browser or via a mobile app.	√	√	√	√	√	√	√	√	√	8
Training & certification for instructors	√				√					1
Introductory briefing sessions for students					√		√	√		3
Organization of student teams							√		√	3
Lectures/guest speakers/seminars							√	√	√	3
Provision of additional learning resources (text readings, cases studies, etc.)			√							1
Customization of game elements and content per instructor needs					√					1
Debrief session led by a dedicated teacher	√	√			√		√	√		4
Applied learning challenges after gameplay	√									0

Content.

The contents of the AGEC programme closely correspond to those of the comparable programmes. As described in the introduction chapter (P. 10), students in the AGEC programme learn how to identify a social problem to solve (opportunity identification), conduct market research, raise capital, pitch, recruit, product development, marketing, corporate social impact, mergers and acquisitions, and so on. This is consistent with similar gamification programmes listed in Table 2.

Overall, other comparable programmes covered a wide range of entrepreneurship topics (ideation, customer needs, competitive analysis, validations, business model canvas/business plan development, SWOT analyses, costing, marketing, branding, and social media management), guiding students through the venture creation and growth process (Almeida, 2017b; Antonaci et al., 2015; Bellotti et al., 2014; Costin et al., 2018; Grivokostopoulou et al., 2019; Isabelle, 2020; Kriz & Auchter, 2016; Williams, 2015; Zulfiqar et al., 2021). They combine theoretical lectures with hands-on, gamified learning activities. Instructors can tailor the learning content to their course objectives, and students usually work in groups. The programmes take a time-lag approach, presenting theoretical knowledge first, followed by the introduction of the business simulation game. The games expose students to real-world entrepreneurial challenges while also teaching them critical thinking and business skills, preparing them to create their own ventures.

Assessment.

The performance of students in the AGEC game is determined by their completion of all required game tasks, such as engaging with a mentor and reading articles, in addition to providing correct answers on the weekly assignments or the end-of-module quiz. Based on these performances, students are ranked on a leaderboard, and prizes are granted to the top performers, as initially outlined in the introduction. This approach aligns with the strategies employed in other gamification programmes. In similar educational games, winners are assessed based on a range of performance criteria, which may include company survival, annual surplus, share value, and overall company development within the game's environment (Grivokostopoulou et al., 2019; Isabelle, 2020; Kriz & Auchter, 2016). These programmes also incorporate gamified learning activities like quizzes and assessment exercises to gauge the progress of the students

(Grivokostopoulou et al., 2019). In such instances, students receive feedback and assistance, and prizes are awarded based on their performance in the quizzes and the overall performance of their virtual companies within the game environment.

Moreover, during the focus group discussion, stakeholders disclosed that AGEC students are administered pre- and post-programme surveys to evaluate their progress. This practice is in alignment with comparable gamification programmes. As reported by Hamari et al. (2014), Hanus and Fox (2015), and Henrie et al. (2015), the evaluation of gamified education has predominantly centered on the impact of game mechanics, such as badges and leaderboards, on students' experiences, motivation, and engagement. Data for these assessments is often collected through online questionnaires and observations.

Plausibility of Determinant(s).

According to Chen (2014), programmes require a clear focus in order to achieve their objectives. This focus involves identifying a leverage mechanism or root cause of a problem, which forms the basis for the programme to address a specific need. It is assumed that by activating this leverage mechanism or addressing the root cause of the problem, the programme will achieve its objectives. This leverage mechanism is known as the determinant. During the focus group discussion, stakeholders identified self-efficacy as the most important determinant of the AGEC programme. That is; by playing this game, students will gain confidence in their ability to succeed as entrepreneurs. This determinant is valid according to the social learning theory. Social learning theory Bandura (1977) conceptualises self-efficacy—or the conviction that one can, in fact, carry out the behaviour that elicits the outcome—as the most critical determinant of behavioural change. Entrepreneurial self-efficacy, defined as an individual's confidence in their ability to succeed in entrepreneurial roles and tasks, is seen as a crucial factor in influencing new venture intentions and is a strong predictor of entrepreneurial intentions and action (Barbosa et al., 2007; Isabelle, 2020; McGee et al., 2009; Snell et al., 2015; Zhao et al., 2005). Previous research suggests that appropriate training and education can enhance entrepreneurial self-efficacy, leading to increased entrepreneurial activities (Florin et al., 2007; Mueller & Goic, 2003).

Plausibility of Outcomes.

Assessing the plausibility of a programme theory also entails investigating the causal relationships between the programme and its intended outcomes (Rossi et al., 2004). During the focus group discussion, stakeholders identified the causal relationships between the AGEC programme's activities and outcomes, as illustrated in the revised programme theory (see Figure 6). In this section, the causal links are compared to findings from social science literature to determine whether the programme's activities can plausibly be expected to result in the desired outcomes.

Table 3 summarises the outcomes of the AGEC programme as identified by stakeholders. These outcomes were compared to findings from similar projects in the social science literature.

Table 3:*Outcomes of selected entrepreneurial education games reported in the social science literature in comparison to the AGEC game.*

Outcomes	Gamified entrepreneurship education programmes								
	Grivokostopoulou et al. (2019)	Kriz and Auchter (2016)	Isabelle (2020); Slavtchev et al. (2012)	Zulfiqar et al. (2021)	Williams (2015)	Almeida (2017b)	Brawer (1997)	Xin and Ma (2023)	AGEC Programme
Increased entrepreneurship knowledge	√	√							√
Improved problem-solving						√			√
Increased curiosity and creativity					√				√
Perceived entrepreneurship as viable career path			√						√
Developed entrepreneurial interest/ intentions to open their own business	√							√	√
Developed growth mindset									√
Greater self-efficacy	√		√	√				√	√
Increased critical thinking									√
Increased ability to spot opportunities					√				√
Developed new venture ideas					√		√		√
Pursue entrepreneurial activities		√					√		√

The studies in Table 3 examined various entrepreneurship education games, including simulation games, serious games, and gamified educational frameworks. These games often simulated real-world business scenarios, allowing students to apply theoretical knowledge in a practical, risk-free environment, thereby fostering entrepreneurial skills and intentions. Evaluations included longitudinal studies, experimental studies, and case studies, primarily involving university students aged 18-30 from Germany, Greece, Canada, Saudi Arabia, Malaysia, Pakistan, the UK, Portugal, the US, and China. Most studies were short-term (one year or less), with only one assessing the long-term impact over ten years. Although no studies were conducted in Africa, the findings provide a good basis for assessing the expected outcomes of the AGEC game. While most studies reported improvements in entrepreneurial skills, knowledge retention, engagement, motivation, and entrepreneurial intentions, the generalizability and long-term impact of these findings warrant further investigation. These findings are explored further below.

Research has shown that gamification is a fun and effective way to teach and learn about entrepreneurship (Williams, 2015). Several studies found a positive relationship between game-based entrepreneurship education and entrepreneurial skills and knowledge (Almeida, 2017a, 2017b; Kriz & Auchter, 2016; Wawer et al., 2010; Williams, 2015) and self-efficacy (Isabelle, 2020; Mayer et al., 2014; Xin & Ma, 2023). The entrepreneurship skills reported in these studies include, problem solving, decision-making, curiosity, creative thinking, opportunity recognition, idea generation, and persuasion (Almeida, 2017b; Armer, 2011; Williams, 2015).

Moreover, self-efficacy, as previously defined as "a person's belief in their ability to successfully launch and entrepreneurial venture" (McGee et al., 2009, p. 965), is considered an important antecedent to new venture intentions (Isabelle, 2020). The findings on entrepreneurial intention are mixed. On one hand, Bellotti et al. (2013); Wangi et al. (2018) found that gamification improves students' interest in and motivation to learn entrepreneurship. Additionally, Fellnhofer (2015) found that entrepreneurial behavior and intention were significantly different between players and non-players of a serious game. On the other hand, gamification was found to have a significant negative effect on students' entrepreneurial intention

(Newbery et al., 2016; Williams, 2015); this effect was more significant for women (Newbery et al., 2016). As such, a conclusive statement could not be made on this outcome, although these findings are consistent with other studies about the impact of entrepreneurship education on the intentions of students to become entrepreneurs or self-employed. For example, Slavtchev et al. (2012) found that entrepreneurship education has a long-term stimulating effect on students' intentions to become entrepreneurs or self-employed but a short-term discouraging effect on their intentions. Although the cultivation of an 'entrepreneurial spirit' can commence during training, it is imperative to underscore that practical work experience and time dedicated to employment beyond the academic realm are pivotal factors contributing to the success of startups. Individuals obtain professional and industry-specific expertise and managerial competencies during this time, as well as develop business networks, find potential customers, accumulate financial capital, etc. (Slavtchev et al., 2012).Therefore, by increasing students' awareness of the importance of these factors and encouraging them to gain practical experience in paid jobs before launching their own businesses, entrepreneurship education can boost their potential for entrepreneurship.

The intention of a person to start their own business is closely related to the creation of new ventures (Isabelle, 2020; Kriz & Auchter, 2016; Slavtchev et al., 2012). Launching and running a real online business with the help of a web-based gamification platform, according to Isabelle (2020); Slavtchev et al. (2012), helps students determine early on in their programme whether entrepreneurship might be a viable career choice for them. Furthermore, Kriz and Auchter (2016) investigated the long-term effects of a gaming simulation for entrepreneurship in Germany and discovered that the simulation game-based programme resulted in participants starting startups at roughly twice the normal rate in Germany (around 16%).

These findings suggest that the AGEC programme theory is plausible. Gamification has been shown to be a highly engaging and effective approach for teaching entrepreneurship, fostering the development of entrepreneurial skills, knowledge, and self-efficacy. While its impact on students' entrepreneurial intentions varies, with some studies reporting increased motivation and interest and others suggesting a negative effect, these findings are consistent with broader research on entrepreneurship

education. Practical industry experience is crucial for startup success, as it equips individuals with expertise, competencies, and networks. Hence, promoting practical experience before starting a business can enhance students' entrepreneurial potential. Additionally, web-based gamification platforms have the potential to help students explore entrepreneurship as a career option, as evidenced by a study in Germany showing an increased rate of startup creation among participants.

Plausibility of the Causal Assumptions.

Furthermore, the causal assumptions were assessed for plausibility. The first assumption is that the AGEC game can foster aspiration by generating enthusiasm and involvement among players, inspiring them to see entrepreneurship as a viable career path and to engage in entrepreneurial activities in the future. As previously discussed, research suggests that game-based entrepreneurship programmes positively support student motivation, entrepreneurial knowledge and skills development, self-confidence to start a business, and the development of meaningful attitudes and intentions towards entrepreneurship (Wawer et al., 2010; Williams, 2015).

The second assumption is that playing this game leads to learning, indicating that its design, mechanics, and content offer a well-organized educational experience that enables players to grasp diverse aspects of entrepreneurship. According to gamification literature, well-designed game-based entrepreneurship programmes have significant potential as a method of teaching entrepreneurial concepts and skills (Zulfiqar et al., 2021). Business simulation games, such as AGEC, according to Zulfiqar et al. (2021), combine advances in information technology with the evolving nature of young students; they create a safe learning environment and, through experimentation and experiential learning, allow students to cope better with the complexity of the real business world.

Finally, the third and final assumption was that the game's design and content are engaging, which will entice students who have played the AGEC game to return and play it again the following year. According to research, incorporating business simulation games into traditional teaching methods can result in more productive, useful, and joyful student learning outcomes (Zulfiqar et al., 2019). This allows students

to create and run various businesses, face setbacks and challenges, overcome obstacles, and get rewards in a more vibrant but risk-free environment (Zulfiqar et al., 2019). These elements increase participants' motivation and willingness to participate in the programme.

Theory Evaluation Question 3: What Aspects of the AGEC Programme Can be Modified to Maximise the Intended Outcomes?

The results of the plausibility assessment suggest that the AGEC programme theory is plausible. The activities, content, outcomes, assessment methods, and assumptions of the AGEC Programme align closely with those of similar gamified entrepreneurship education programmes. The entrepreneurship topics which are covered in the game were common to those found in successful gamified entrepreneurship programmes such as the (Almeida, 2017b; Antonaci et al., 2015; Bellotti et al., 2014; Costin et al., 2018; Grivokostopoulou et al., 2019; Isabelle, 2020; Kriz & Auchter, 2016; Williams, 2015; Zulfiqar et al., 2021). These programmes covered a wide range of topics, including ideation, customer needs, competitive analysis, validations, business model canvas/business plan development, SWOT analyses, costing, marketing, branding, and social media management. In terms of programme activities, the AGEC programme includes the majority of the activities offered by similar programmes presented in the plausibility assessment. In addition to the 2D/3D simulation games, AGEC, similar to other programmes, offers debriefing sessions and post-game applied learning challenges to assist students reflect on and apply the concepts they have learned. This suggests that the programme has a potential to provide students with the foundation they need to start their own businesses.

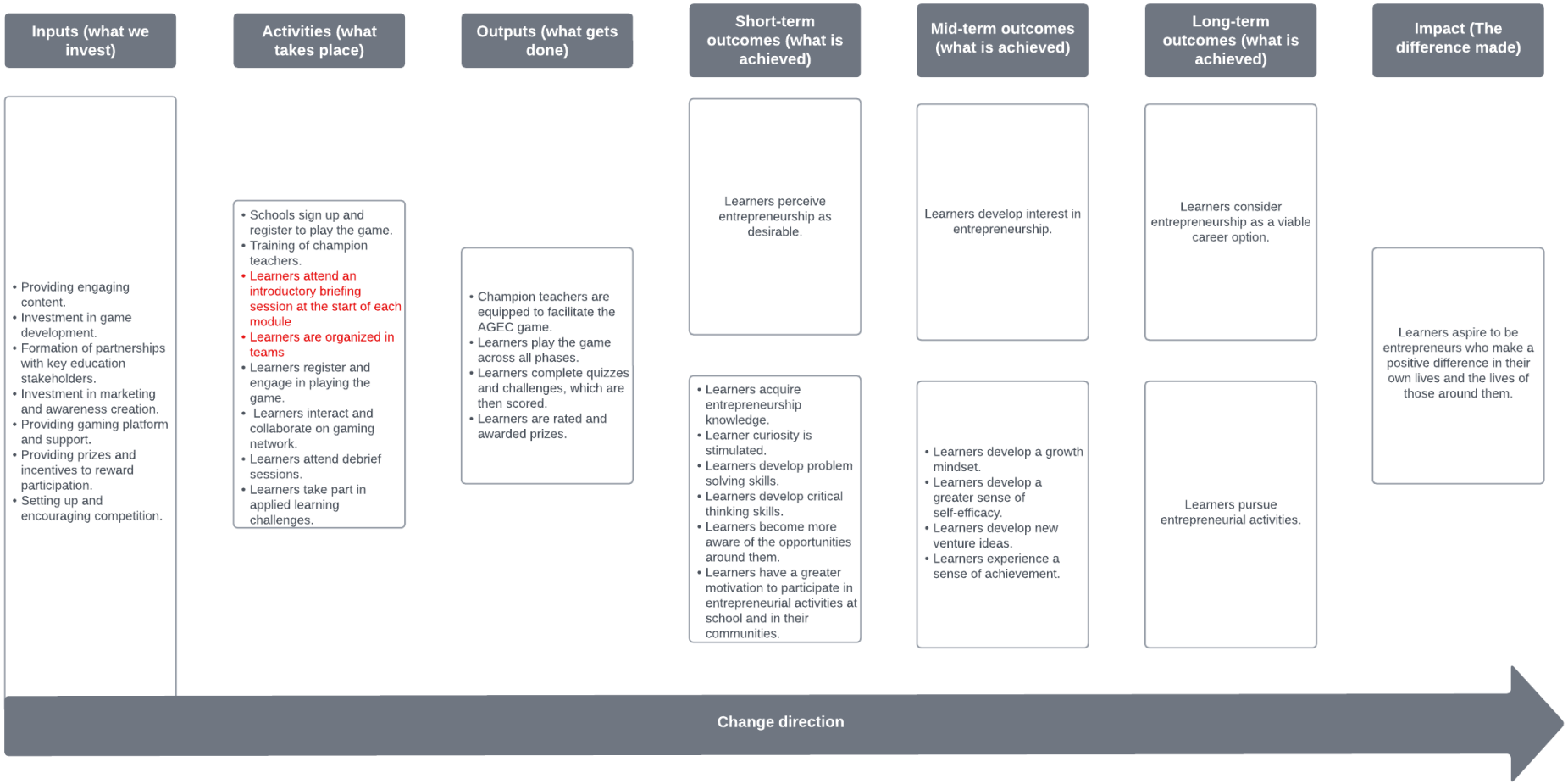
Moreover, the findings suggest that the outcomes of the AGEC Programme are plausible. The plausibility check revealed that the anticipated AGEC outcomes are closely aligned with those reported for other entrepreneurship gamification programmes. The literature review further supports the assumption that the expected AGEC outcomes were achievable through the implementation of the gamification programme, as it is grounded in a valid determinant (self-efficacy). This is consistent with social learning theory, where Bandura (1977) identifies self-efficacy—the belief in one's ability to perform a behavior that leads to a specific outcome—as the most crucial factor in behavioral change. This

implies that the AGEC programme has a strong foundation for success, as it was based on a plausible determinant (Chen, 2014).

To further strengthen the programme and increase its likelihood of achieving the desired outcomes, the evaluator recommends adopting best practices identified in other successful gamification programmes from the literature review. For instance, in addition to the end-of-module debriefing sessions where students discuss their decisions and their impact on business performance, a briefing session could be introduced at the beginning of each module. This session would briefly explain key theoretical concepts and provide students with different decision options related to a particular business scenario within the game (Williams, 2015). Additionally, organizing students into teams to keep each other accountable and providing additional reading resources on entrepreneurship topics covered in the game would be beneficial.

The revised AGEC programme theory, incorporating these findings, is presented below.

Figure 8: *Revised AGEC programme theory using insights from plausibility assessment.*



Process Evaluation

The process evaluation results identify strengths and weaknesses in the AGEC programme's implementation (evaluation question 1). Feedback from participating teachers and students provided insights into their experiences and perceptions. The evaluator also documented obstacles to successful implementation (evaluation question 2) and recorded participants' suggestions for improving the programme (evaluation question 3). The findings are discussed below.

Process Evaluation Question 1: To what extent are the proposed changes to the AGEC game being implemented as planned?

Finding 1.1: *The AGEC programme's implementation was hindered by persistent technical challenges, particularly with device compatibility and slow technical support, leading to user frustration and high dropout rates.*

The AGEC programme faced significant technical challenges during its implementation. Students experienced persistent issues with device compatibility, especially on mobile phones and tablets, prompting some teachers to advise switching to computers. Participants reported difficulties with registration, logging in, frequent crashes, freezing screens, and other glitches. These problems were exacerbated by the teachers' lack of technical expertise to address the issues. The quotations below illustrate these results:

> *"Yes, I know one of my colleagues was having problems on her phone. She was trying to play the game on the phone, but she was having problems, so we ended up switching to a desktop." (Teacher 2)*

> *"The only problem I had was that the servers just don't work. So, I would have to log in, log out, and reload my page a lot. I found it very hard to stay focused and on track on the game when it would log me out so much, yeah, it was a little difficult to stay on it." (Student 6)*

> *"When we sent an e-mail to the e-mail address which was provided, it took so long, you know, before they could actually get the response to the request that we made or the queries that were made. So, most of our students lost interest, some of them, you know, started*

playing along the way there were problems with the programme, with the systems, and obviously they waited. They tried to contact, then they also dropped out. It was only later that they provided us with a WhatsApp, you know, contact details. I think that's when things improved." (Teacher 2)

The AGEC team's initial slow response to technical assistance requests further frustrated students, causing some to lose interest and drop out. Although introducing a WhatsApp contact number for inquiries eventually improved response times, it came too late for many disengaged students. The findings highlight that the proposed changes did not improve the gaming experience for students as planned, significantly impacting user engagement, and resulting in high dropout rates. Therefore, it is vital to enhance future implementations by providing real-time technical support, improving device compatibility through thorough testing, and maintaining proactive communication with participants to address emerging issues and keep them engaged quickly.

Finding 1.2: *Reducing gameplay time to lower bandwidth usage was well-received for its affordability, while opinions on gameplay duration varied. This highlights the need for a balanced approach to maintaining engagement and accommodating different schedules*.

Reducing gameplay time to lower bandwidth usage was well-received, as it made the game more affordable and accessible by decreasing data consumption. As one teacher explained:

"Previously, it used to use so much data to play the game or be in the challenge. So, I think now, I don't know how you guys did that, but I know that it's not so expensive to play the game." (Teacher 7)

Opinions on the ideal gameplay duration, however, varied. Some participants preferred longer, flexible periods to accommodate busy schedules, while others favoured frequent, shorter challenges to maintain engagement:

"I think the larger allocation is better for me because I'm a matric student, so I wouldn't be able to do the weekly challenges every single week because I just wouldn't have the time." (Student 1)

Teachers observed that extended intervals between challenges often led to student disengagement:

> *"They should have had this every alternative week challenges because that would keep them on their toes… Sometimes you get 3 months, and then because you don't monitor it, you know by the time you come to the three months, students are not interested." (Teacher 1)*

The feedback underscored the need for a balanced approach to gameplay duration, considering factors such as flexibility and the preferences of both players and educators.

Finding 1.3: *The integration of built-in assessments made the game more interactive and less burdensome, but awarding prizes only at the end of long periods discouraged students, highlighting a preference for more frequent challenges.*

Integrating built-in assessments was positively received, making the game more interactive and less burdensome than weekly assignments. Students appreciated the opportunity to improve their points through unlimited attempts. For example, Student 3 explained:

> *"I liked this new version of the game. It felt more interactive because you would just complete a certain stage and then do the quiz. Even the way the quizzes were set out, it's like when you were done answering, you could see what was wrong and then see the correct answer to that." (student 3)*

However, some teachers noted that awarding certificates or prizes only at the end of the gameplay period discouraged student participation, suggesting a preference for more frequent, monthly or weekly challenges:

> *"They increased the amount of period to play the game. Don't drag it out for three months and then only provide certificate/award prizes at the end. They should be monthly challenges, not a span of four, three months. It discourages students" (Teacher 1).*

Finding 1.4: *Teachers felt a significant need for more training and support to effectively assist students with the AGEC game, as the lack of resources and guidance left them feeling isolated and discouraged.*

There was a clear need for teacher training and support, as participants felt that better preparation would enable them to assist students more effectively. Although some teachers acknowledged that an orientation was provided, those who missed the initial meeting found it difficult to obtain the necessary materials. Once the game began, they felt isolated and had minimal help from the AGEC team. Teachers expressed dissatisfaction with the insufficient training and assistance in implementing the AGEC game, struggling to access resources, guidance, and timely responses to their inquiries. This lack of support left them feeling lost and unsure of what to do, ultimately discouraging their participation in the programme. The quotations below echo these sentiments:

> *"I felt no, actually, because it was literally thrown at my face at the last minute, as I had not been involved in it previously. The teacher who had been involved was no longer at the school. So, it came that morning and was starting that afternoon or evening. I feel like if we had had some time for training and getting informed, we wouldn't always have to ask someone else when people ask us questions, and that someone else would ask another person about the same thing." (Teacher 3)*

> *"For me, the challenge that I had, or maybe I didn't understand the programme very well as a teacher. I thought I was supposed to also have access to check what is it that the students are doing. But now my understanding was that I wanted to get access. I was told that no, you know, as an educator or something, this is for students only. So how do I see or how do I even answer? What is it that the students are up to now? I don't understand because I didn't have access to go through. Maybe I just didn't understand how because I thought for me to monitor clearly, I also needed to understand not just the students telling me, 'This is what they're doing.' So, for me, that part, it wasn't really clear how, as educators, you know, we could monitor in terms of what the content, even what the content of the programme was." (Teacher 3)*

> *"I even was trying to distance myself at some stage because now I really didn't understand what is it that they do. What is the content there? How do they move from here to there, and when they talk about inviting other people, how does it work so, ah, I said to myself,*

maybe I didn't fully understand the instructions. Maybe there's some way I'm supposed to log in as well and be able to play to see what is it that the students are also experiencing, but I don't think I was able to do that." (Teacher 2)

Finding 1.5: *The irregular implementation of debrief sessions hindered students' understanding and participation in the AGEC game, with teachers often resorting to sharing resources via WhatsApp and Google Classroom due to time constraints and insufficient resources.*

Out of fourteen interviewees, only one student reported having regular debriefing sessions. The others indicated that sessions were not held regularly; instead, teachers shared relevant resources via WhatsApp and Google Classroom. Teachers sometimes met with students irregularly, usually for Q&A sessions. Teachers struggled to find time for debriefing sessions and often lacked the resources to plan them effectively. As one teacher explained:

"The problem is that most of the time, it is difficult to find time to meet and conduct a meeting with the students. So, I was just communicating with them through WhatsApp." (Teacher 4)

COVID-19 disruptions further complicated the balance between academic responsibilities and the AGEC game, resulting in student issues not being addressed promptly. Additionally, peer-to-peer interactions were limited. The lack of regular debrief sessions hindered students' understanding of entrepreneurship concepts taught in the game and any challenges they faced. Thus, there is a weaker support system for meaningful student participation. Despite these challenges, one teacher successfully integrated the game into their business studies course, demonstrating the potential benefits of implementing debrief sessions regularly:

"Well, he would keep track of our whole class, and every lesson he would let us know what's happening, or he would want an update on it." (Student 3).

Finding 1.6: *The AGEC game had mixed effects on student motivation and engagement, with the original leaderboard and weekly prizes being more effective in maintaining interest than the current extended format.*

The AGEC game had mixed effects on student motivation, engagement, and interest in entrepreneurship. Over half of the interviewed students found the game motivating and beneficial, particularly due to the leaderboard, which was a key motivating factor. However, the original leaderboard was viewed as more inspiring than the current version, as students knew their standings in the competition and top performers were rewarded regularly. Additionally, some students enjoyed the challenging nature of the game, which kept them engaged and broadened their horizons. The game also sparked some students' interest in entrepreneurship. Despite these positives, some students struggled with technical challenges in the game and found the extended gameplay duration, where prizes were awarded only at the end of the competition, demotivating. Teachers and students preferred the previous format with weekly challenges and prizes, providing more consistent motivation and engagement. The quotations below support this finding:

> *"I found some of the games very challenging, and personally, I love things that are challenging. They excite me. So, whenever I come across challenging games, it brings excitement." (Student 6)*
>
> *"I think after playing the game, I took a little bit more interest in entrepreneurship because initially I didn't have a lot of background knowledge on it." (Student 7)*
>
> *"Unlike the leaderboard from last time, compared to this leaderboard, it wasn't that long. You know, the previous one would give them motivation like after a week they get prizes, sometimes they get prizes. But in this one, it was different. I didn't get that, and most students didn't get it. My students, I remember, they were like getting a lot of motivation from that one. This one got this, this one got this, this week, next week, you know. I remember the only student, if you remember what I said, who got a very big prize was in the top three. He actually won an Xbox. I don't know what the problem was that this one, we didn't get that. The leaderboard this time is not that exciting." (Teacher 4)*

Finding 1.7: *The AGEC game is valued for fostering entrepreneurial skills and enhancing academic performance, with some seeing it as essential for preparing students for the fourth industrial revolution.*

The AGEC game was regarded as a valuable tool for imparting entrepreneurial skills and knowledge, fostering entrepreneurial thinking, fundraising, marketing, problem-solving, perseverance, and innovation. Students reported that it also enhanced their academic performance by boosting creativity in assignments and essays, improving traits like creativity, language, structure, and originality in academic writing. Some interviewees view it as essential for preparing students for the fourth industrial revolution, with students reporting increased interest in entrepreneurship and readiness to apply their knowledge in real-world scenarios. For example:

> *"There are certain topics where, when we end the topic, we have to write an essay on that specific topic. Now when you're writing an essay in business studies, your marks would be based on creativity, language, layout, and originality. The Allan Gray game helped with the originality aspect of what I did and actually helped me get better marks." (Student 5)*
>
> *"Yeah, so it really helped me, taught me a lot of stuff about the different aspects and situations you have to go through to start a company, which I had no idea about. It really made my interest in entrepreneurship way more concrete." (Student 3)*
>
> *"From my experience with Allan Gray, it was worth it, and it was great. I learned so many things from the game about how business works. I'm ready to take it into the real world." (Student 2)*

Process Evaluation Question 2: What are the potential barriers to successful implementation?

Finding 2.1: *Limited access to essential equipment in rural and underprivileged areas hinders student participation in the AGEC game, emphasizing the need for better resource support to ensure equitable engagement.*

Students from underprivileged backgrounds, especially in rural areas, struggle to participate in the AGEC game due to limited access to essential equipment like computers, iPads, or laptops and internet connectivity. Interviewees emphasized the importance of resource access for successful implementation. Interviewees reported that schools equipped with computer labs and other technological resources enable

students to participate more easily in the game, promoting a fair learning environment that allows all students, regardless of their personal access to technology, to engage in the game and its associated learning opportunities. Conversely, resource constraints in rural schools hinder student involvement, often forcing teachers to rely on their limited personal devices, which were quickly overwhelmed by the growing number of participating students. This resulted in frustration and discouragement among many teachers, as the quotations below illustrate. This highlights the need for additional support to ensure equitable participation in the AGEC game across the country.

> *"No, we're struggling on that because we are disadvantaged. It is a rural school where we don't have many computers. So, we end up using only teachers' computers, which are limited. It can lead to overtime. And again, like I said, I have limited laptops, approximately 8 for 80 students, which is discouraging me." (Teacher 6)*
>
> *"It becomes difficult because we don't have resources. So, if you can maybe assist us with the resources, then yes, it will be more flexible for the students to participate. We need equipment, which can be computers or iPads, and even Wi-Fi. Anything that can contribute, any resource that can contribute to making this successful." (Teacher 6).*

Finding 2.2: *The COVID-19 pandemic hindered student participation in the AGEC game, especially in resource-limited schools, as students struggled to balance academic work and lacked access to necessary tools, exacerbating existing educational inequalities.*

The COVID-19 pandemic significantly affected student participation in the AGEC game. Interviewees noted that when the game was played in early 2023, schools were still working to catch up with the unfinished curriculum, making it challenging for students to balance academic work with the demands of the game. As a result, some students prioritized their academic tasks over the game. This issue was particularly pronounced in schools with limited resources, where students lacked access to computers, tablets, phones, and internet connectivity to continue learning from home during school closures. The pandemic exacerbated existing inequalities, with many disadvantaged schools unable to facilitate effective online learning:

"No, I think it was more about the workload, trying to balance school academics and trying to do the challenge at the same time. The girls were finding it quite a challenge because we've had COVID in the last few years, and the curriculum had been cut off in certain sections of the different subjects. Now, everything is back to normal, and at this point, feeling overwhelmed in different grades, of course, as far as trying to do the work. If you understand, the girls in this school are very competitive when it comes to academics." (Teacher 1)

Process Evaluation Question 3: Which, if any, improvements to the delivery of the AGEC game are recommended by participants?

During the interviews, the evaluator asked participants to suggest improvements that could enhance the delivery and overall experience of the AGEC game. Below is a summary of the recommendations provided by participants:

- Incentivize teachers to offer support to students.
- Provide teacher training or workshops and ongoing support during the gameplay period.
- Create and distribute well-organized information packages for teachers.
- Supply computers, iPads, and Wi-Fi to rural schools.
- Conduct thorough testing to ensure the game is fully functional and reliable.
- Develop a stable offline version of the game to make it accessible to low-income schools.
- Offer smaller, weekly prizes to keep the game interesting and engaging.
- Add sound effects to enhance the gaming experience.
- Allow participants to name their own characters.
- Improve visual quality to address issues with blurriness and pixelation.
- Respond to queries within a set period (e.g., 24–48 hours).

Chapter 4: Discussion and Recommendations

The evaluation of the AGEC programme provides a comprehensive understanding of its theoretical foundations, implementation processes, and overall effectiveness in fostering entrepreneurship among young students. The discussion section synthesizes findings from both the theory and process evaluations, highlighting key insights for improving future implementation.

Theory Evaluation

The theory evaluation findings suggest that the AGEC programme theory is plausible. The programme's activities align with other successful gamified entrepreneurship education programmes. It uses 2D/3D simulation games, provides training for teachers, and includes debrief sessions, which are common in effective entrepreneurship education games. Additionally, the inclusion of post-game applied learning challenges is innovative, providing practical entrepreneurial skills. This approach fosters problem-solving, creativity, and critical thinking, bridging the gap between theoretical knowledge and real-world business scenarios.

Furthermore, the evaluation findings suggest that the AGEC programme can achieve its intended outcomes. Findings from similar gamification programmes show that gamification can be used to effectively teach entrepreneurship, fostering skills, knowledge, and self-efficacy. The programme's focus on self-efficacy is well-founded, as confidence is crucial for entrepreneurial intentions. While the impact on entrepreneurial intentions is mixed, the overall evidence supports the programme's potential to inspire students to consider entrepreneurship as a career.

In addition, the programme addresses a noble cause by democratizing access to entrepreneurship education, particularly for students from lower quintile schools, addressing a significant educational gap in the South African context. The programme equips students with essential skills and offers pathways to further opportunities, such as university bursaries and additional development programmes, for students who otherwise would not have access to such opportunities, leveling the playing field for all students regardless of their socio-economic background.

The programme is also founded on valid assumptions. The game's design generates enthusiasm and involvement, fostering a positive attitude towards entrepreneurship. Its well-organized educational experience helps students grasp diverse aspects of entrepreneurship, enhancing their learning and motivation.

However, the programme could be further improved by adopting best practices from other successful gamification programmes. For example, including briefing sessions for students at the beginning of the challenge, organizing students in teams to keep each other accountable, and providing additional reading resources for students to learn the entrepreneurship topics covered in the game, where possible.

Process Evaluation

The process evaluation findings revealed several strengths and weaknesses in the AGEC programme implementation, offering valuable insights into the experiences and perceptions of participating teachers and students. This section will explore the implications of these key findings, providing a basis for recommendations to improve the programme's delivery.

Technical Challenges: The findings suggest that the changes made to strengthen the backend system to make the AGEC game more robust and improve the user experience did not have the desired effect. Students continued to face technical issues, including screen freezing, login difficulties, and game malfunctions (glitches). Additionally, teachers lacked the technical expertise needed to resolve such issues. This contradicts the programme's original intention of ensuring the game is fully functional before its launch. Persistent technical challenges can negatively impact student motivation and interest in participating in the AGEC, as evidenced by the high dropout rate. Although the introduction of a WhatsApp contact improved response times, it came too late for many disengaged students. These findings highlight the need for real-time technical support, improved device compatibility, and proactive communication to maintain interest in the game among teachers and students. Therefore, the evaluator recommends testing the game on both the web and in the AGEC app with a small group of users. This step ensures that the game elements are effectively implemented to enhance player experiences. According to Wawer et al. (2010), a well-designed game should evoke strong engagement, making participants feel as if they are in the real

world. The game should provide an authentic and profound experience, enabling players to acquire new behaviours, skills, and competencies applicable to specific real-world situations without interruptions (Wawer et al., 2010). Additionally, AGEC should consider incorporating a live chat feature to offer real-time assistance. Furthermore, AGEC should develop a comprehensive Frequently Asked Questions (FAQ) page that addresses common issues, ensuring that students and teachers can easily find answers to their questions through the website.

Gameplay Duration: Reducing gameplay time to lower bandwidth usage was well-received, making the game more affordable and accessible. However, opinions on the ideal gameplay duration varied. Some participants preferred longer, flexible periods, while others favored frequent, shorter challenges to maintain engagement. The feedback highlights the need for a balanced approach to gameplay duration that accommodates different schedules and maintains student interest.

Built-in Assessments: The integration of built-in assessments made the game more interactive and less burdensome compared to weekly assignments. However, awarding prizes only at the end of the gameplay period (usually 2-3 months long) discouraged students, who preferred more frequent rewards. This suggests that implementing more frequent, smaller challenges and prizes could enhance student motivation and participation.

Teacher Training and Support: Although the findings suggest that an orientation session was conducted for teachers, there was a clear need for more training and support for teachers to effectively assist students with the AGEC game. Teachers felt isolated and discouraged due to insufficient resources and guidance. This lack of support limited their ability to provide meaningful assistance to students. Therefore, the evaluator recommends extensive training and certification for teachers beyond the one-time orientation. Training for facilitators, including teachers or tutors, is a pivotal component for the success of any gamification programme. It empowers facilitators to provide effective support to students. Additionally, as highlighted by Williams (2015), offering training and potentially professional accreditation for teachers in the use of gamification helps them to appreciate and seamlessly integrate the programme into the classroom environment. In the case of AGEC, the training could focus on clarifying expectations, introducing the key

concepts covered in the game, and providing general guidance on where to find resources to respond to student inquiries. Providing comprehensive training, ongoing support, and well-organized information packages for teachers could significantly improve the implementation of the programme.

Debrief Sessions: The findings of the process evaluation suggest that the shift from having weekly assignments assessed by champion teachers to built-in assessments led to a decrease in debrief sessions organized by teachers. Only one student out of fourteen teachers and students interviewed reported regular debrief sessions. Teachers often resorted to sharing resources through platforms such as WhatsApp and Google Classroom. The lack of debriefing sessions is cause for concern as students' questions were not promptly answered. Additionally, peer-to-peer interactions were limited. This resulted in a weaker support system for students to participate meaningfully in the game. Regular debriefing sessions are essential for reinforcing entrepreneurship concepts and addressing student challenges, thereby enhancing the overall learning experience. Therefore, the evaluator recommends that AGEC should follow up with teachers after the game launches to ensure that schools and teachers are adhering to and carrying out regular debrief sessions as planned. According to Cavanaugh et al. (2016), debrief sessions aid students in deep thinking. Furthermore, as described in the introduction, the debriefing sessions with their champion teacher provide an additional opportunity for student feedback which reinforces learning. During debriefing sessions, students delve into the differences and similarities between the game and reality, identifying key lessons learned from the simulation game. This process supports information retention, enabling participants to master the entrepreneurship concepts covered in the game (Kriz & Auchter, 2016).

Student Motivation and Engagement: The AGEC game had mixed effects on student motivation and engagement. Some students found it motivating and beneficial, while others were demotivated by technical issues and the extended three-month gameplay duration. The removal of weekly prizes and the longer duration were not well-received by teachers or students. Although the extended duration provided flexibility, it made it harder for students to maintain focus.

Literature indicates successful gamification programmes last from 8 weeks to 3 years (Isabelle, 2020; Kriz & Auchter, 2016; Williams, 2015), so there's no immediate need to change the duration. Instead,

the evaluator suggests enhancing student engagement by increasing the frequency of debriefing sessions and encouraging peer-to-peer learning. Team-based approaches, as seen in other programmes, foster accountability (Antonaci et al., 2015; Costin et al., 2018; Isabelle, 2020; Kriz & Auchter, 2016).

The leaderboard was a significant motivator, and students preferred the original version with weekly prizes. This aligns with gamification frameworks that emphasize challenges, competitions, feedback, rewards, leaderboards, and collaboration to boost motivation(Werbach et al., 2012). A live leaderboard adds a competitive element and helps monitor performance (Isabelle, 2020). The evaluator recommends awarding prizes at the end of each module to provide feedback and encourage continued participation in the programme.

Fostering Entrepreneurial Skills: The AGEC game was seen as a valuable tool for fostering entrepreneurial skills and enhancing academic performance. Students reported increased interest in entrepreneurship and readiness to apply their knowledge in real-world scenarios. Interviewees noted that the game cultivated entrepreneurial thinking, fundraising, marketing, and problem-solving skills and encouraged perseverance and innovation. It also improved creativity, language, structure, and originality in academic writing, preparing students for the fourth industrial revolution.

Both teachers and students found the AGEC game useful for developing entrepreneurial skills and enhancing learning outcomes, as it improved the quality and creativity of school assignments. This aligns with Isabelle (2020), who found that gamification improved students' motivation, learning outcomes, and performance. If the challenges discouraging participation are addressed, the AGEC programme could be a valuable tool for nurturing entrepreneurship among high school students in South Africa.

Potential Barriers to Successful Implementation

Resource Constraints

Despite improvements in school infrastructure and resources over the past 25 years in South Africa, some students still attend schools with poor infrastructure, dilapidated buildings, unsanitary pit latrines, water supply issues, ill-equipped teachers, shortages of learning materials, large classes, and high dropout rates (International Labour Organization, 2020; Parker et al., 2020). Students in rural schools faced

challenges participating in the AGEC programme due to resource shortages, including computers, tablets, phones, wifi, and data. This often forced teachers to rely on their personal devices, which were limited and quickly overwhelmed by the growing number of students, causing frustration and discouragement.

Ensuring equitable access to resources such as computers, iPads, and internet connectivity is crucial for successful implementation. Additional support is needed to provide these resources and create a fair learning environment for all students. The evaluator recommends that AGOF consider providing resources, such as devices and internet connectivity, especially to schools in low-income communities, to enhance participation in the AGEC game. One teacher mentioned having a computer lab in their school, which made it easy for her students to participate in the programme.

Impact of COVID-19

The COVID-19 pandemic significantly affected student participation, especially in resource-limited schools. Due to disruptions, schools were catching up on unfinished curricula, causing students to prioritize academic tasks over the AGEC programme, leading to decreased participation. This aligns with research showing the pandemic strained South Africa's fragile education system, particularly impacting primary and secondary schools in low-income communities (Soudien et al., 2022).

The pandemic reversed progress in areas like household incomes, access to school materials, and nutrition, exacerbating inequalities. Many disadvantaged schools lacked the means for satisfactory online learning (Parker et al., 2020; Spaull & Van der Berg, 2020). In poorer households, children often lacked a quiet workspace, desk, computer, internet connectivity, or parental support for homeschooling (Spaull & Van der Berg, 2020). A survey found only 22% of households had computer access, and just 10% had internet access(Statistics South Africa, 2019). While 90% of households had mobile phones, only 60% had internet access via their phones (Spaull & Van der Berg, 2020). Another survey by the South African Democratic Teacher Union (SADTU, 2021) further revealed that two-thirds of students from poorer households had almost no communication from their teachers during school closures. During this time, an estimated 18% of all school-going children lacked an adult caregiver during the day, leading to significant

learning losses, particularly for children from poor backgrounds who had limited access to educational inputs (Soudien et al., 2022).

Although COVID-19 is no longer a major global health issue, its impact on future programme implementation remains to be seen. This highlights the need for targeted support for students from disadvantaged schools.

Recommendations

The evaluation aimed to provide insights for improving the AGEC programme. Below is the summary of recommendations based on the evaluation findings. Each recommendation is designed to be actionable and feasible within the programme's context:

- *Strengthen Technical Support and User Experience*: Before fully launching updates, conduct extensive pilot testing on both web and app platforms with a small group of users. This testing will ensure all elements work smoothly and provide user feedback to refine the experience. Furthermore, implement a live chat feature for real-time technical assistance. This feature will allow students and teachers to get immediate help with technical issues, reducing frustration and dropout rates. Additionally, create a comprehensive FAQ page on the AGEC website covering common technical and gameplay issues. Make it easily accessible to students and teachers to promote self-help options and minimize dependency on live support.
- *Optimize Gameplay Duration and Incentive Structure*: While the longer gameplay period offers flexibility for students to tailor the game to their schedules, AGEC should replace the single end-of-game reward with smaller, module-based challenges that offer prizes at the end of each module. This format would sustain motivation through frequent, achievable goals and accommodate varied schedules.
- *Enhance Teacher Training and Ongoing Support*: Develop an in-depth training programme for teachers that includes certification. Topics should include key entrepreneurship concepts, game navigation, troubleshooting, and strategies for student support. Offer training sessions multiple

times a year to accommodate new teachers and refresh knowledge for existing ones. Additionally, provide ongoing resources such as a teacher handbook and video tutorials accessible on the AGEC platform, and schedule periodic check-ins to address emerging issues and share best practices.

- *Revive and Mandate Debrief Sessions for Enhanced Learning*: Following each gameplay module, schedule debrief sessions where teachers lead discussions on the entrepreneurial concepts learned and their real-world applications. AGEC should work closely with schools to ensure these sessions are part of the regular programme. Furthermore, supply teachers with a structured guide to facilitate these sessions effectively. This guide should include key discussion points, prompts for deeper reflection, and questions to encourage peer-to-peer learning. Additionally, this session could also be used to introduce key theoretical concepts covered in the next module and provide students with various decision options related to the business scenarios in the game.
- *Increase Access to Devices and Internet Connectivity*: Partner with sponsors or government initiatives to supply low-income schools with essential devices such as tablets or computers specifically for AGEC participation. Additionally, explore partnerships with telecommunications companies to offer subsidized or free data packages for students participating in AGEC. This approach will reduce barriers to access, especially in rural or under-resourced communities.
- *Boost Student Motivation and Engagement Through Team Dynamics and Leaderboards*: Organize students into teams within each school to foster accountability, encourage peer support, and strengthen motivation. Team performance could be highlighted on a leaderboard to stimulate healthy competition and collaborative learning. Furthermore, reinstate weekly updates on a live leaderboard, incorporating performance metrics from individual and team achievements. Introduce small weekly prizes for top performers to maintain a consistent incentive structure.

Limitations

This study is subject to several limitations, which are elucidated in this section to highlight potential constraints on the evaluation. Firstly, the evaluation of the programme theory is constrained by the fact that

the literature utilized to assess the plausibility of the AGEC programme predominantly originates from developed countries. Furthermore, the pool of comparable programmes is limited, often tailored towards university-level students. Due to time constraints, the plausibility assessment did not encompass a comprehensive systematic review of all available literature. Only literature adhering to exclusion and prioritization criteria, as detailed in the methods section, was incorporated into the analysis. The absence of published research on the gamification of entrepreneurship education at the high school level in the South African context poses a notable limitation, as the characteristics, pedagogical approaches, activities, outcomes, and implementation of gamification programmes in international contexts may differ from those most effective in the South African context.

On the other hand, the process evaluation faces limitations arising from the restricted number of students who successfully completed the AGEC programme. At the time of the evaluation, out of the 9,517 students who had registered to participate in the game in 2023, only 70 had completed it, with fewer than 10 being above the age of 18. Consequently, the pool of students meeting the eligibility criteria for this evaluation was scant, resulting in a small sample size. Furthermore, because participants in the AGEC programme were spread across the country and the researcher did not have the funds to travel or transport them, interviews were conducted through telephone. Although telephone interviews have been shown to be effective in reaching participants who are difficult to reach in person or through other means, the refusal rate was very high. The researcher faced significant challenges in securing appointments. Additionally, participants who had scheduled appointments frequently cancelled or did not return phone calls. As such, only 7 students and 7 teachers were interviewed. Although these participants may offer valuable insights into the programme, their perspectives cannot be deemed representative of the entire AGEC student population. Therefore, caution is warranted when interpreting the findings of this evaluation.

References

Abrahams, A. S., & Singh, T. (2013). Expeditionary learning in information systems: Definition, implementation, and assessment. *Decision Sciences Journal of Innovative Education*, *11*(1), 47-75.

Ackah-Baidoo, P. (2016). Youth unemployment in resource-rich Sub-Saharan Africa: a critical review. *The extractive industries and society*, *3*(1), 249-261.

Acs, Z. (2008). How is entrepreneurship good for economic growth? In *Entrepreneurship, Growth and Public Policy* (pp. 291-301). Edward Elgar Publishing.

African Development Bank. (2016). Jobs for youth in Africa: Catalyzing youth opportunity across Africa.

Almeida, F. (2017a). Experience with Entrepreneurship Learning Using Serious Games. *Cypriot Journal of Educational Sciences*, *12*(2), 69-80.

Almeida, F. (2017b). Learning entrepreneurship with serious games-a classroom approach. *arXiv preprint arXiv:1710.04118*.

Antonaci, A., Dagnino, F. M., Ott, M., Bellotti, F., Berta, R., De Gloria, A., Lavagnino, E., Romero, M., Usart, M., & Mayer, I. (2015). A gamified collaborative course in entrepreneurship: Focus on objectives and tools. *Computers in Human Behavior*, *51*, 1276-1283.

Armer, G. R. (2011). Practice Makes Perfect: Using a Computer-Based Business Simulation in Entrepreneurship Education. *Journal of Adult Education*, *40*(1), 23-25.

Aspen Network of Development Entrepreneurs (ANDE) South Africa chapter. (2017). *South Africa's Entrepreneurial Ecosystem Map*.

Bagheri, A., Alinezhad, A., & Sajadi, S. M. (2020). Entrepreneurship education and gamification: An analysis of students' learning outcomes. In *The Entrepreneurial Behaviour: Unveiling the cognitive and emotional aspect of entrepreneurship*. Emerald Publishing Limited.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Barbosa, S. D., Gerhardt, M. W., & Kickul, J. R. (2007). The role of cognitive style and risk preference on entrepreneurial self-efficacy and entrepreneurial intentions. *Journal of Leadership & Organizational Studies*, *13*(4), 86-104.

Bbenkele, E., & Ndedi, A. (2010). Fostering entrepreneurship education in South Africa: the role of Sector Education Training Authorities (SETA). *African Entrepreneurship in Global Contexts. Retrieved from www/slideshare. net/alain. ndedi/entrepreneurship.*

Bellotti, F., Berta, R., De Gloria, A., Lavagnino, E., Antonaci, A., Dagnino, F., Ott, M., Romero, M., Usart, M., & Mayer, I. S. (2014). Serious games and the development of an entrepreneurial mindset in higher education engineering students. *Entertainment Computing*, *5*(4), 357-366.

Bellotti, F., Berta, R., De Gloria, A., Lavagnino, E., Antonaci, A., Dagnino, F. M., & Ott, M. (2013). A gamified short course for promoting entrepreneurship among ICT engineering students. *2013 IEEE 13th International Conference on Advanced Learning Technologies* (pp. 31-32). IEEE.

Ben-Zvi, T., & Carton, T. C. (2007). From rhetoric to reality: Business games as educational tools. *INFORMS Transactions on Education*, *8*(1), 10-18.

Botha, M. (2006). *Measuring the effectiveness of the women entrepreneurship programme, as a training intervention, on potential, start-up and established women entrepreneurs in South Africa* (Doctoral dissertation, University of Pretoria).

Bowmaker-Falconer, A., & Meyer, N. (2022). Fostering entrepreneurial ecosystem vitality: Global Entrepreneurship Monitor South Africa 2021/2022. *Stellenbosch University*.

Bragstad, L. K., Bronken, B. A., Sveen, U., Hjelle, E. G., Kitzmüller, G., Martinsen, R., Kvigne, K. J., Mangset, M., & Kirkevold, M. (2019). Implementation fidelity in a complex intervention promoting psychosocial well-being following stroke: an explanatory sequential mixed methods study. *BMC medical research methodology*, *19*(1), 1-18.

Brawer, F. B. (1997). Simulation as a Vehicle in Entrepreneurship Education. Digest Number 97-1.

Brousselle, A., & Champagne, F. (2011). Program theory evaluation: Logic analysis. *Evaluation and program planning*, *34*(1), 69-78.

Bruni-Bossio, V., & Willness, C. (2016). The "Kobayashi Maru" meeting: High-fidelity experiential learning. *Journal of Management Education*, *40*(5), 619-647.

Carroll, C., Patterson, M., Wood, S., Booth, A., Rick, J., & Balain, S. (2007). A conceptual framework for implementation fidelity. *Implementation science*, *2*(1), 1-9.

Cavanaugh, J. M., Giapponi, C. C., & Golden, T. D. (2016). Digital technology and student cognitive development: The neuroscience of the university classroom. *Journal of Management Education*, *40*(4), 374-397.

Chen, H.-T. (2005). *Practical program evaluation: Assessing and improving planning, implementation, and effectiveness*. Sage.

Chen, H. T. (2014). *Practical program evaluation: Theory-driven evaluation and the integrated evaluation perspective*. Sage Publications.

Chimucheka, T. (2014). Entrepreneurship education in South Africa. *Mediterranean Journal of Social Sciences*, *5*(2), 403.

Cleveland, J., & Cleveland, J. (2006). Youth entrepreneurship: Theory, practice and field development. *WK Kellogg Foundation Youth and Education Unit.*

Costin, Y., O'Brien, M. P., & Slattery, D. M. (2018). Using Simulation to Develop Entrepreneurial Skills and Mind-Set: An Exploratory Case Study. *International Journal of Teaching and Learning in Higher Education*, *30*(1), 136-145.

Dana, L.-P. (1993). An international survey of entrepreneurship education. *Journal of enterprising culture*, *1*(01), 67-92.

Deterding, S. (2012). Gamification: designing for motivation. *interactions*, *19*(4), 14-17.
Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining" gamification". Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments (pp. 9-15).

Dietrich, T., Rundle-Thiele, S., Kubacki, K., Durl, J., Gullo, M. J., Arli, D., & Connor, J. P. (2019). Virtual reality in social marketing: A process evaluation. *Marketing Intelligence & Planning*.

Donaldson, S. I. (2007). *Program theory-driven evaluation science: Strategies and applications*. Routledge.

DuHadway, S., & Dreyfus, D. (2017). A simulation for managing complexity in sales and operations planning decisions. *Decision Sciences Journal of Innovative Education*, *15*(4), 330-348.

Fellnhofer, K. (2015). Changing entrepreneurial intention and behaviour: a digital game-based learning environment dedicated to entrepreneurship education. *Journal for International Business and Entrepreneurship Development*, *8*(4), 378-404.

Florin, J., Karri, R., & Rossiter, N. (2007). Fostering entrepreneurial drive in business education: An attitudinal approach. *Journal of Management Education*, *31*(1), 17-42.

Francis, J. J., Johnston, M., Robertson, C., Glidewell, L., Entwistle, V., Eccles, M. P., & Grimshaw, J. M. (2010). What is an adequate sample size? Operationalising data saturation for theory-based interview studies. *Psychology and health*, *25*(10), 1229-1245.

Grivokostopoulou, F., Kovas, K., & Perikos, I. (2019). Examining the impact of a gamified entrepreneurship education framework in higher education. *Sustainability*, *11*(20), 5623.

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work?--a literature review of empirical studies on gamification. 2014 47th Hawaii international conference on system sciences (pp. 3025-3034).

Hanus, M. D., & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & education*, *80*, 152-161.

Hennink, M. M., Kaiser, B. N., & Marconi, V. C. (2017). Code saturation versus meaning saturation: how many interviews are enough? *Qualitative health research*, *27*(4), 591-608.

Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & education*, *90*, 36-53.

Herrington, M., Kew, J., Kew, P., & Monitor, G. E. (2010). *Tracking entrepreneurship in South Africa: A GEM perspective*. Graduate School of Business, University of Cape Town South Africa.

Herrington, M., Kew, P., & Alesimo Mwanga. (2017). *Global Entrepreneurship Monitor South Africa Report 2016/2017: Can small businesses survive in South Africa*.

Amnesty International. (2020). Broken and unequal: The state of education in South Africa.

International Labour Organization. (2020). *Global Employment Trends for Youth 2020*. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_737648.pdf

Isabelle, D. A. (2020). Gamification of entrepreneurship education. *Decision Sciences Journal of Innovative Education*, *18*(2), 203-223.

Jesselyn Co, M., & Mitchell, B. (2006). Entrepreneurship education in South Africa: a nationwide survey. *Education+ training*, *48*(5), 348-359.

Jiménez, A., Palmero-Cámara, C., González-Santos, M. J., González-Bernal, J., & Jiménez-Eguizábal, J. A. (2015). The impact of educational levels on formal and informal entrepreneurship. *BRQ Business Research Quarterly*, *18*(3), 204-212.

Kim, S., Song, K., Lockee, B., Burton, J., Kim, S., Song, K., Lockee, B., & Burton, J. (2018). *What is gamification in learning and education?* Springer.

Kingdon, G. G., & Knight, J. (2004). Unemployment in South Africa: The nature of the beast. *World development*, *32*(3), 391-408.

Kitov, I., & Kitov, O. (2011). Employment, unemployment and real economic growth. *arXiv preprint arXiv:1109.4399*.

Kolb, D. A. (1984). The process of experiential learning. *Experiential learning: Experience as the source of learning and development*, 20-38.

Kriz, W. C., & Auchter, E. (2016). 10 years of evaluation research into gaming simulation for German entrepreneurship and a new study on its long-term effects. *Simulation & Gaming*, *47*(2), 179-205.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.

Lovelace, K. J., Eggers, F., & Dyck, L. R. (2016). I do and I understand: Assessing the utility of web-based management simulations to develop critical thinking skills. *Academy of Management Learning & Education*, *15*(1), 100-121.

Markiewicz, A., & Patrick, I. (2015). *Developing monitoring and evaluation frameworks*. Sage Publications.

Maswanganyi, N. (2014). Job creation lags behind SA's economic growth rate.

Mayer, I., Kortmann, R., Wenzler, I., Wetters, Á., & Spaans, J. (2014). Game-based entrepreneurship education: Identifying enterprising personality, motivation and intentions amongst engineering students. *Journal of Entrepreneurship Education*, *17*(2), 217-244.

McGee, J. E., Peterson, M., Mueller, S. L., & Sequeira, J. M. (2009). Entrepreneurial self–efficacy: Refining the measure. *Entrepreneurship theory and practice*, *33*(4), 965-988.

Mendes, L. (2022, 30/08/2022). *"Africa is the future": all eyes turn to the youngest continent as the next frontier for growth*. Trade Finance Global. Retrieved 05/10/2022 from https://www.tradefinanceglobal.com/posts/africa-is-the-future-all-eyes-turn-to-youngest-continent-as-next-frontier-for-

growth/#:~:text=As%20the%20world's%20youngest%20continent,what%20these%20demographics%20may%20mean.

Meyer, D. F. (2017). An analysis of the short and long-run effects of economic growth on employment in South Africa. *International Journal of Economics and Finance Studies*, *9*(1), 177-193.

MG, D. T. F.-H. (1996). Types and quality of knowledge. *Educational Psychologist*, *31*, 105-113.

Moore, G., Audrey, S., Barker, M., Bond, L., Bonell, C., Cooper, C., Hardeman, W., Moore, L., O'Cathain, A., & Tinati, T. (2014). Process evaluation in complex public health intervention studies: the need for guidance. In (Vol. 68, pp. 101-102): BMJ Publishing Group Ltd.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., Moore, L., O'Cathain, A., Tinati, T., & Wight, D. (2015). Process evaluation of complex interventions: Medical Research Council guidance. *Bmj*, *350*.

Msimango-Galawe, J., & Majaja, B. (2022). Mapping the needs and challenges of SMEs: A focus on the city of Johannesburg entrepreneurship ecosystem. *Cogent Business & Management*, *9*(1), 2094589.

Mueller, S. L., & Goic, S. (2003). East-West differences in entrepreneurial self-efficacy: Implications for entrepreneurship education in transition economies. *International Journal of Entrepreneurship Education*, *1*(4), 613-632.

National Planning Commission. (2012). *National Development Plan 2030: Our Future-make it work*.

Naudé, W. (2010). Entrepreneurship, developing countries, and development economics: new approaches and insights. *Small business economics*, *34*, 1-12.

Newbery, R., Lean, J., & Moizer, J. (2016). Evaluating the impact of serious games: the effect of gaming on entrepreneurial intent. *Information Technology & People*, *29*(4), 733-749.

O'Reilly, M., & Dogra, N. (2016). *Interviewing children and young people for research*. Sage.

O'Neill, R. (2004). Entrepreneurship as a subject at university. The South African experience. In.
Page, J. (2013). For Africa's youth, jobs are job one. *FORESIGHT AFRICA*, 1.

Parker, R., Morris, K., & Hofmeyr, J. (2020). Education, inequality and innovation in the time of COVID-19. *JET Education Services*.

Politis, D. (2005). The process of entrepreneurial learning: A conceptual framework. *Entrepreneurship theory and practice*, *29*(4), 399-424.

Ranchhod, A., Gurău, C., Loukis, E., & Trivedi, R. (2014). Evaluating the educational effectiveness of simulation games: A value generation model. *Information Sciences*, *264*, 75-90.

Rocca, C., & Schultes, I. (2020). Africa's Youth: Action Needed Now to Support the Continent's Greatest Asset. *Mo Ibrahim Foundation*.

Rogers, P. J. (2000). Program theory: Not whether programs work but how they work. In *Evaluation models* (pp. 210-211). Springer.

Rossi, P. H., Lipsey, M. W., & Freeman, H. E. (2003). *Evaluation: A systematic approach*. Sage publications.

Ryan, R. M., Rigby, C. S., & Przybylski, A. (2006). The motivational pull of video games: A self-determination theory approach. *Motivation and emotion*, *30*, 344-360.

SADTU. (2021). *Report for SADTU—The challenge of going back to school—Survey*.

Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review*, *32*(1), 77-112.

Sathorar, H. H. (2009). Assessing entrepreneurship education at secondary schools in the NMBM. *South Africa: Nelson Mandela Metropolitan University*.

Scheirer, M. A. (1994). Designing and using process evaluation. *Handbook of practical program evaluation*, *40*, 68.

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of human-computer studies*, *74*, 14-31.

Slavtchev, V., Laspita, S., & Patzelt, H. (2012). *Effects of entrepreneurship education at universities*.
Smith, G. F. (2005). Problem-based learning: can it improve managerial thinking? *Journal of Management Education*, *29*(2), 357-378.

Smith, J. R. (2018). *Finding a Space Between Poverty and High Growth: A Model for Youth Enterprise Development in South Africa* University of the Witwatersrand, Faculty of Commerce, Law and Management …].

Snell, L., Sok, P., & Danaher, T. S. (2015). Achieving growth-quality of work life ambidexterity in small firms. *Journal of Service Theory and Practice*, *25*(5), 529-550.

Soni, P. (2014). Entrepreneurship policy in South Africa. *Arabian Journal of Business and Management Review*, *3*(10), 29-43.

Soudien, C., Reddy, V., & Harvey, J. (2022). The impact of COVID-19 on a fragile education system: The case of South Africa. *Primary and secondary education during COVID-19: Disruptions to educational opportunity during a pandemic*, 303-325.

South African Reserve Bank. (2016). *Rates*. Retrieved 20/07/2022 from http://www.resbank.co.za/Research/Rates.aspx.

Spaull, N. (2020). COVID-19 and schooling in South Africa: Who should go back to school first? *Prospects*, 1-10.

Spaull, N., & Van der Berg, S. (2020). Counting the cost: COVID-19 school closures in South Africa and its impact on children. *South African Journal of Childhood Education*, *10*(1), 1-13.

Statistics South Africa. (2019). *General household survey*.

Statistics South Africa. (2021). Quarterly Labour Force Survey, Quarter 4: 2021

Steenekamp, A. G., Van der Merwe, S., & Athayde, R. (2011). An investigation into youth entrepreneurship in selected South African secondary schools: An exploratory study. *Southern African Business Review*, *15*(3), 46-75.

United Nations Statistics Division. (2019). *Sustainable Development Goals Overview: End poverty in all its forms everywhere*. https://unstats.un.org/sdgs/report/2019/goal-01/

Valerio, A., Parton, B., & Robb, A. (2014). Entrepreneurship education and training programs around the world: dimensions for success.

van Eck, L., Qabazi, N., Retief, J., Langa, K., Theunissen, S., Bhikoo, A., & Lovasic, L. (2021). The Entrepreneur at the Centre of Entrepreneurship Development Support: More Novel than Obvious? Lessons from South Africa. In *Generation Impact* (pp. 201-210). Emerald Publishing Limited.

Van Praag, C. M., & Versloot, P. H. (2007). What is the value of entrepreneurship? A review of recent research. *Small business economics*, *29*(4), 351-382.

Van Vuuren, J., & Nieman, G. (1997). Entrepreneurship education and training: a prospective content model. *Unpublished paper, University of Pretoria*.

Von Broembsen, M., Wood, E., & Herrington, M. (2005). Global entrepreneurship monitor: South African report 2005. *The UCT Centre for Innovation and Entrepreneurship*, 14-27.

Wangi, N. B. S., Halim, P., Badruddin, S., Maulamin, T., Setiawan, M., Wajdi, M., Mahatmaharti, A., Heriyawati, D., & Simarmata, J. (2018). Gamification framework and achievement motivation in digital era: Concept and effectiveness. *Int. J. Eng. Technol*, *7*(3.6), 429-431.

Wawer, M., Milosz, M., Muryjas, P., & Rzemieniak, M. (2010). Business simulation games in forming of students' entrepreneurship. *International Journal of Euro-Mediterranean Studies*, *3*(1), 49-71.

Werbach, K., Hunter, D., & Dixon, W. (2012). *For the win: How game thinking can revolutionize your business* (Vol. 1). Wharton digital press Philadelphia.

Williams, D. (2015). The impact of SimVenture on the development of entrepreneurial skills in management students. *Industry and Higher Education*, *29*(5), 379-395.

Wood, E., & Herrington, M. (2003). *Global entrepreneurship monitor* (South African report, Issue.: http/www.gbs.nct.ac.za

/gbswebb/userfiles/gemsouthafrica2000pdf

World Bank. (2009). *Africa development indicators 2008/2009: youth and employment in Africa: the potential, the problem, the promise*. World Bank, Washington, District of Columbia.

World Bank. (2022, 13/04/2022). *The World Bank in Africa: Overiew*. World Bank.

Xin, B., & Ma, X. (2023). Gamifying online entrepreneurship education and digital entrepreneurial intentions: An empirical study. *Entertainment Computing*, *46*, 100552.

Zhao, H., Seibert, S. E., & Hills, G. E. (2005). The mediating role of self-efficacy in the development of entrepreneurial intentions. *Journal of applied psychology*, *90*(6), 1265.

Zulfiqar, S., Al-reshidi, H. A., Al Moteri, M. A., Feroz, H. M. B., Yahya, N., & Al-Rahmi, W. M. (2021). Understanding and predicting students' entrepreneurial intention through business simulation games: A perspective of COVID-19. *Sustainability*, *13*(4), 1838.

Zulfiqar, S., Sarwar, B., Aziz, S., Ejaz Chandia, K., & Khan, M. K. (2019). An analysis of influence of business simulation games on business school students' attitude and intention toward entrepreneurial activities. *Journal of Educational Computing Research*, *57*(1), 106-130.

Appendices

Appendix A: Focus group guide.

Purpose: To gain insight into how the AGEC project was conceptualized (i.e., to understand the assumptions - values, beliefs, and experiences - that informed its design), its intended operation, and current implementation. This understanding will help us develop a sound theory of change for the project.

Definitions

Activities: Activities are actions or tasks that you do to achieve a specific goal. For example, if your goal is to build a birdhouse, your activities might include measuring and cutting the wood, assembling the pieces, and painting the birdhouse.

Outputs: Outputs are the things that you create or produce when you do an activity. For example, if your activity is to write a story, the output would be the finished story that you wrote.

Outcomes: Outcomes are the results or changes that happen because of the activity or output. For example, if you wrote a story to raise awareness about a social issue, the outcome might be that more people learn about the issue and take action to help solve it.

Impact: Impact is the overall effect or result of the activity or programme over time. For example, if you started a recycling programme in your community, the impact might be that less waste ends up in landfills and the environment is cleaner.

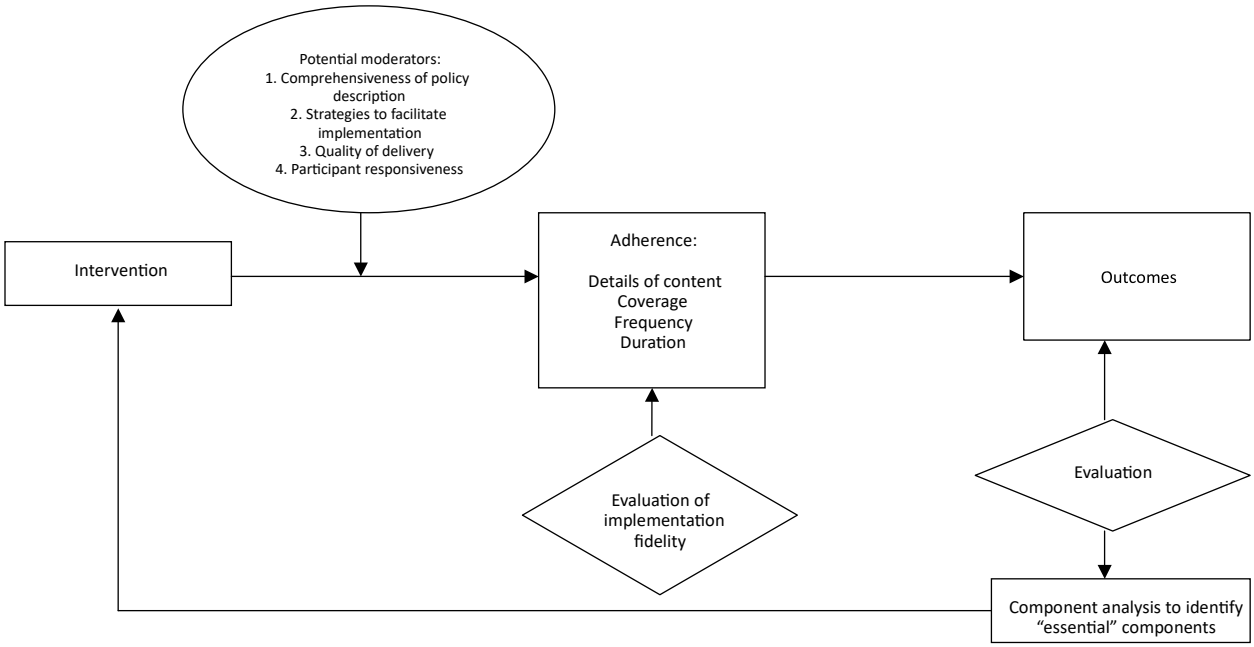
Assumptions: Assumptions are things that we believe to be true without necessarily having evidence to support them. For example, you might assume that everyone in your community recycles, but you don't know for sure unless you have evidence to back it up. It's important to identify and challenge assumptions to make sure they are valid and accurate.

Need: needs refer to the specific requirements or challenges faced by individuals or communities, such as access to education, healthcare, or basic services. Identifying needs is important to design effective interventions and allocate resources appropriately.

Questions

1. What is the overarching goal of the Allan Gray Entrepreneurship Challenge programme?
2. What challenges or issues do you see in your community that the programme is trying to solve?
3. Who is the intended audience for the game and what are their characteristics?
4. What are the key features of the programme and how do they relate to the intended outcomes?
5. How does the game engage and motivate students to develop entrepreneurial skills and knowledge?
6. What types of resources or support might be needed to ensure the successful implementation and adoption of the game?
7. How can the game be integrated into existing curricula or educational programmes to ensure that it is used effectively?
8. What are the expected intermediate and long-term outcomes of the game for the intended audience?
9. What are the fundamental assumptions driving the design and implementation of the Allan Gray Entrepreneurship Challenge Programme? In other words, what are the beliefs or assertions that the programme is built upon?
10. Are the activities and outcomes of the programme logically and sensibly linked?
11. Review the activities and outcomes listed in the previous theory of change and provide your assessment of their relevance. Specifically, which activities and outcomes are still applicable to the current programme context, and which ones should be removed or modified?

Appendix B: Carroll et al. (2007) Conceptual Framework for Implementation Fidelity



Appendix C: Interview Schedule

Introduction:

Hello, my name is Ismail Ombo, and I am a master's student at the University of Cape Town. My department is partnering with the Allan Gray Orbis Foundation to evaluate the Allan Gray Entrepreneurship Programme. I am reaching out to you as a key informant who has played/championed the game in your school in 2022/2023. The aim of our study is to understand how well the game was implemented across schools in South Africa, to address any challenges encountered by students while playing the game, and to improve the game's design and delivery. Participation in the study is voluntary, and you may withdraw at any time. The call will take approximately 45 minutes and will be recorded for transcription and documentation purposes only. The study is approved by the faculty of commerce ethics committee, and any information collected will be kept confidential. If you agree to be interviewed, you will receive 2GB data for your time. May I have your consent to proceed with the interview?

Student

Evaluation question 1: To what extent are the proposed changes to the AGEC game being implemented as planned?

Adherence:

- How did you hear about the Allan Gray Entrepreneurship Challenge?
- Which device did you use to play the game?
- Did you attend debrief sessions with the teacher dedicated to champion the game in your school?
    - If yes, how many times did you attend the debrief session?
    - How long did each session last? o Can you describe the quality of the content/material covered? o Were the lessons engaging and interactive? o How prepared did your teacher appear when facilitating the debrief session?
    - If ‘no,’ why not?

Delivery quality:

- How engaging and enjoyable was the game, and did it keep your attention throughout the entire duration of play?
- Was the facilitator (champion teacher) able to effectively guide and support you during the game?
- Were the instructions and guidance provided throughout the game easy to understand and follow?
- Were the visuals and graphics used in the game of high quality and effective in aiding your learning?
- Were there any specific aspects of the game that stood out to you? Why?
- Were there any technical issues or glitches that you encountered while playing the game? If so, how were they addressed?
    - Were there any technical issues that interfered with your ability to play the game or fully engage with the content?
- In 2022/2023 AGOF made several changes to the AGEC game including:
    - Reduced gameplay time o Replaced weekly assignments with built in assessment.
    - Students have unlimited chances to improve points and be eligible to earn prizes.
    - Improved backend system to better support the game.
    - Added confirmation of details on registration to avoid incorrect registrations. o Offer more activities and material through the Gaming Network to keep students engaged.
    - Longer challenge time (2/3months of gameplay) – students can play at will.
- In your opinion:
    - Did you feel that the changes made to the delivery of the game were responsive to feedback and suggestions from users? o Were the new features implemented satisfactorily?

- Were the new features useful in enhancing your understanding of entrepreneurship? o Did the changes to the delivery model improve the overall quality of the game? o Did the new delivery model increase your motivation to learn about entrepreneurship?

Participant responsiveness:

- Were the challenges in the game appropriate for your level of knowledge?
  - Was the game challenging but still within your ability level?
- Did you feel that the game prepared you adequately for real-life entrepreneurship scenarios?
  - Were you able to apply the concepts learned in the game to real-life situations?
- Did the game motivate you to want to learn more about entrepreneurship?
- Did you feel that the game provided you with enough opportunities to interact with other players and receive feedback on your progress?
- Were you satisfied with the feedback and support you received from the facilitators during the game?
- Were you motivated to continue playing the game and complete all the levels, or did you lose interest at any point?
- Would you recommend the game to others interested in learning about entrepreneurship?

Evaluation question 2: What are the potential barriers to implementation?

- Did you face any challenges or obstacles while playing the game, and if so, how did you address them?

Evaluation question 3: Which, if any, improvements to the delivery of the AGEC game are recommended by participants?

- Do you have any suggestions for additional changes or improvements to the game or its implementation?

Teacher

Evaluation questions 1: To what extent are the proposed changes to the AGEC game being implemented as planned?

Adherence:

- Did you follow the instructions provided for implementing the game?
    - If 'no,' why not? o If yes, were the instructions clear and easy to understand?
    - For each activity in the teacher's guide, was the activity fully completed, partially completed, or not done? If any activity was partially completed or not done at all, please explain what you did not complete and why.
    - On average, how many debrief sessions did you hold with your students? o How long did each session last? o How many students attended on average? o Which teaching methods did you use?
    - Did you add anything that was not part of the teacher's guide (such as new content, activities, etc.)? If so, please describe what you added and why they were necessary?
- Did you receive any training or support to help you implement the game effectively?

Delivery quality:

- Which devices did your students use to play the game?
- Did the game run smoothly on the devices used by your students?
- Did you notice any technical issues during the game, and if so, how did you address them?
- Was there adequate support provided by the AGEC team to resolve any technical issues?
- How engaged were your students during the game, and did they find it enjoyable and relevant to their learning? o Did the game engage your students and keep their attention throughout the duration of play?
- In 2022/2023 AGOF made several changes to the AGEC game including:

    - Reduced gameplay time o Replaced weekly assignments with built in assessment.
    - Students have unlimited chances to improve points and be eligible to earn prizes.
    - Improved backend system to better support the game.
    - Added confirmation of details on registration to avoid incorrect registrations. o Offer more activities and material through the Gaming Network to keep students engaged.
    - Longer challenge time (2/3months of gameplay) – students can play at will.
- In your opinion, were the new features implemented satisfactorily? Were the new features useful in enhancing the learning experience for your students?

Participant responsiveness:

- Did you find that the game was suitable for all of your students, or were there any students who struggled to engage with the material?
- Were your students motivated to continue playing the game and complete all the levels, or did they lose interest at any point?
- Were your students able to understand and apply the concepts learned in the game to real life situations?
- Did the game provide your students with adequate feedback on their performance, and did this feedback help them improve their understanding of entrepreneurship?
- Did you notice any changes in your students' attitudes towards entrepreneurship as a result of playing the game?
- In your opinion, did the game contribute to your students' overall understanding of entrepreneurship, and would you recommend it to other teachers in your province?

Evaluation question 2: What are the potential barriers to implementation?

- Did you face any challenges or obstacles while implementing the game, and if so, how did you address them?

Evaluation question 3: Which, if any, improvements to the delivery of the AGEC game are recommended by participants?

- Do you have any suggestions for improving the game's effectiveness as a teaching tool for entrepreneurship?

Appendix D: Memorandum of Agreement

MEMORANDUM OF AGREEMENT (#717)

Made and entered into by and between

ALLAN GRAY ORBIS FOUNDATION (RF) NPC

A registered non-profit company, having NPC registration number 2021/401558/08
Herein represented by Mlungisi Zuma in his capacity as
Research Specialist and he being duly authorized thereto

(hereinafter referred to as "the Organisation")

And

THE UNIVERSITY OF CAPE TOWN THROUGH THE UCT KNOWLEDGE CO-OP

A university incorporated in terms of the Higher Education Act, 1997, and the statute of the University of Cape Town, promulgated under Government Notice No. 1199 of 20 September 2002, having its principal place of business at Bremner Building, Lower Campus, Lovers' Walk, Rondebosch, 7700, herein represented by Nadia Ebrahim, in her capacity as Senior Legal Advisor of the University of Cape Town and she being duly authorized thereto

(herein after referred to as "**UCT**")

(Hereinafter collectively referred to as the "Parties" and individually as the "Party")

PREAMBLE

Whereas UCT Knowledge Co-op is a unit within UCT which works in partnership with communities to address development challenges. The unit aims to make it easier for community partners to access UCT's skills, resources and professional expertise and works by matching community groups with academic partners in a collaboration that meets the needs for research or practical support identified by the community group;

And Whereas the Organisation is a non-profit organisation with the mission to become a centre of excellence for responsible entrepreneurship, to foster a community of responsible entrepreneurs and, consequently, to contribute to developing long-term economic and societal wealth and has identified the challenge to evaluate the design and implementation of the Allan Gray Entrepreneurship Challenge in secondary schools in order to improve programme design.

And Whereas the Parties wish to establish an arrangement to govern the relationship between them on the basis of the terms and conditions contained hereinbelow.

1. **Definitions**

   In this Agreement, unless clearly inconsistent with or otherwise indicated by the context, the definitions set out hereinbelow shall apply:

   1.1. "Agreement" means this memorandum of agreement between the Parties captured in this document, together with any annexures, which are incorporated herein by reference.

   1.2. "Commencement Date" means 19 October 2022 notwithstanding the date of last signature hereto, provided that ethics approval has been obtained where required;

   1.3. "Intellectual Property" means intellectual capital relating to the Project in the form of any and all technical or commercial information, including, but not limited to the following: specifications and formulae; data, systems and processes; production methods; trade secrets; undisclosed inventions, financial and marketing information; as well as registered or unregistered intellectual property in the form of patents, trade marks, designs, know-how and copyright in any works, including literary works or computer software programs;

   1.4. "Knowledge Co-op Representative" means Roshan Sonday;

   1.5. "Project" means the research to be undertaken towards the case study entitled: "A theory and process evaluation of the Allan Gray Entrepreneurship Challenge programme", as set out in more detail in the brief description attached hereto as Annexure "A";

1.6. "UCT Academic Supervisor(s)" means Associate Prof. Adiilah Boodhoo, School of Management Studies, Section of Organisational Psychology at UCT.

2. Purpose

With the support of the Organisation, Ombo Dumutu who is enrolled for the MPhil in Programme Evaluation (hereinafter, "the Student"), shall conduct research towards the Project under the academic supervision of the UCT Academic Supervisor. The Student is undertaking the Project primarily as a learning experience and is not able to offer advice as an expert on the matter to be researched.

3. Duration

3.1. The Project will commence on the Commencement Date (see clause 1.2 above) and shall endure until 31 October 2023.

3.2. The Parties may extend this Agreement if required by mutual agreement in writing.

4. Nature of the Partnership

4.1. The use of the term "partner" in this Agreement is not intended in a way that implies the creation of a legal partnership, joint venture or any other kind of legal entity between UCT and the Organisation in order to implement the proposed Project. It is rather used to express a partnership in which both Parties have equal status.

4.2. The Parties are entering into this Agreement on the basis that they are equal partners who bring different and yet complementary strengths to the tasks of the Project.

4.3. The Parties commit themselves to the common goal of achieving the objectives of the Project to the standard acceptable in the academic field. Their relationship in implementing this Project will be underpinned by principles of transparency and trust.

5. Roles and Responsibilities of the Parties for the Project

5.1. Student tasks:

- Share the draft research proposal with the Organisation for comment.
- Display professional behaviour at all times while working in the Organisation or on their programme.
- Conduct field work and write a dissertation. A client report will be negotiated, should the Organisation indicate the need for this.

- Share findings with the Organisation via the dissertation which will enable the Organisation to make informed decisions about its programme. The student may also conduct a presentation on his findings and recommendations to the Organisation.

5.2. The Organisation tasks:

- Introduce the Student to the Organisation staff and assign a designated an employee to provide access to relevant organisational information.
- Assist with the selection of study participants as required for the Project.
- Assist in obtaining permission for surveys with informants.
- Provide access to secondary data including publications, existing programme implementation documents and reports (as well as the raw data), as needed.
- Provide feedback and comment at times during the research process.
- Copy the Academic supervisor in all correspondence with the Student

5.3. Knowledge Co-op tasks:

- The Knowledge Co-op Representative will introduce the UCT Academic Supervisor(s), the Student and the Organisation to each other and mediate the process towards completion of the Project.
- Disseminate outputs from the Project.

6. Finances

Unless expressly otherwise agreed upon in writing, there shall be no consideration payable by either Party for the performance of work by the other Party under the Project and each Party shall be responsible for procuring its own funding and paying its own costs incurred in respect of the Project.

7. Confidentiality and disclosure of information

7.1. Neither Party nor their respective employees, consultants or agents shall disclose, use or make public, any information or material acquired or produced in connection with or by the performance of this Agreement, other than in the performance of their respective obligations under this Agreement, or as required by law, without the prior written approval of the other Party, which may not be unreasonably withheld.

7.2. The Parties intend that the provisions of this clause shall be binding on them and shall survive the termination or expiration of this Agreement.

7.3. The Parties agree that any person interviewed during the course of the Project will be advised of the nature and consequences of the Project and will thereafter complete and sign an informed consent form before any interviews commence.

8. Intellectual Property and Publication

8.1. Each Party shall retain all rights to existing Intellectual Property owned by it at the commencement of the Project arising under this Agreement. The rights to any Intellectual Property created by the Student during the course of the Project period shall be vested in UCT.

8.2. The Parties agree that any products of this process will be made available to the public on the UCT Knowledge Co-op website under a Creative Commons licence.

9. Dispute Resolution

Any dispute, arising from, or in connection with this Agreement shall first be resolved by the Parties through the process of negotiation or mediation and if the dispute cannot be resolved, then the dispute shall be referred to the Arbitration Foundation of South Africa for resolution.

10. Service of Required Legal Notices

Any notice or communication associated with the performance of this Agreement required to be given under this Agreement shall be deemed made if given by registered or certified mail, postage prepaid, and addressed either to the stipulated legal address given below or to such other address as may hereafter be specified in writing by the Parties:

If to UCT:
Attention: The Director
Research Contracts & Innovation
University of Cape Town, Allan Cormack House
2 Rhodes Ave, cnr Main Road
Mowbray, 7700

If to the Organisation:
Attention: Mr Mlungisi Zuma
Research Specialist
46 Hof Street
Gardens
Cape Town
8001

11. General

12.1 No alteration, variation, addition or agreed cancellation of this Agreement shall be of any force or effect unless reduced to writing as an addendum to this Agreement and signed by the Parties or their duly authorized signatories.

12.2 No indulgence, leniency or extension of time which any Party ('the grantor') may grant or show to the other shall in any way prejudice the grantor or preclude the grantor from exercising any of its rights in the future.

12.3 If any clause or term of this Agreement should be invalid, unenforceable or illegal, then the remaining terms and provisions of this Agreement shall remain in full force and effect without the invalid or unenforceable provisions.

THUS DONE AND SIGNED AT LOEVENSTEIN, CAPE TOWN ON THIS 4TH DAY OF NOVEMBER 2022

for and on behalf of **UNIVERSITY OF CAPE TOWN:**

Name: Nadia Ebrahim Signature: Nadia Ebrahim

READ AND ACKNOWLEDGED:

Student 16/11/2022 ombo

OMBO DUMUTU Date Signature

Academic supervisor 17/11/2022

PROF. ADIILAH BOODHOO Date A/Prof Adiilah Boodhoo Signature

THUS DONE AND SIGNED AT AGOF-SANDTON ON THIS 8 DAY OF November 2022

for and on behalf of **ALLAN GRAY ORBIS FOUNDATION (RF) NPC:**

Name: Mlungisi Zuma Signature: mlungisizuma

Appendix E: Ethics Clearance Letter

Faculty of Commerce

Private Bag X3, Rondebosch, 7701
2.26 Leslie Commerce Building, Upper Campus
Tel: +27 (0) 21 650 4375/ 5748 Fax: +27 (0) 21 650 4369
E-mail: jacques.rousseau@uct.ac.za
Internet: www.uct.ac.za
@Commerce UCT **UCT Commerce Faculty Office**

11 01 2023

Ismail Dumutu

School of Management Studies

University of Cape Town

REF: REC 2023/01/004

A Theory and Process Evaluation of the Allan Gray Entrepreneurship Challenge

We are pleased to inform you that your ethics application has been approved. Unless otherwise specified this ethical clearance is valid until 31-Dec-2023 .

Your clearance may be renewed upon application.

Please be aware that you need to notify the Ethics Committee immediately should any aspect of your study regarding the engagement with participants as approved in this application, change. This may include aspects such as changes to the research design, questionnaires, or choice of participants.

The ongoing ethical conduct throughout the duration of the study remains the responsibility of the principal investigator.

We wish you well for your research.

2023.01.11
15:59:32 +02'00'

Jacques Rousseau
Commerce Research Ethics Chair
University of Cape Town
Commerce Faculty Office
Room 2.26 | Leslie Commerce Building

Office Telephone: +27 (0)21 650 2695 / 4375
Office Fax: +27 (0)21 650 4369
E-mail: jacques.rousseau@uct.ac.za
Website: http://www.commerce.uct.ac.za/com/Ethics-in-Research

Appendix F: Focus Group Consent Form

A Theory and Process Evaluation of the Allan Gray Entrepreneurship Challenge

Thank you for agreeing to participate in this study on the Allan Gray Entrepreneurship Challenge (AGEC) Programme. The purpose of this focus group is to gain insight into how the programme was conceptualized (i.e., to understand the assumptions - values, beliefs, and experiences - that informed its design), its intended operation, and current implementation. This understanding will help us develop a sound theory of change for the programme.

What will you be asked to do in this discussion?

As a focus group participant, you will be asked to discuss and share your opinions on a) the design of the AGEC programme and how it is currently being implemented in schools across South Africa, b) any organisational support provided to students and teachers to ensure effective implementation, and c) your thoughts on the game as a tool for fostering entrepreneurship in South Africa.

This discussion will be led by myself, Ismail Ombo Michael Dumutu, and it will not exceed 3 hours.

What about confidentiality?

To help protect your confidentiality, all information obtained from the focus group will be kept completely confidential, and your name or any personally identifiable data will not be included in written notes or reports about the meeting. All information gathered during the discussion will be securely stored on a password-protected laptop and in the cloud. Participants (including you) will also be asked not to share what was discussed. If I use names, they will not be yours, and no one will be able to identify the respondent or focus group participants.

What are the risks of being part of the focus group?

Participating in the focus group poses no known risks. However, if you are uncomfortable making a comment, you may choose not to answer a specific question.

What are the benefits of the focus group discussion?

The information obtained from this discussion may help the AGEC team learn more about how well it is operating and what improvements may be needed.

Note:

1. The focus group will be audio-recorded and transcribed. If you participate in the study, you may request that the recording be paused at any time. You can choose how much or how little you want to speak during the discussion. You may also leave the focus group at any time.
2. Participants must also respect the privacy of their peers and refrain from repeating what is said in the focus group to others outside of this context.

If you have any questions or concerns regarding this study, please contact:

Ismail Ombo Michael Dumutu

dmtism001@myuct.ac.za

Adiilah Boodhoo

adiilah.boodhoo@uct.ac.za

I understand this information and agree to participate fully under the conditions stated above.

Name and Title of Participant	Date	Signature