

Game Design as Reflective Pedagogy in Entrepreneurship Education

Willian Gatti Junior¹, Beaumie Kim², Laleh Behjat³, Emily Marasco³ and Marjan Eggermont³

¹Ambrose Business School, Ambrose University, Calgary, Canada

²Werklund School of Education, University of Calgary, Canada

³Schulich School of Engineering, University of Calgary, Canada

Abstract: The relationship between business education and games, primarily simulation games, dates to the 1930s in Europe and the 1950s in the US and continues to grow today. These games are often used to teach action-oriented disciplines, such as marketing, strategy, and entrepreneurship, providing situations in which decision-making under risky circumstances can be practiced. Our research shifts the focus from playing games to designing them for learning. Our game design activity brings the ambiguity and uncertainty from the entrepreneurial environment into the classroom, where risks can be taken, and failure is part of the experience. Students dive into an iterative design process grounded in inquiries and investigations. This requires communication and negotiation skills, aiming to construct dynamic business representations in constant conversation with the situation. Although students' lack of professional experience and game design knowledge poses challenges, the design activity uncovers many learning possibilities and discoveries. Our pedagogical approach attempts to embrace constructionists' learning characteristics by using a board game to mediate the design process, besides the gameplay. Students' designs should not only reflect their problem-solving experiences, identities, and understandings, but also construct meaning through conceptualizing business interpretations as game elements, mechanics, and rules. Through observations in university classroom settings (Canada, France, and Brazil), we present examples of students' game designs and how they interpreted entrepreneurial challenges through their designs. By employing design thinking to create conceptual representations in a meaningful game, they showed their understanding of entrepreneurship, worldviews, and contextual knowledge grounded in their sociocultural contexts. A board game became a tool that embodied design possibilities based on low-cost resources and was used in classrooms without computers, internet access, or other technical devices. A board game provides an inclusive and immersive learning experience that supports better conceptual understandings of systems, such as entrepreneurial activity. This research contributes not only to understanding the role of board games in business education (in contrast with prevalent digital simulation games) but also motivates the next generation of entrepreneurial educators to experiment with novel teaching methods.

Keywords: Game design, Game-based learning, Entrepreneurship education, Design thinking

1. Introduction

The field of entrepreneurship education is continuously seeking innovative pedagogical approaches that promote experiential learning and engage students in meaningful ways. Experiential learning aspires to bridge the divide between theoretical knowledge and practical application by incorporating problem-based learning (Tan and Ng, 2012), student-initiated business ventures, real-world case studies, and simulation games (Kassean *et al.*, 2015) into the classroom.

A simulation game can be classified as a distinct genre within the broader scope of games, characterized by its aim to replicate real-world processes, systems, or scenarios, enabling players to engage with and manipulate these simulated elements (Sauvé, Renaud and Kaufman, 2010). The fundamental objective of a simulation game, for some authors also refers as a serious game (Fox, Pittaway and Uzuegbunam, 2018), is to provide an immersive and interactive learning experience that fosters a comprehensive understanding, exploration, and acquisition of knowledge on various facets of the simulated system or situation. Inherent to simulation games are elements of decision-making, strategy formulation, and problem-solving, as players assume the role of active agents within the simulated environment, necessitating thoughtful choices and the discernment of consequences arising from their actions. It is noteworthy to mention that within the context of this study, the term "games" specifically alludes to simulation games, underscoring their distinctive nature and purpose in the analysis and exploration conducted herein.

Despite its potential benefits, the utilization of game design as an experiential approach remains underexplored within entrepreneurship education. Nevertheless, game design presents a distinctive opportunity for students to examine entrepreneurship concepts and cultivate essential skills. This study probes the challenges and prospects of incorporating game design activities in entrepreneurship education, with a focus on understanding how students, especially those lacking professional experience or game design expertise, navigate the process of designing games.

By examining various game designs, this paper investigates the initial game design concepts, the impact of students' backgrounds, experiences, and pre-existing game knowledge, as well as the iterative process that culminates in more sophisticated and meaningful game designs. Additionally, the paper analyses the interrelated

components that undergird students' approaches to game design, emphasizing the significance of socio-cultural contexts and interdisciplinary knowledge in shaping their educational games.

This paper, situated within a constructionist framework (Papert, 1991; Kafai, 2006), seeks to enhance our understanding of game design as an educational approach for entrepreneurship education. By doing so, we provide valuable perspectives on the difficulties faced by students, the educational possibilities that arise from engaging in game design, and recommendations for effectively implementing this activity to enhance students' design competencies.

2. Game Design as a Pedagogy

Within educational contexts, games are purposefully designed to generate immersive experiences. Players learn to draw inferences about the game's elements and negotiate their meanings within real-world social and cultural contexts (DeVane, Durga and Squire, 2010). Consequently, games serve as a metaphorical medium for experimenting with and enacting radical changes, testing ideas in a safe environment, and providing players with a context for interpretation. Games are distinct from other media in that they offer players the opportunity to influence outcomes through their own efforts (Isbister, 2016).

Business education and games share a long-standing relationship. Their interconnected history dates back to the 1930s in Europe and the 1950s in the United States (Faria *et al.*, 2009), with the continuous evolution of business gaming resulting from advancements in war games, operations research, computer technology, and educational theory (Wolfe, 1993). In this context, game design as a pedagogical approach pertains to the design and/or programming of games (digital games), supporting learning objectives such as coding concepts, design literacy or design thinking, critical thinking, systems thinking, and problem-solving (Kim and Bastani, 2017; Martins and Oliveira, 2018).

One learning theory that underpins game design as a pedagogical activity is constructionism, first proposed by Seymour Papert (Papert, 1991). Constructionism is rooted in constructivism (Holmes and Gee, 2016), which perceives learning as an active process wherein learners construct new ideas or concepts based on their existing and prior knowledge, social interactions, and motivation. Constructionism extends these elements by proposing that the process necessitates a tangible artifact as an outcome that can be shared with others (Kafai and Burke, 2015; Holmes and Gee, 2016). In this regard, instead of embedding lessons within games, constructionism advocates for students to construct their own games as artifacts, forging new relationships with knowledge during the design process (Kafai, 2006). Under this perspective, games are conceptualized as objects-to-think-with (Papert, 1980), providing an engaging medium for students to introspectively examine and integrate their old and new insights about entrepreneurship. Furthermore, a pedagogy grounded in game design fosters more inclusive learning environments capable of engaging students with diverse skills by exploring their interests and creativity during the design process (Kim and Bastani, 2017).

Several studies have reported successes in implementing game design as a tool in teaching and learning practices. Hwang, Hung, and Chen (2014) conducted a study on an elementary school science course, wherein a digital design game activity promoted problem-solving skills. Yang and Chang (2013) demonstrated that digital game design in a biology course for two seventh-grade classes enhanced students' critical thinking skills. In higher education, Marasco *et al.* (2017) reported that engineering students developed creative, problem-solving, time, and project management skills by designing games in a technical course. Gaskin and Berente (2011) asserted that a digital game design workshop could enhance design thinking among Master of Business Administration (MBA) students.

However, board games provide more cost-effective opportunities for design and represent an actual social practice, not only during the design activity but also throughout gameplay sessions. Despite this, only a few initiatives in the literature report the use of board game design in classroom settings. Most of these initiatives involve teachers adapting or modifying commercial games or custom-built games for use in their courses (Castronova and Knowles, 2015; Sánchez *et al.*, 2017; Hoy, 2018). Kim and Bastani (2017) discussed board game design as an educational intervention, showcasing a study in which eighth-grade students designed their own board and card games, integrating various disciplines to incorporate multiple sources of knowledge in science, technology, engineering, art, and math (STEAM) education.

Business instructors employ games as a pedagogical tool to offer students diverse and immersive entrepreneurial business experiences (Pittaway and Cope, 2007), facilitating learning and enhancing students' skills. Fox *et al.* (2018) argued that games enable players to learn in various ways, such as through doing,

reflecting, and experiencing failure. Students perceive gameplay as a valuable educational exercise that expands their knowledge of entrepreneurial decision variables (Fox, Pittaway and Uzuegbunam, 2018).

While gameplay focuses on problem-solving and decision-making within a controlled environment governed by game rules, game design offers students, as game designers, opportunities to exercise their storytelling, design thinking, and creative thinking skills. A game design activity generates contextualized and authentic learning experiences, making knowledge and skills acquired through project-like work more transferable to future situations (Ke, 2014).

Furthermore, business students typically do not receive hands-on training related to new product development, as found in design education (Christensen *et al.*, 2022). Introducing game design to entrepreneurship classes will not only develop students' problem-solving skills but also provide reflective training in material interaction, enabling students to create tangible representations of their conceptual understandings. This process should assist students in articulating and continually questioning their mental frameworks concerning entrepreneurship.

3. The Challenges and Opportunities in Game Design

The game design activity seeks to introduce the ambiguity and uncertainty inherent in the entrepreneurial environment into the classroom, creating a space where risks can be taken, failure is enjoyable, and taboos can be challenged. The designer perspective inherent in this activity necessitates a transition from teacher-driven knowledge transmission to a conception of knowledge as a dynamic construct driven by students.

However, our research indicates that students need support to navigate this design process. The initial prototype typically reflects rudimentary and simplistic perspectives of the entrepreneurial activity, manifesting in a game design with basic mechanics, game elements, and rules. The method for implementing this design activity is as follows: after the first prototype, students pitch ideas (as products), followed by a feedback session, an instructor-supported iterative design process to refine ideas, and a playtest session. During the playtest session, students play each other's games and provide written feedback. Subsequently, a debriefing session is held, followed by an individual written report in which students describe their experiences playing and designing the game and the lessons learned from this process. To conclude the report, students present an analysis of the lessons learned and their connection to other courses in the program.

While students' lack of professional experience and game design knowledge presents challenges to this activity, numerous learning opportunities and discoveries also emerge. The challenge lies in guiding students, as non-designers, to engage in an iterative design process rooted in inquiries and investigations, necessitating communication and negotiation skills as they work in groups and aim to construct business representations (Visser, 2006) through constant dialogue with the situation (Schön, 1983). Learning opportunities are embedded in the process of participating, engaging, and/or interacting with and around the game (Bayeck, 2020). The overarching goal of the game design activity is not to produce a ready-to-market game; rather, students' designs should reflect not only their problem-solving experiences, identities, and understandings, but also construct meaning (Krippendorff, 2006) through conceptual business interpretations articulated as game elements, mechanics, and rules.

4. Research Design

This study employed a design-based research (DBR) approach to investigate the potential of game design as a teaching method in entrepreneurship education. DBR was originally developed in the 1990s (Brown, 1992; Collins, 1992) to address various issues in the realm of education. These issues included theoretical inquiries about the nature of learning in specific contexts, the necessity to move beyond limited measures of learning, the need to derive research outcomes from formative evaluation, and the examination of learning phenomena in authentic settings rather than controlled laboratory environments (Collins, Joseph and Bielaczyc, 2004).

DBR can be defined as a "series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" (Barab and Squire, 2004, p. 2). By conducting research in authentic contexts, DBR enhances the validity of the findings and suggests that the results could have significance not only within the context of the intervention but also in other similar contexts (Anderson and Shattuck, 2012). DBR primarily focuses on developing and refining innovative educational designs, interventions, or technological solutions, aiming to create and test new educational theories, practices, or tools in real learning environments.

Numerous frameworks have been proposed for design research, such as those suggested by Bannan-Ritland and Baek (2008), Easterday et al. (2014), Edelson (2002), and Kennedy-Clark (2013). For this study, we drew inspiration from McKenney and Reeves's (2012) framework, which encompasses a series of iterative cycles representing the interaction between the design and the context, leading to an improved design and understanding of the intervention. Our initial step involved various formats, such as reflections, research group discussions, previous experiences, and literature reviews, to shape a game design experience suitable for implementation in the classroom. The subsequent step entailed conceiving a game design activity to address the problems and diagnoses that emerged during the previous stage. Finally, we conducted prototype tests (reported in this paper) wherein qualitative data were collected through observations and artifact examinations.

Observations were conducted in a non-intrusive manner, allowing students to engage in the game design process naturally. The first author took detailed field notes, focusing on students' interactions, collaboration, problem-solving, decision-making, and the evolution of their game designs. Additionally, the first author documented the students' game concepts, prototypes, and final game designs.

The researchers systematically analyzed the field notes, game concepts, prototypes, and final game designs. The analysis focused on identifying common elements and patterns in students' approaches to game design, the integration of entrepreneurship concepts, and the development of skills and competencies throughout the process. Thematic analysis was employed to categorize the data and identify prevalent themes related to the research questions.

The results presented in this work could be considered a work-in-progress, as DBR typically follows an iterative design and evaluation process. This process involves developing a design or intervention, implementing it in real-world settings, collecting data on its effectiveness, and iteratively refining the design based on the findings.

5. Game Design in Action

5.1 Designing Games for Knowledge Representation

When students are initially challenged to design a game that represents their knowledge about a given discipline, the first ideas that emerge often resemble trivia-style games. Some variations also appear, such as games where players move along a path on the board and must answer a question upon landing on specific spots.

An example of this is a game designed by a group of students in France, titled "Who Will Be the Best Entrepreneur of the Year?" (Figure 1). The initial design was a traditional quiz game featuring questions based on course content. After receiving feedback, the students refined their idea to present a game in which players analyze business opportunities across four domains (human resources and accounting, research and development, product and pricing, and communication and marketing) as they progress around the board. The colors of the squares indicate the type of card and corresponding opportunity to be assessed.



Figure 1: Who will be the best entrepreneur of the year?

Another project that began as a quiz game was "Tackle" (Figure 2). Led by two American female students, this project underwent significant revisions after the feedback session, resulting in a more engaging game. In Tackle, the students employed an unbalanced design in which players assume the roles of different characters aspiring

to be entrepreneurs. Each character has a unique background, starting the game at different positions on the board and with varying amounts of money according to their profile. The students crafted this design to explore societal inequalities and their consequences for entrepreneurship. For instance, playing as a white male entrepreneur provides the player with a shorter path to success and a more comfortable initial investment for starting a business. In contrast, if a player assumes the role of a black woman, they encounter greater difficulties and constraints in reaching the same position.

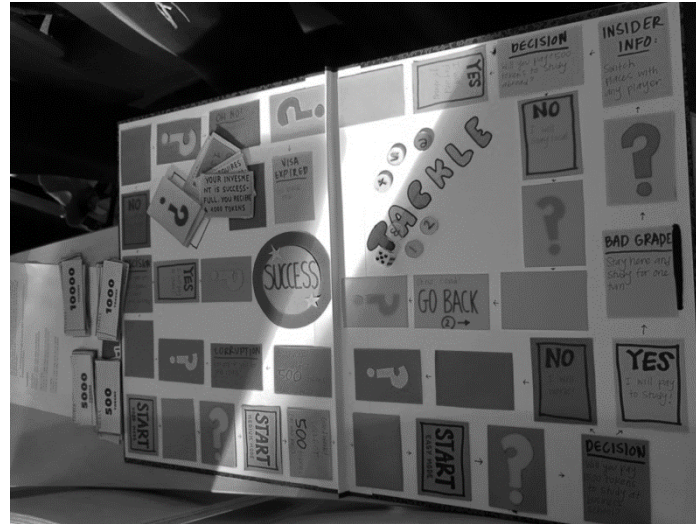


Figure 2: Tackle

5.2 Drawing on their prior experiences, and socio-cultural backgrounds

When students brainstorm game designs, quiz-style games are often the first ideas that emerge, and the students' backgrounds tend to be the primary components they incorporate into their games. For instance, students from a Brazilian college created a game called "Empreenda Ai" (roughly translated to "Go for It"), which reflects the struggles of being an entrepreneur in their country, particularly the difficulties in navigating complex tax legislation. The main board depicts São Paulo, one of Brazil's most industrialized states, where cities are interconnected by roads. Players must purchase raw materials, produce goods in their factories (represented on the players' boards), and sell their products in the cities on the main board. As companies expand, players must pay taxes based on varying percentages according to company size. Additionally, freight costs between cities must be paid.

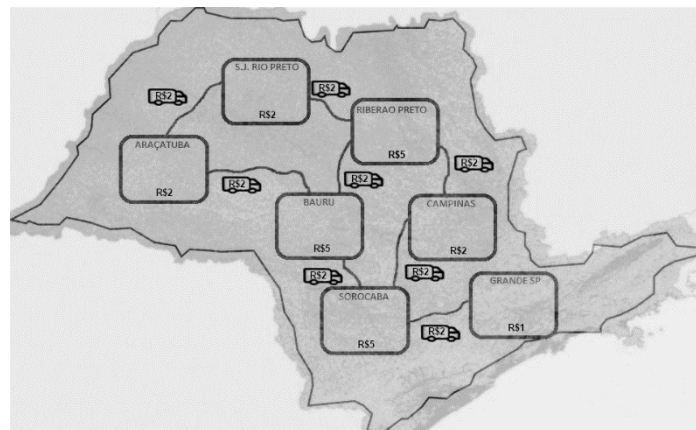


Figure 3: Empreenda ai

Students' backgrounds encompass not only their personal experiences and observations, but also the types of board games they have played, which can significantly influence their designs. A prime example of such influence is the game Monopoly (Darrow and Magie, 1935), which has served as a key reference for many students. French students' games, "Strat' Game" and "Competitive Business," are examples of modified versions of Monopoly (Darrow and Magie, 1935) that introduce strategy concepts related to entrepreneurial activities. As players

progress around the board, they answer questions pertaining to the course, with the ultimate goal of accumulating as much money as possible.

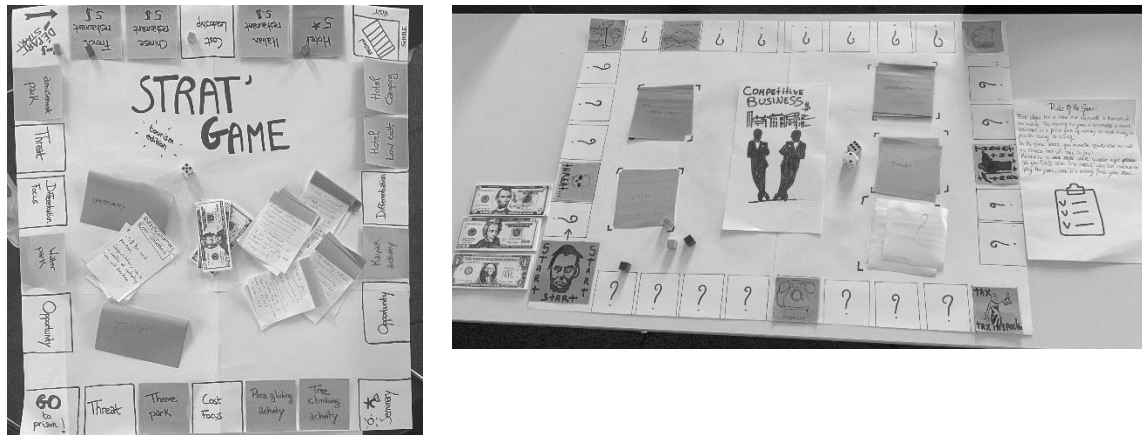


Figure 4: Strat' Game and Competitive Business

5.3 Thinking With Existing Games

While students learn through the adaptation of traditional board games, more sophisticated designs involve more than simply modifying elements to represent entrepreneurship constructs. Rather, effective designs necessitate in-depth reflection to facilitate the integration of course content, novel elements, and diverse game mechanics into the original design. Though the original game design may still be discernible in the students' final work, the new game creatively explores the main disciplinary ideas. For example, in order to represent their knowledge of various supply chain topics, students at a Canadian college modified the traditional "The Game of Life" (Klamer and Markham, 1960) to create "The Game of Supply Chain" (Figure 5). In this game, players perform different actions on the main board as well as on an individual board representing their factories (Production Cycle). As players establish a company, produce goods in their factories, and sell products, they encounter and address situations presented by action cards (e.g., raw material shortages) as they move around the board. The game demands strategic thinking from players while teaching supply chain management concepts embedded in entrepreneurship.



Figure 5: The Game of Supply Chain

"The Game of Life" (Klamer and Markham, 1960) also served as the foundation for another game design in Canada. "The Life of an Entrepreneur" (Figure 6) is a game that portrays the innovative journey of an entrepreneur, highlighting the numerous difficult choices they must make to maintain a successful business. Players, as unique characters, encounter real-life decisions and accumulate assets and liabilities throughout the game. Additionally, the game introduces risky and unethical paths, prompting players to reflect on these issues in the context of entrepreneurship.



Figure 6: The life of an entrepreneur

Another example from a university in Canada combines elements and game mechanics from Risk (Lamorrisse and Levin, 1959), Catan (Teuber, 1995), and Pandemic (Leacock, 2008) to create "Footprint Factor" (Figure 7). This project began with the premise that continuous economic growth and environmental conservation are incompatible. The game reproduces this reasoning by inviting players to experience the logic of sustainable development. "Footprint Factor" challenges players to navigate a complex and interconnected system while promoting sustainable practices in business operations and addressing the environmental impact of entrepreneurial activities. Players must collect resources from the planet (lumber, water, minerals, and oil) and combine them to open factories, produce, and sell products. As they sell, they cause negative impacts on the environment. However, their money can be used to purchase various resources (technology, researchers, and clean energy) to upgrade their factories, transforming them into environmentally friendly operations.

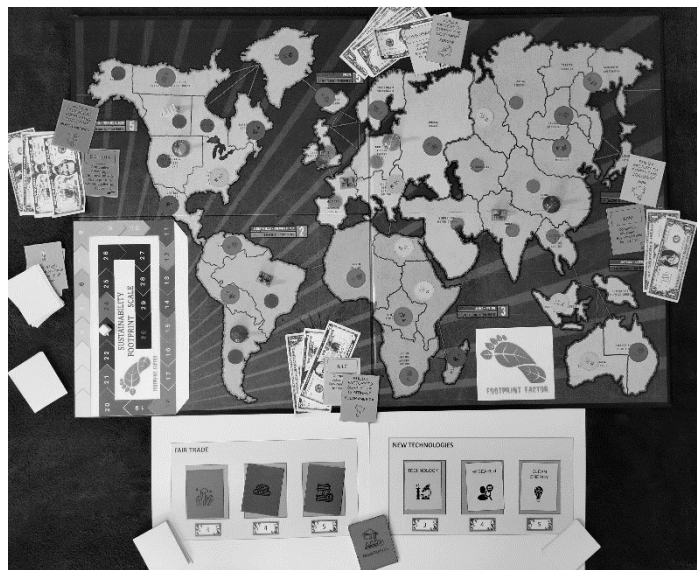


Figure 7: Footprint factor

5.4 Critical Thinking for Entrepreneurship Complexity

"Conquer the Market: An Entrepreneurship Game" (Figure 8) is a sophisticated example of how a game modification can result in an intricate design. Developed by French entrepreneurship students, inspired by the game Catan (Teuber, 1995), the game challenges players to gather tangible and intangible resources that are identified as gaps in the market, ideas, knowledge, network (human capital), and money. By combining these resources, players can build elements such as factories, warehouses, retail stores, and supply chains that must be connected to each other. The game also features cards with both positive and negative impacts on players. The winner is the player who builds a factory, a warehouse, and a retail store in the correct order, connected by

the supply chain, and reaching the customers located on the edge of the board. This project introduced a new design challenge since it was created using the Tabletopia (Tabletopia, 2014) website. The students studied how to design the game components on the website, which allowed them to develop knowledge not only related to entrepreneurship concepts, such as the venture creation process and product production and distribution, but also in computation and graphic design.

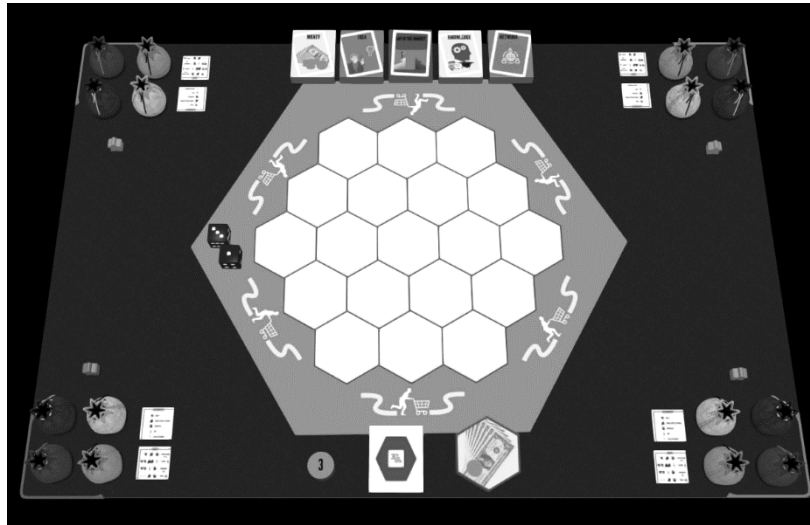


Figure 8: Conquer the market: An entrepreneurship game

The game design activity is not confined to board games, as card games also offer promising opportunities for students to express their creativity while forging meaningful connections with entrepreneurship concepts. Entrepreneurial Prestige (Figure 9) is an example of a card game built upon the Dominion (Vaccarino, 2008) game. The game's objective is to use various cards based on the business model canvas to develop a personalized business strategy and gain prestige. The three types of prestige are brand awareness (the lowest), brand reputation (middle), and brand recognition (the largest). The action cards enable players to diversify their strategy by utilizing skills to purchase more cards, obtain additional funding, and develop more prestige. The funding cards provide players with the currency required to purchase other cards. There are three main funding cards: Friends and Family, Venture Capital, and Investors. Finally, the Prestige cards count towards Business Prestige points at the end of the game.

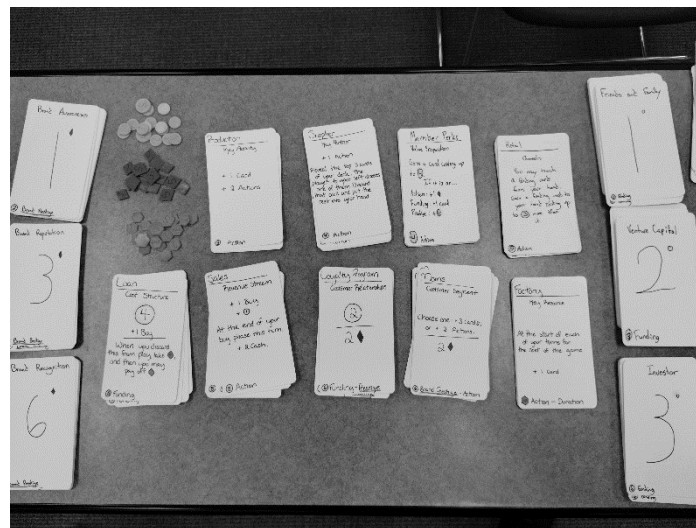


Figure 9: Entrepreneurial Prestige

6. Conclusions

Upon examining the games created by students in the context of entrepreneurship education, several common elements emerge that contribute to the development of essential skills and competencies. These shared

experiences and approaches highlight the potential of game design as a pedagogical tool that encourages creativity, collaboration, and experiential learning in the classroom.

Initially, students tend to draw upon familiar game structures and mechanics, such as trivia-style games or games that involve moving along a path and answering questions. However, through an iterative design process involving feedback sessions, playtesting, and refinement, students gradually develop more sophisticated and meaningful game designs that better reflect the entrepreneurial concepts they are learning. This process helps students develop adaptability, resilience, and critical thinking skills as they evaluate and improve their initial ideas and prototypes.

The influence of popular board games, such as Monopoly (Darrow and Magie, 1935), Risk (Lamorisse and Levin, 1959), Catan (Teuber, 1995), and The Game of Life (Klamer and Markham, 1960), is evident in the games designed by students. These classic games often serve as a foundation for students to build upon and modify as they incorporate entrepreneurship concepts and ideas. This approach exposes students to interdisciplinary learning as they apply and reconfigure their knowledge from various business subjects to create games that engage players while teaching and reinforcing the concepts and ideas studied in their program.

Incorporating students' personal backgrounds, experiences, and observations from their own lives is another common element in the game designs. This approach fosters cultural awareness and empathy among students, as they become more aware of the diverse challenges faced by entrepreneurs in different contexts. By reflecting on these challenges, students develop a deeper understanding of the complexities of entrepreneurship.

Group work and communication play a significant role in the game design activities, fostering teamwork, collaboration, and negotiation skills among students. They must effectively communicate their game concepts and designs during the development process, pitch ideas, provide and receive feedback, and present their final projects to peers or instructors.

Additionally, game design activities require students to plan, coordinate, and execute their projects within specific timeframes and constraints, developing their project management skills. This, combined with the problem-solving skills required to address various challenges such as balancing gameplay and integrating educational content, contributes to the overall growth and development of students as future entrepreneurs and professionals.

In summary, the game design activities within the context of entrepreneurship education provide a platform for students to develop a range of skills and competencies, including creativity, innovation, problem-solving, collaboration, critical thinking, adaptability, communication, project management, interdisciplinary learning, cultural awareness, empathy, and design thinking. By engaging in these activities, students not only enhance their understanding of entrepreneurship concepts but also prepare themselves for success in their future careers and endeavours.

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