PUPPY VALLEY: AN APP-MEDIATED BOARD GAME TO ENHANCE SCAM AND FRAUD AWARENESS AMONG US SENIORS

by

Prince Owusu Attah

A Thesis

Submitted to the Faculty of Purdue University

In Partial Fulfillment of the Requirements for the degree of

Master of Fine Arts

Patti & Rusty Reuff School of Design, Art, and Performance

West Lafayette, Indiana

May 2021

THE PURDUE UNIVERSITY GRADUATE SCHOOL
STATEMENT OF COMMITTEE APPROVAL

Dr. Cheryl Zhenyu Qian, Chair

Department of Art and Design

Steve Visser

Department of Art and Design

Dr. Victor Yingjie Chen

Department of Computer Graphics Technology

Dr. Shannon C. McMullen

Department of Art and Design

Approved by:

Dr. Arne Flaten

I dedicate this thesis to my beloved mother, Vida Fordjour, whose sacrifice and hard work provided me a chance at education. Her confidence and belief in education was my source of inspiration for the completion of this degree. To my wife, Alberta, whose unalloyed support and encouragement have seen me through this program. I am deeply appreciative. Also, to my son, Denzel, for being a source of comfort and being the reason, I strive to achieve more.

ACKNOWLEDGMENTS

I would like to thank God for his guidance and protection throughout my academic journey and the opportunity to complete this research.

My deepest gratitude goes to my supervisor and committee chair Dr. Cheryl Zhenyu Qian for her utmost support and guidance from gaining admission into Purdue and throughout the interaction design program. She represents all the impactful women who have played a foundational role in my career.

I'm also thankful to each of my committee members; Steve Visser, Victor Yingjie Chen, and Shannon C. McMullen, for their individual contributions to my academic journey.

I want to express my gratitude to all the faculty and staff, specifically Sally Unser and Kathryn Marie Evans at Purdue's Industrial Design department, for their unwavering support during my time in this program.

Finally, I would like to thank the staff of University Place, West Lafayette, for their immense support for conducting this research.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Scams and fraud have become a significant problem for the American population within the past few years. While victims range from young to older adults, it is the seniors who are the major targets. In 2018 the Federal Trade Commission reported that senior citizens aged 60 years and above formed 35% of all the scam victims it recorded. According to the U.S Senate Committee on aging, scams like the grandparent scam, IRS impersonation scam, romance scam; have become popular. Even at this level of notoriety, most victims are usually unaware of it entirely or how its perpetrators commit these crimes. Being aware of the situation is a critical step towards curbing this problem. This thesis project uses User-Centered Design (UCD) to understand, conceptualize, and prototype a solution to promote social interaction while improving the cognitive abilities of seniors and creating awareness about fraud. The design requirements and direction were formed through multivariate research methods like literature review, user interviews, and focus group sessions. The proposed solution is Puppy valley, an app-mediated trivia board game that has a physical wheel and mobile application and uses narratives inspired by real fraud cases to create activities for users to play with. After the research and design, the game was evaluated by five experts, and refinements within the scope of the study were made based on the insights from the evaluation.

Keywords: senior scam and fraud, elder abuse, app-mediated board game, scam prevention, fraud awareness, trivia board game

CHAPTER 1 INTRODUCTION

This chapter introduces the background of the study and an overview of the study's research approach. The method also elaborates on the general organization of the chapters in the document.

1.1 Background

Seniors have become one of the fastest-growing populations in America. As this population ages, fraud targeted at them increases. According to Burnes, Henderson, Sheppard, Zhao, Pillemer, & Lachs (2017), each year 1 out of 18 cognitively active older adults become victims of scams or fraud in the United States. While some can retrieve or recover from these catastrophes, others cannot. This 'public health crisis," as declared by the Center for Disease Control (CDC), has a dire ramification on the lives of Americans (Ganzini, McFarland, & Cutler, 1990).

The effect of scams and fraud goes beyond the individual victim; it affects the family, friends, and immediate neighbors alike. The most challenging aspect of this problem (for this population) centers around their inability to recognize if they have fallen victim to these acts against them. Another challenge of theirs' is the ability to remember the details when they succeed to report to the authorities. All these are cognitive impediments seniors face as they grow old. Beyond this role of cognition after the victimization, cognitive abilities are the most critical factor that contributes to people getting victimized in the first compared to social factors like interpersonal trust, low conscientiousness, poor honest judgment, loneliness (Judges, Gallant, Yang & Lee, 2017). This lays an essential foundation for the importance of cognition and how general victimization can be prevented if preventive measures and solutions center around improving victims' cognitive abilities.

While the context of the discussion here is about seniors, the issue is not far from the much younger population, who also fall prey to these scammers and fraudsters. With fraudsters and scammers continually changing their tactics, building awareness for every individual is essential. While existing preventive and awareness measures are delivered through traditional media like online blogs and newspapers, it calls for people to conduct the research to find them.

This complex problem and the potential solution's multi-faceted nature illustrate the urgency to address this problem creatively and unconventionally. How can this problem be addressed creatively and effectively?

This research aimed to identify creative opportunities that would be useful in creating awareness and improving the cognitive abilities of individuals as a preventive measure towards curbing scams and fraud among seniors in the united states.

1.2 Research Approach

This study follows a user-centered design approach that attempts to prioritize the users' needs and context at each design touchpoint of the design. The user-centered design was popularized in the 1980s by Donald Norman and Stephen Draper through their book *User-Centered System Design: New Perspectives on Human-Computer Interaction*. The approach promotes a multivariate inquiry and research methods in understanding the needs of users. After the initial research, different research can be adapted to synthesize and establish user needs, pain points, or problems. This is the period when the design problem is also framed for the design requirements. During the design phase, iterative methods are implemented to brainstorm, generate ideas, prototype, and test solutions, and the best solution is developed as final. Testing and evaluation are encouraged to validate the effectiveness and efficacy of the solution. Insights from the testing and assessment can then be leveraged to refine the final deliverables.

After this introductory chapter, Chapter 2 acts as a literature review section. The researcher reviewed existing literature on the topic to gain a better understanding of the issue of fraud targeting seniors, existing strategies to fix it, and mechanisms and principles for cognitive training that were incorporated into the final solution, which is a technology-mediated board game for raising fraud awareness and training senior cognitive abilities.

The overall research methods, as well as the activities and data used in the research, are discussed in Chapter 3. It covers everything from the first chapter to the eighth.

In Chapter 4, the researcher performs a peer product analysis in order to gain a better understanding of current and closely related solutions, as well as to recognize gaps and opportunities. A total of ten products were reviewed across four product spectra.

Next in Chapter 5, the researcher conducted an interview and focus group sessions with the user group, and later conducted a thematic analysis by triangulating the literature review data

and the interview and focus group data. Insights generated were used to frame the design problem and project direction.

The design process is then detailed in Chapter 6. This is done by the researcher brainstorming and sketching ideas, playtesting selected designs, wireframing, prototyping, and creating the final solution.

With the support of the five evaluators, the researcher performed an expert review of the final solution in Chapter 7. The evaluation's findings were used to improve the final design. Finally, in Chapter 8, the researcher summarizes the findings and makes recommendations for future studies.

CHAPTER 2 LITERATURE REVIEW

This chapter explores existing literature related to fraud, cognitive, and ways adults learn to guide the research. Reviewing past and present studies laid the foundation for key problems to address in subsequent chapters.

2.1 Context of Fraud

2.1.1 Fraud in the United States

The Dictionary of Criminal Justice Terminology (1981, p 215) categories fraud under the term ‘white-collar crime. White-collar crimes involve nonviolent and deceptive crimes a person engages in for financial gains. The Center for Disease Control (CDC) also defines fraud as a “Deception carried out to achieve personal gain while causing injury to another party. It further elaborated it as an intentional distortion of truth initiated to convince another to part with something of value or to surrender a legal right.”. Because fraud involves deception and finesse, it is often difficult to recognize, report, and prosecute when committed against its victims, unlike other crimes that involve forcefully taking something from someone. (McGhee, 1983)

Fraud comes in different forms, often targeted at victims through email, phone calls, mobile apps. Some include social security scams, fake telemarketing products, home improvement scams, investment scams, grandchild scams, pyramid schemes, credit card scams, charity scams. (Anonymous, 2016; Braucher & Orbach, 2015; E. A. Gross, 2001) Perpetrators can be anybody from anywhere and include family and close acquaintances which, is one of the common elder abuse. All these groups of people can take advantage of victims through various means. Beyond losing precious valuables victims, they can also lose their reputation, trust in themselves, and even their lives. Because of such effects, the CDC has classified fraud committed against elders as a public health crisis needing urgent attention (Hall, 2016). Fraud overall casts a broad negative effect on society. In 2019 the FBI reported it received 467,371 reports of fraud in which complainants lost about 3.9 billion dollars, a contrastingly lower number compared to the 1.7 million reports the FTC received recording client losses of 1.9 billion dollars. Even with all these losses, the FBI believes undocumented and reported cases are even more. (*Federal Bureau of*

Investigation, and Federal Trade Commission, 2020). The financial cost of fraud to American society and its economy is substantially underrepresented. These federal agencies only report only reported cases to them alone, leaving state and law enforcement reports and complaints out (Blanton, 2012).

Data from the private sector also show other grave consequences. Between May 2014 and October 2015, More than 180,000 customer reports of computer-based fraud termed as Computer Tech Support Scam have been received by Microsoft, according to the company. According to the organization, 3.3 million Americans are victims of technical support scams each year, resulting in $1.5 billion in losses. *(US Senate Aging Committee, 2019*).

Another prevalent activity, a scam as a medium for fraud, is excessive unsolicited calls or what is term as Robocalls. According to the FCC, almost 2.4 billion robocalls are made per month, in which hackers use automated mass-distributable calls to entice unsuspecting victims to take actions they order them to take. They call based on reasons like expired car warranty that needs to be renewed, federal loan offers, lottery rewards. After these instructions request their targets pay some amount of money to enjoy the "goodies" they are offering from which they end up getting defrauded (Tu et al., 2016).

Government and private researchers have for decades studied several fraud trends that are common among senior victims. Seniors remain one of the single most affected demographics in the united states. The highest governing body on aging—U.S. Senate Special Committee on Aging—conduct has data on calls received from the aged who received spam calls. This data represents calls received from people all over the 50 states in America through the fraud hotline since its inception since 2013. Out of the complaints, the ten most frequently used avenues have been documented. However, this data is only limited to only data received through the government body.

Figure 1. 2019 Origin of Calls Received by the Aging Committee Fraud Hotline

Rank	Type of Scam	# of Complaints
1	Social Security Impersonation Scam	371
2	Robocalls / Unsolicited Phone Calls	123
3	Sweepstakes Scam / Jamaican Lottery Scam	107
4	Romance Scams	99
5	Computer Tech Support Scams	93
6	Grandparent Scams	51
7	IRS Impersonation Scam	34
8	Identity Theft	27
9	Debt Scams	21
10	Elder Financial Abuse	18

Figure 2. The U.S. Senate Special Committee on Aging's 2019 Top 10 Most-Reported Scams

2.1.2 Common Causes of Senior Fraud

Kircanski, Notthoff, Deliema, Samanez & Shadel (2018) studied that emotional arousal was also a cause of senior susceptibility to fraud targeted at them. In their research that observed older adults with the ages of 65 and 85, and younger adults between the ages of 30 to 40, the researchers used misleading advertisement and three emotional arousal conditions; high-arousal positive (HAP), high-arousal negative (HAN), and low arousal (LA) to assess the emotional state of each demographic in that circumstance. The researchers found that both the sample of younger adults and older adults were susceptible to scams, given that some participants were ready to purchase whatever item they were assigned to purchase. On the other hand, compared to the younger adults, the older adults were more s susceptible to scams. They observed that most people who were quick and excited about distorted deals engineers to harm them could learn not to make rapid decisions in the heat of the moment, saving them from potentially being easy targets of these scams. This study into the visceral factors like emotional arousal leading to victims being defrauded shows a broad trend of how targeted manipulative content is effective and efficient.

Grimes, Hough, Mazur & Signorella (2010) also observed that the lack of security awareness and knowledge is a significant cause of internet-related fraud, which has dominated as a major medium for scams. They observed this through a survey of older adults and younger people from universities. The two groups with varied internet experience answered questions related to privacy and trust, knowledge of security hazards, and data reduction. Their analysis wanted to understand if age and gender were a contributor to the people's knowledge and awareness security hazard. The study reposted that the younger generation had more experience and understanding of internet-related fraud than the older demographic. This was associated with the confounding difference in education and interaction with computers of the younger demographic compared to the older group. Whiles they no relationship between age and lower knowledge about these frauds in older, instead, they found that as older women age, they became less knowledgeable and aware of internet hazards. In their discussion, Grimes et al. (2010) recommended creative ways of raising awareness about fraud among the older generation.

In their quests to examine correlates of proneness to scams in older adults without dementia, James, Boyle and Bennett (2014) found that decreased psychological well-being resulting from loneliness and lowered cognitive function could be causatives of susceptibility to financial victimization in old age. While studying 639 community living seniors, the researcher found that

an issue arising from aging had a positive correlation with exposure and thorough look through adjustment of the model. This indicated that issues like social support, income, cognition, and the general well-being of their psychology influenced the way they become exposed to scams. With the ubiquity of social media and all these platforms, this study speaks to the modern-day issue of seniors needing more interaction with their families.

In agreement with James' findings on the cognitive-related issues, Judges, Gallant, Yang, and Lee (2017), after surveying 151 community-dwelling older adults and conducting multivariate assessments on cognitive abilities, trust tendencies, and personality inventories. Judges et al (2017) found that scam and fraud victims depicted lower levels of cognitive aptitude than non-victims and cognitive abilities were a high-level cause of scam victimization.

They highlighted those cognitive abilities take precedence over all the other attributes as the cause, pointing to the need to understand and develop preventive measures. Burnes et al (2017) ultimately suggest that training and engaging seniors' cognitive abilities will help prepare them for future victimization. This insight to calls for more understanding of people's cognitive abilities.

2.1.3 The Role of Cognition in Senior Fraud

In his article 'Why g matters: The complexity of Everyday Life,' Gottfredson (1997) describes it as "the ability to reason, prepare, solve problems, think abstractly, comprehend complicated concepts, learn easily, and learn from experience." Before this, Hunter (1986) summed up a broad set of aptitude around a person's verbal, quantitative, and technical abilities. But more accepted and widely used description by Seidenberg, Haltiner, Taylor, Hermann and Wyler (1994) also sums up abilities like language, visual-perceptual skills, verbal memory, visual-spatial memory, and Attention/concentration. Each ability has a distinct meaning below.

- Language- Ability to recall spoken direction, formulate sentences and identify relationships
- Visual-Perceptual – Ability to recognize objects based on their form, pattern, and color
- Verbal Memory - Memorizing verbally presented information
- Visual-Spatial Memory – The ability to imagine and hold everything in their "mind's eye."
- Attention/Concentration - Staying focus on the task at hand while ignoring distractions

Seidenberg et al. (1994) developed this widely accepted set of domains as part of the Multiple Ability Self- Report Questionnaire (MASQ) to be used for self-reporting and self-assessment of cognitive abilities. Judges et al. (2017) used the MASQ to assess the impact of cognition, personality, and trust in fraud victimization, making the various cognitive domains an excellent scaffold to build cognitive training and awareness.

Table 1. MASQ Items Listed by Subscale.

Language	
L1	When talking, I have difficulty conveying precisely what I mean.
L2	I can follow telephone conversations.
L3	I find myself searching for the right word to express my thoughts.
L4	My speech is slow or hesitant.
L5	I find myself calling a familiar object by the wrong name.
L6	I find it easy to make sense out of what people say to me.
L7	People seem to be speaking too fast.
L8	It is easy for me to read and follow a newspaper story.
Visual-Perceptual Ability	
VP1	I can easily fit the pieces of a jigsaw puzzle together.
VP2	I am able to follow the visual diagrams that are included in "easy to assemble" products.
VP3	I have difficulty locating a friend in a crowd of people.
VP4	I have difficulty estimating distances. For example, from my house to a house of a relative.
VP5	I get lost when traveling around.
VP6	It is hard for me to read a map to find a new place.

Figure 3. MASQ Items Listed by Subscale Developed by Seidenberg et al.

Verbal Memory

VM1	I forget to mention important issues during conversations.
VM2	I forget important things I was told just a few days ago.
VM3	I am able to recall the details of the evening news report several hours later.
VM4	I forget important events which occurred over the past month.
VM5	I forget the important portions of interesting gossip I have heard.
VM6	I forget to give phone call messages.
VM7	I have to hear or read something several times before I can recall it without difficulty.
VM8	I can recall the names of people who were famous when I was growing up.

Visual-Spatial Memory

SM1	After putting something away for safekeeping, I am able to recall its location.
SM2	When I first go to a new restaurant, I can easily find my way back to the table when I get up.
SM3	I have difficulty finding stores in a mall even if I have been there before.
SM4	I can easily locate an object that I know is in my closet.
SM5	I have difficulty remembering the faces of people I have recently met.
SM6	After the first visit to a new place, I can find my way around with little difficulty (e.g., restaurant department store).
SM7	I remember the pictures which accompany magazines or newspaper articles I have recently read.
SM8	I can easily pick out my coat from among others on a coat rack.

Attention/Concentration

AC1	I can do simple calculations in my head quickly.
AC2	I ask people to repeat themselves because my mind wanders during conversations.
AC3	I am alert to things going on around me.
AC4	I have difficulty sitting still to watch my favorite TV programs.
AC5	I am easily distracted from my work by things going on around me.
AC6	I can keep my mind on more than one thing at a time.
AC7	I can focus my attention on a task for more than a few minutes at a time.
AC8	I find it difficult to keep my train of thought going during a short interruption.

Figure 4. MASQ Items Listed by Subscale Developed by Seidenberg et al.(Cont'd)

2.1.4 Implications of Senior Fraud

The insight gathered from reading many articles, publications and judging from the statistics and interviews can establish that senior fraud is costing individuals and the government thousands of dollars. It is a critical problem confronting Americans that demand a preventive solution. Though there is no one size fits all solution to this problem, most of the target audience were defraud because of aging and cognitively declining issues, lacking awareness of the many schemes the fraudsters come up with, or lacking companions' meaningful interaction with the well-being. It is, therefore, crucial to develop a plan for educating and creating awareness about scams. Exploring ways seniors learn could open further opportunities in this space.

2.2 Approach of Learning

As senior scams and fraud continue to proliferate in the United States, learning a new way to prevent them should draw individual attention. It would be essential to recognize what learning is in general. There are several definitions of learning, but one of the most expansive definitions can be found in Illeris' (2017) book, *An overview of the history of learning theory*. He broadly defined learning as the outcome of a mental and interactive process between an individual and material and their social environment. Before Illeris, Brown, Collins, and Duguid (1989), also proposed that " learning is a process of enculturating that is supported in part through social interaction and the circulation of narrative, groups of practitioners are essential, for it is only within groups that social interaction and conversation can take place." Gross (2012), in his book "Psychology: The science of mind and behavior," suggested that learning is the system of gaining new or remodeling existing knowledge, habits, experiences, values, or decisions. (R. Gross, 2012)

Illeris (2017) further emphasized that humans' ability to learn and accumulate a vast amount of knowledge is one of the innate skills of human beings far more advanced than any other living being. Earlier research shows that this inherent ability is achieved through the complex cognitive functions of human brains. Illeris' research suggested that, while humans hold this inborn biological ability, society views learning as socialization, qualification, competence development, and therapy adding to the complexity and many-sidedness of learning.

2.2.1 Learning Styles and Strategies

To distinguish between learning styles and strategy, Escanero, Soria, Guerra, Silva and Gargiulo (2015) cited Esteban and Ruiz (1996) that learning styles refer more to the general approach to learning, and learning strategies are the specific steps learners take in their broad learning styles. Oxford (2003) also hypothesized that learning strategies are the exact behavior and thought process of a learner's style of learning. Researchers have studied learning styles for decades, making its definition vary a lot, but the most common definition is derived from the Keefe (1988) concept. Keefe hypothesized that "learning styles are cognitive, affective, and physiological traits that serve as relatively stable indicators of how learners perceive, interact, and respond to their learning environments." Gallego (2013) observed that several authors have theorized, and termed different learning styles and strategies, making the research in the area convoluted and confusing. Curry (1983) expressed a similar viewpoint, bemoaning the prevalence of muddled learning style conceptualizations and the scale of actions believed to be predicted by learning style conceptualizations.One of the most popular hypotheses is Kolb (1984) Experiential Learning styles list. Kolb hypothesized that effective learning is achieved when a person advances through a four-stage learning cycle. First, when a learner encounters a new situation or reinterprets an existing experience and progresses to a reflective observation of the experience, it leads the learner to learn from the experience and develop their own abstract concept. The learner then moves to the point of concretizing the ideas by applying them to the real-world experience. Kolb also notes that the learner can enter this cycle at any stage through a mindful and logical sequence in time. Woolfolk (2010) agreed with the findings of Dunn (1985) found that different learners preferred to learn through different modes: visual, auditory, and kinesthetic. However, Woolfolk proposed that learning styles should be learning style preferences, which further blurs the line between learning styles and learning strategies. In their early research, Mumford and Honey (1987) also classified individuals' learning styles into activist, reflector, theorist, and pragmatist styles. The activist engages in a variety of activities to learning. The reflector spends time absorbing information and prepare to think it through. The theorist analyses the precise structure of information, while pragmatists apply the concepts to address real problems. Schmeck & Ribich (1978), in their earlier research, also categorized the learning process into deep, elaborative, and superficial. Deep learners critically think about the information, while elaborative learners reorganize information to their understanding and superficial learners memorize the superficial

aspects of knowledge. Whiles all these learning styles provide an excellent foundation for parts of my research, Dunn (1985) and Honey & Mumford (1992) learnings styles together fit my research in the best way. Both theories with their classifications align very well with Cercone (2008), finding what adults learning techniques to consider when creating an online learning experience. Knowledge of prior studies on learning will mainly guide my work to select the most accurate learning style for adults digital learning environment. In instances like information architecture.

2.2.2 Adult Learning Theory (ALT)

Understanding adult learning has for decades been a subject of research interest for many fields. In '*An Update on adult learning theory*' Merriam (1993) highlighted that, due to generational institutionalization of learning and the common pitfalls in the pedagogical learning model for adults, it became necessary for researchers to understand the diverse forms in which adults learn. The quest to understand this area resulted in an oversaturation of findings and hypotheses in adult learning. She emphasizes that this popularity of the research area created so much confusion that adult learning can be described in one vivid definition, an opinion shared by several other researchers like Cercone (2008). However, Cercone considers ALT as the set of cognitive theories that guide how and what adult learners need in the learning experience. As earlier noted, common disparities between children and adult learning styles drew the attention of researchers who advanced studies and created the ALT. Pedagogy, which involves instructors set goals and objectives to impart to the learner, revealed its weakness when more adults desired to learn what the society considered formal. Their expectation, previous experience, and even time ((Tweedell, 2000) all affect their approach to learning, a model slightly different from the traditional classroom learning giving rise to a new theory termed Andragogy (Merriam, 1993). In her book *Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory*, Merriam (2001) quoted Malcolm Knowles' " Andragogy is the art and science of helping adults learn." It highlighted how Malcom generated a contrasting definition from pedagogy which he defined as "the art and science of helping children learn.". This derivation has over the years revealed how these theories are connected, showing how andragogy is not limited to adults alone but could also be applied to different ages because it considers the learner as having self-direction, possesses rich life experience, focused on learning to apply immediate knowledge and internally motivated (Merriam, 2001). It has even become more critical to understand and apply Andragogy in the

internet age as online and virtual learning continue to be a sort of agent by adult's worker and students with diverse responsibilities with minimum time (Cercone, 2008). ALT will be leveraged in this project to develop a holistic learning experience that promotes the empirical application of the knowledge gained, self-motivation and self-direction.

2.2.3 Learning through Education in the 21st Century

Learning hasn't evolved much over a millennium. For seniors of today, learning was an institutionalized interaction between a teacher and a learner—the trained teacher imparted the learner with knowledge. The standard view of learning was through education—formal education, which was the most valued way of learning (Merriam, 1993).

Schneider & Kogan (2008) and Mallet, Trudel, Lyle & Rynne (2009) suggest we can view learning through education from three main perspectives: formal, informal and non-formal. Formal education is the school-based teacher-student education(OECD,1996), Informal education is all things we learn outside of the structured school setting (Dib, 1988; Feng, Hossain & Paton, 2018) and Non-formal is a hybrid of the two, it happens at home, work place, hobby, etc. (Greenfield, 2009). This interpretation of learning through education became popular or standardize when the Organization for Economic Co-operation and development, OECD (1996) standardized informal and non-formal educations as valuable modes of getting require employable skills in the 21st Century. These evolutionary steps helped enabled some of the several mediums and styles of learning today in the internet age. With the advent of the internet, the digitization of learning and tools within educational technology has seen tremendous advancement. Online learning in the internet age has become an essential part of American education. More higher education institution continues to hybridize their mode of delivery by integrating online courses into traditional classroom learning making it convenient for adults interested in taking distance learning programs. Online learning generally helps bridge the distance and location gap. They are also generally inexpensive, demand less time and commitment compared to traditional classroom-based only courses. Beyond the regular online courses, Massive Open Online Courses (MOOCs), have also made online learning ubiquitous. They are structured to accommodate hundreds of thousands of students at a time from all over the world with very little to no fees and have adaptive nature and flexibility (Boyatt, Joy, Rocks & Sinclair, 2014). Popular platforms like Edx, Coursera, Udemy, Lynda students can earn basic certifications to master's degrees on some of these sites. All these

benefits make an online course a convenient choice for me to use for this platform. As suggested by research, the integration of the andragogical principle will be necessary and a critical factor in creating such a learning environment (Cercone, 2008; Conaway & Zorn-Arnold, 2016; Sato et al., 2017).

2.2.4 The Promise of Situated Learning

Context is essential in any learning experience. The ability to directly apply knowledge gained now to a situation in real life is one of the fundamental principles of adult learning (Knowles, 1970; Merriam, 1993, 2001). Activity and context here are grounded in the theory called situated learning. Situated learning suggests that learning needs to happen in the original context for which the knowledge is produced and that effectively gaining knowledge requires social interaction and collaboration (Lave & Wenger, 1991).

Situated learning, developed out of situated cognition which was theorized by Brown, Collins & Duguid (1989), suggests that learning should be immersed in activities and imitate real-world context. Herrington & Oliver (2000) and Herrington, Herrington, Oliver, Stoney & Willis (2001) suggest that to develop an effective eLearning course the instructor must develop real context and activities. The course should provide expert support. The content should encourage social interaction through group collaboration while promoting self-reflection and an opportunity for learners to articulate the knowledge acquired and its assessment. eLearning platforms like 'A Support Net' develop by Open University & Elucidat (2017) a complete overview of all learners' actions for their own inspection. There three major concepts that are examples of situated learning. Brown et al. suggested cognitive apprenticeships, which involves an expert mentoring novices in a real-world job setting. Vygotsky (1978) also proposed scenario-based learning which breaks up into part for the learner to apply it in a scaffolded experience. Dzunic, Stoimenov & Dzunic (2011) also theorized a new growing utilization of community of practice. Tasks in this form can physical or computer based, make this concept a very good option for my work.

2.2.5 Scenario-based and Game-based Learning

Scenario-based learning is critical for adult learning in the internet age. Being a core element of adult learning, context can be better developed with scenarios and experiences that

mimic the real-world experience. Clark & Mayer (2012) define scenario-based learning as "a preplanned guided inductive learning environment designed to accelerate expertise in which the learner assumes the role of an actor responding to a work-realistic assignment or challenge, which in turn responds to reflect the learner's choices." Clark & Mayer (2012). Scenarios-based learning draws on contextualized narratives that learners immerse themselves through role-playing to situate themselves in the narratives. Gjedde (2015) observed that exploring this kind of hybridized learning encourages people to be more immersive in their studies about a certain topic. Scenarios like narratives are best experienced in game-based learning environments. Game-based learning, an alternative to traditional learning, offers a variety of opportunities for a different context. Games like Trivia-based games have been a popular educational method most in family medicine (Akl, Mustafa, Wilson, Symons, Moheet & Schünemann, 2010). Games bring together a variety of elements that helps learners explore physically and mentally. Through game themes, components, and mechanics, players become too immersed in the gameplay's sense and cognition. Games like board games are popular among the senior community and have mostly targeted improving their mental skills. (Mortenson, Sixsmith & Kaufman, 2017)

2.3 Summary

To summarize, scams and fraud targeted at seniors can be associated with the victims declining cognitive abilities, general lack of security awareness, and limited social interaction, making them susceptible to fraud. Declining cognitive abilities being the major cause can be assessed and improved using five Multiple Ability Self- Report Questionnaire (MASQ) proposed by Seidenberg et al. (1994). While age, gender, and limited experience with technology are linked to a lack of security awareness. Enhancing this awareness begins with understanding learning strategies, especially adult learning techniques, which can pave the way to more creative education of the aging population. Strategies like game-based learning offer an opportunity to situate learners into the context and narratives of the scams. This continuous, immersive learning can strengthen people's awareness and cognition while allowing them to interact with their communities. This review mainly directs the research towards novel ways of enhancing the cognitive abilities of seniors while creating awareness around fraud. These insights also inform the next chapter as where the researcher explores existing solutions in the various topics in the literature review.

CHAPTER 3 METHODOLOGY

This chapter highlights the methods and procedures employed in this study. Given that this research is a design study, it used iterative research and design methods whiles adapting to changing circumstances that arose through the process. While some stood as a limitation, the researcher embraced them as opportunities through reflexive and iterative means to shape the outcome of this research. The research was initiated with secondary research, which involved multiple rounds of literature review and peer product review. The literature review aimed to understand the problem space. This involved a review of academic and nonacademic literature across numerous disciplines. The peer product review was conducted to assess existing solutions and products, closely related to the problem space to identify opportunities and gaps within them. Insights from the secondary research guided the researcher in the primary research. The Primary research was conducted to understand the user group and the experience with the problem space. Interviews and focus group discussions were conducted at this point. The interviews, which were intended as a snowball, formed part of the participant recruitment process for the focus group discussion. The focus group discussion brought together qualifying participants who shared their perspectives on questions asked. Data from both the interviews and focus groups were analyzed using thematic analysis. Ten themes were generated from the analysis, out of which the key design problems were framed. Three personas were modeled to reflect the problem and user needs. The next stage after the research and analysis was the design stage. This stage started with a brainstorming session of the solution through multiple sketching and ideation to generate ideas. Selected ideas were further developed, tested, refined, and communicated throw low fidelity prototypes, Hierarchical Task Analysis, and wireframes. The final solution was created as a high-fidelity visual design and physical product design. Next, the researcher conducted a design evaluation to gauge the effectiveness of the final designs and proposed experience. Insights from the data gathered were then used to refine and improve the overall design. The subsequent chapters expound on the details of this study's research and analysis, design, and evaluation methods

3.1 Research and Analysis Methods

Fraud is one of the commonest social issues found in different cultures, fields, and geographies. It has been documented extensively in several pieces of literature across different disciplines and academic settings. Conducting an initial review of existing literature in Chapter 2 allowed the researcher to study the past, current, and future state of the problem space, while assessing the key questions and methods to help in addressing fraud, and fraud targeted at seniors. Well-grounded and quality academic research situated in-between the past and the present advances knowledge in the specific, and is a good source for a literature review (Boote & Beile, 2005; Webster & Watson, 2002).

Starting with an exploration into what fraud is and its impact on society, a description of its impact on vulnerable populations like seniors, the causes, effects, and existing preventive measures, and the way forward. Though the literature in this space is scattered across multiple disciplines, they all attempt to address the most relevant human issues related to fraud. Some leading causes of fraud victimization among seniors were related to cognitive decline, limited awareness, experience with the everchanging mode of the target, and general lack of social interaction. Following that, other literature suggested innovative approaches to enhance the victims' cognitive abilities, raise awareness about fraud, and open conversations around it.

After the initial literature review, several peer products and solutions in the space were reviewed to gain inspiration for gaps and opportunities, which was documented in Chapter three (3). Peer product review, such as competitor analysis, involves assessing existing products with similar features or addressing some part of the problem or context of the discussion. Since the cognitive decline was identified, it was important to explore a variety of solutions and products from different use cases. Three spectra of products were reviewed: digital games, cognitive training apps, and board games. The details of the review can be found in Chapter 3.

Focus group discussions were conducted to obtain a personal and contextualized understanding of the situation, allowing the target audience to share their personal lived experiences, which heavily influenced the research direction. Due to limited time and lack of senior volunteers, only one focused group was conducted. Participants were recruited two weeks before the Focus group via the Life and Enrichment Office of University Place. Recruitment details were posted on the notices board in the building. Still, the researcher had to visit the residence and

collaborate with the Life and Enrichment Coordinator to conduct an informal snowball interview while explaining the details to potential participants.

All sampled and selected participants were cognitively active as per information from the institution. Nine (9) participants were recruited, but seven (7) attended the focus group. Seven Caucasian senior adults between ages 82-88 participated. Three of the participants were male, and four were female. All participants had been targeted within the last two years. Three of the seven participants were victims who had lost a combined worth of seven thousand and sixty dollars. A female victim who lost sixty dollars later recovered her money from her bank. Both methods being primary research tools, helped the research directly view real people's problems with real issues (Rabiee, 2004; Ryan et al., 2009).

The informal interviews provided important details about the context, so it was leverage as part of the analysis. Conducting in-person interviews allows the researcher to validate the participants' views and request clarification, making it a useful source of data (Opdenakker, 2006). Conducting interviews made the research data richer and authentic for the final insights to drive the design direction.

Next, after the initial research, the data were analyzed for relevant insights using Thematic analysis. The thematic analysis gives you a lot of versatility in analyzing data, making it easier to approach vast data sets by categorizing them into broad themes (Clarke, Braun & Hayfield 2015). The analysis started with a transcription of the primary research data, familiarizing with the data and identifying items of potential interest, generating initial codes, searching for themes, reviewing potential themes, defining themes, and producing the report (Braun & Clarke, 2006).

Using Atlas.ti, the researcher conducted open coding and axial coding to generate themes common with the triangulated primary and secondary data: interviews, focus group discussions, and literature review. Triangulation allows data to be validated by comparing results from several sources. It verifies the accuracy of results obtained using various instruments. It increases the chances of controlling, or at the very least assessing, some of the threats or multiple factors that influence our outcomes. (Carvalho & White, 1997; Denzin, 2017; Kennedy, 2009). After the themes were generated, the insights were used to model three personas to reflect the user group's user needs, motivation, and frustration. Ultimately the design challenge was framed for the initially formulated themes as; “Design a technology-mediated cognitive training solution to promote fraud awareness and social interaction." All the user studies and analyses can be found in Chapter 4.

3.2 Design Methods

The design phase continues after research and analysis, which was detailed in Chapter 5. This stage started with brainstorming sketching to explore and generate ideas around the problem statement. Walny, Haber, Dork & Sillito (2011) suggest that early sketches help rapid idea generation and are an excellent vehicle for the ideation process. The benefits of brainstorming sketching are enormous at this stage; they help designers not to get highly attached to a single idea, giving them room to explore wide-ranging ideas. Sketches were often used to convey several concepts to the target audience and experts for critiques, based on which the final concept was selected. They were assessed based on their feasibility and accessibility. Finally, one concept was chosen: 'a trivia board game,' and was developed further into three variants. Data for the trivia was sourced from real-life experiences. Individuals and organizations shared on the Better Business Bureau's scam tracker platform. BBB is a non-profit organization dedicated to promoting market trust and serving as a mediator in conflicts between customers and businesses (Kurt, 2020). Each variant was playtested, and the results were used to enhance the final version. The test focused on their learnability, playability, narrative, and game mechanics. The final direction: 'an app-mediated board game,' had two parts. A wheel which is a physical product, and a digital game which is a mobile application for iPad. Several mockups were developed and iteratively improved to develop the physical product until the final product was achieved with the considerations for the iteration centered around the interactivity between the two systems and narrative. The Hierarchical Task Analysis (HTA) for mobile app design began concurrently with the product design. HTA is used to describe and explore the critical task an application user needs to perform to achieve certain goals. It breaks the tasks down into high-level goals, subgoals, operations, and plans. For game design, creating the HTA is one of the most critical activity, to ensure every aspect of the game experience is well touched (Annett, 2003; Cheng & Johnson, 2007; Machado, Gopstein, Nealen & Togelius, 2019). The HTA also helped the researcher explore the scope of the prototyping and other edge case narratives that could be considered. After analyzing the game flow within the HTA chart, I created the wireframes of the design, which was followed by the Visual design and interactive prototype for the design evaluation.

3.3 Evaluation Methods

To assess the efficiency and efficacy of the design, five experts I recruited to conduct a heuristic evaluation of the design, which was detailed in Chapter 7.

Evaluating the usability and functional design is crucial to an effective design in the user-centered design process. Some methods include user testing, GOMS, Cognitive walkthrough, heuristic evaluation, of which some Interface design flaws, user experience problems, and functionality issues are identified through these methods. While empirical user testing or approaches that incorporate users directly in the testing offer a much contextualized and situated understanding of problems and issues, discounted methods like heuristic evaluation also support the expertise of designers who also understand design principles and good design. Heuristic evaluation is affordable, fast, and requires little effort to organize but provides great benefits (Nielsen, 1995, 2005). As a result of these benefits, heuristic evaluation became a good method to evaluate this project. However, assessing the user group was interrupted due to the global COVID-19 pandemic. Given the context of the study, five (5) designers were recruited, which Jakob Nielsen and Thomas Lindauer suggest as a good number to identify key usability issues for this study. In heuristic evaluation, a set of predefined heuristics are used in the assessment. Several design heuristic researchers and designers used the most common one being Nielsen's 10 Heuristics, but they also create new ones through a combination of the existing heuristic literature review. While most of them fit the digital design domain, not all can effectively identify or communicate issues (Quiñones & Rusu, 2017). This study drew from three different sources from; Hochleitner et al., 2010, Nielsen,1995 and Takatalo, Hakkinen, Kaisteinen & Nyman, 2010. for this evaluation. The three sources of heuristics focused on game design, interaction, and user interface design. Evaluators also critiqued a design based on the severity of the issue. The severity ranking system follows Nielsen's proposed severity scale. It is defined based on three core factors, the frequency, the impact, and the persistence of the problem. They were combined on a single rating scale between 0 - 4. Ultimately, problems and recommendations were analyzed for the key insights to use to refine the design.

CHAPTER 4 PEER PRODUCT REVIEW

This study reviewed multiple existing products to understand better the problem space and explore the gaps. This chapter reviewed the products, gathered the insights, and leverage the opportunities to address the problem.

4.1 CogniFit

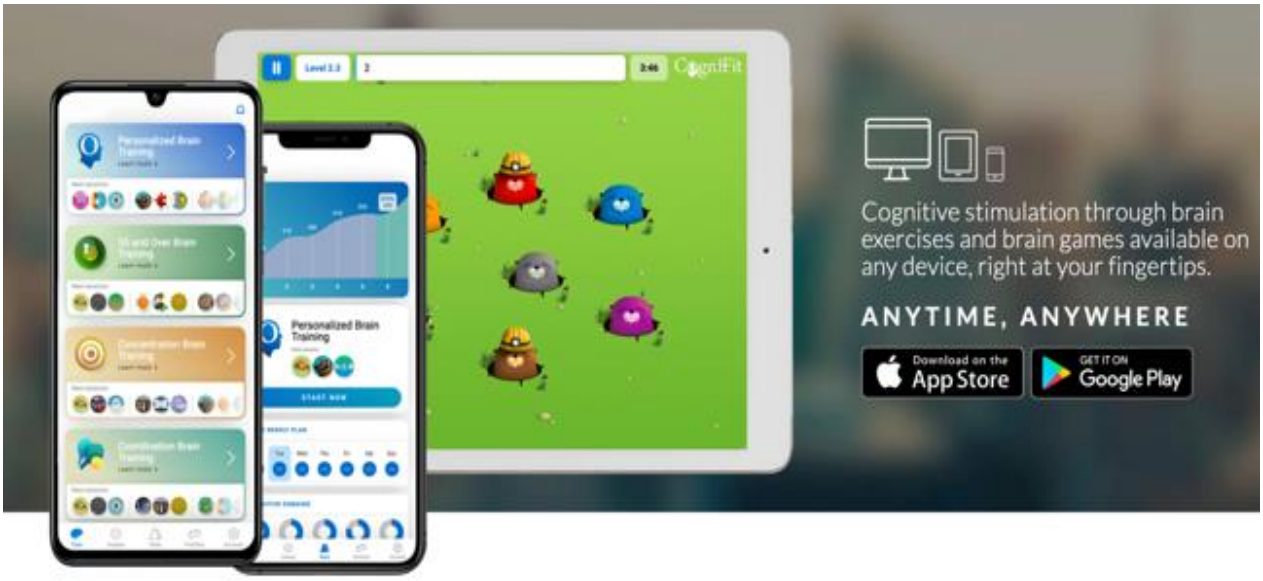

Figure 5. CogniFit Mobile Application and Tablet

One of the products reviewed was CogniFit, a leading immersive mental game that uses customized everyday training to help stimulate cognitive skills. The application compares the user's cognitive abilities to those of the rest of the world and keeps his/her mind active with brain challenges, memory games, puzzles, and several clever games. CogniFit is a paid application that allows players to unlock more challenges as they play. The application can assess cognitive skills and evolution through gameplay. The application is cross-device and platform on mobile and tablet. The product is fun to play with. The design is visually accessible for a wide range of users. Most of the games are a bit convoluted and could have to be tailored to a specific context for easy discoverability. A free trial version would also allow potential users to explore the product offering

before deciding to pay. I generally think it is possible to tailor the cognitive training game to deliver fraud awareness information but focuses on a few activities that users can play and get better at.

4.2 Lumosity

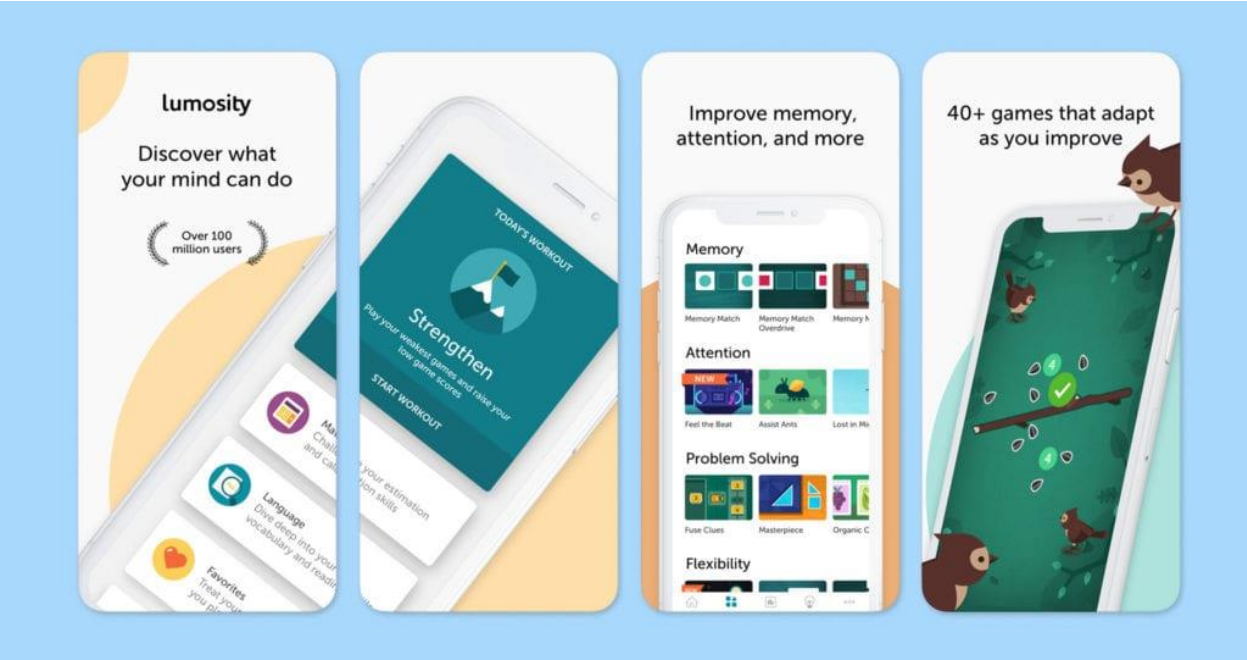

Figure 6. Lumosity Interface Screenshots

The cognitive training program at Lumosity is a fun, immersive way to train the brain and learn about how your mind functions. Lumosity's software consists of science-based games designed to exercise memory, concentration, speed, versatility, and problem-solving skills. It has a freemium business model and is used by over 100 million people worldwide. Like CogniFit, Lumosity has a variety of games that players progress through as they improve. Lumosity, on the other hand, has minimal customization options, and player progress data isn't always straightforward. Furthermore, most of the games are generic games that have been assembled into this scheme. The games on this platform aren't extraordinary, and they're also not particularly social, as there's little or no shareability, limiting family and friends' access to players' progress. The narratives around most of the games could be improved to be more specific and curated towards the elderly.

4.3 CogniPlay

Figure 7. CogniPlay Mobile Application and Tablet

CogniPlay is a tablet-based cognitive training gaming platform that provides mental stimulation through activities targeting several different areas of the cognitive domain, with its primary audience being the senior population. CogniPlay is a unique cognitive training system developed out of extensive academic research and improved over time through usability testing. This game was developed to serve as the first step in a senior's encounter with modern technical devices and interactions. Even with all its benefits, the game is elementary, and the visual design is too simplistic. CogniPlay is an excellent example of the cognitive train. There is an argument to be made for it because it is for seniors. Most seniors are recently getting acquainted with modern applications so that some improvement can be made to catch up with their adaption.

4.4 Brain HQ

Figure 8. BrainHQ Interface Screenshots

BrainHQ is a systematic training framework that enhances brain output from the most fundamental aspects of perception to the most nuanced aspects of memory, attention, and cognitive function. BrainHQ has an extremely gamified product with instant gratification at every point in the application. The application has an excellent interface, but most of the colors do have accessibility issues. Most of the colors used are extremely hot and distracting. The applications have a very fluid micro-interaction. Though the application intends to train the brain, most of the activities are somewhat generic and don't seem to center around cognitive training. BrainHQ has an android and iOS application, making it a cross-platform application. It has a freemium model that allows users to try the product but must pay as they try other features with the application.

4.5 Elevate

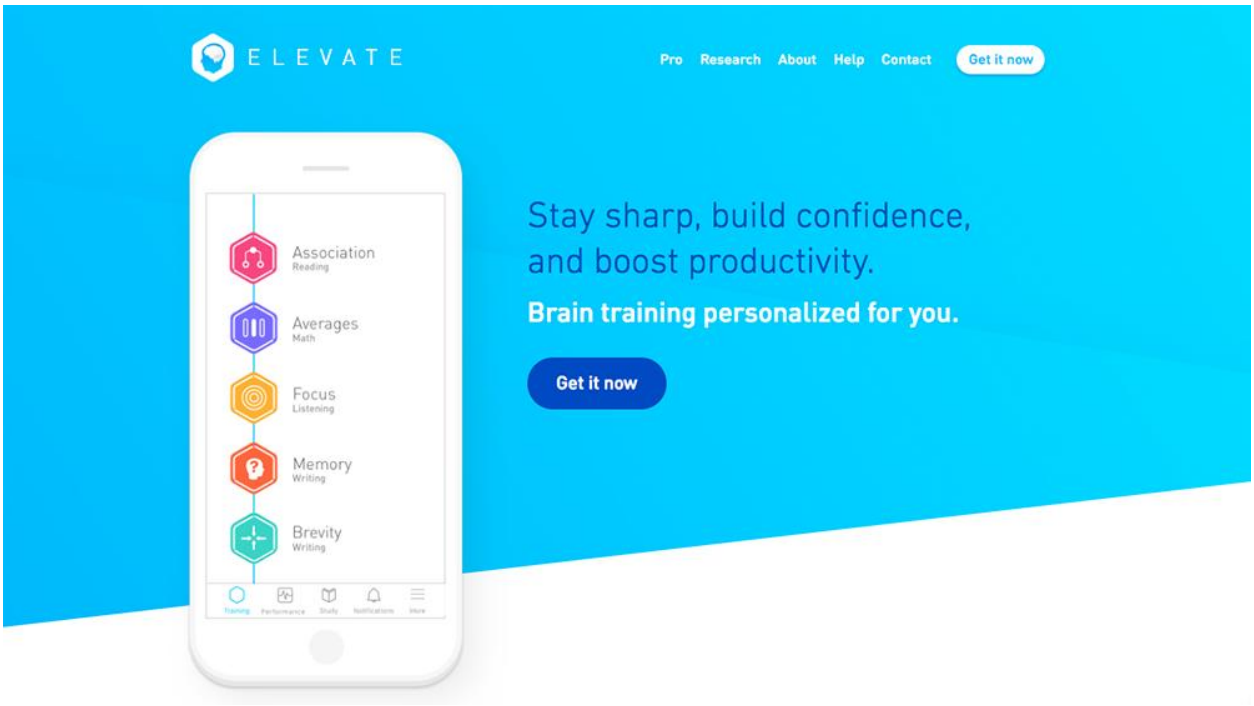

Figure 9. Elevate Interface Screenshots

Elevate is a brain training application that aims to enhance concentration, speech skills, processing speed, memory, math skills, and other cognitive abilities. Elevate is a program that will help you remain focused, gain trust, and increase productivity. Elevate has a very simplified gameplay and interface. The activities are curated on the exact aspect of cognition you want to improve, making it very easy to navigate and minimizes spontaneity within it. Elevate doesn't have an online platform, and it's limited to mobile. Elevate has been certified by the Pearson Learning community as one of the best cognitive training applications. Elevate has a color interface, but the micro-interaction is a little distracting at times. Key learnings from Elevate center around how they try to improve speech which is vital for seniors who attempt to communicate their own experience when targeted.

4.6 Game of Life

Figure 10. Game of Life Product Overview

Following the primary research and analysis, the researcher looked at board games as they emerged as a potential solution for this study. The first product that was reviewed was Game of Life. Game of Life, better called Life, is a board game that imitates a person's journey through life, from college to retirement, completing work, getting married, and giving birth. Life can be played with 2 to 9 players. The game includes 3-D elements and a spinner that must be assembled. However, the game's setup is simple, and the gameplay is simple as well. Players interact with narratives around all these activities and must make choices, interact with other players, and spends the given cash on. Game of Life provides a unique experience that most players of all ages enjoy, the roleplaying effect. The narratives are simple and exciting.

4.7 Mansions of Madness

Figure 11. Mansions of Madness Product Overview

"Mansions of madness is a cooperative, app-driven board game of horror and mystery that takes place in the same universe as eldritch horror and elder sign." The game has different versions, with the last one being the Mansions of madness second edition. The game ranges from one to five players and has to be played through an interaction between the board game and the mobile app. This game presents an excellent opportunity for a diversity of narratives and interacting with the physical product and digital product.

4.8 BBB Scam Tracking Platform

Date	Scam Type	Postal Code	Dollars Lost	Details
Feb 28, 2020	Fake Check/Money Order	33510	$0.00	View
Feb 28, 2020	Other	37363	$720.00	View
Feb 28, 2020	Healthcare/Medicaid/Medicare	34688	$0.00	View
Feb 28, 2020	Phishing	97225	$0.00	View
Feb 28, 2020	Other	35757	$0.00	View
Feb 28, 2020	Employment	85747	$1,000.00	View

Figure 12. BBB Scam Tracking Website Interface.

The Better Business Bureau is a non-profit association that promotes ethical business practices. It uses its rating system to help customers in the United States and Canada recognize and recommend trustworthy businesses, brands, and charities. It also has a scam monitoring site where people can report contacts with people or companies that defraud them. The real-time user-generated content is organized into categories based on scams, which can be explored using a map and point of interest, as well as a categorized filtering method. The stories posted on the site depict classic scenarios and common scams that most ordinary people fall for. This platform's narratives can be used to construct realistic situations from which people can benefit.

4.9 Some General Takeaways from Existing Products

All the products explored in this review presented opportunities that could be leveraged in the potential solution, while most of them do not fill the gaps, or do not entirely address the problem around cognitive improvement or fraud awareness. Some general takeaways include:

i. Narratives and real-life stories could have a great impact on people as a tool for awareness and sensitization.

ii. Customizing the experience around user's cognitive ability: For most of the products reviewed in this study, one key problem they most had was their limited ability to access the current cognitive state of the user.

iii. Tailoring the cognitive training to fraud awareness training. There is still an unexplored space around fraud awareness in the creative space. Most preventive contents are around blogs and articles.

iv. Accessible visual design: Given the target audience, implementing accessible design and design language is critical to the solution's success.

v. Mobile/Tablet first design: Through the review, one of the insights gathered was that most solutions tried to focus on a mobile device. This also stems from the mobility and the ease of use that mobile presents.

CHAPTER 5 USER INTERVIEWS AND FOCUS GROUP

This study implemented two primary user research methods: user interviews and focus group discussions. This chapter discusses the data collection procedures, analysis method implemented, and key findings generated from the data.

User interviews and focus group discussions are some of the most effective user research methods for collective qualitative data. They offer the researcher the opportunity to inquire and drive the conversation about the user experience. The researcher also has the chance to seek clarification when a participant is clear or makes an error (Ryan, Coughlan & Cronin, 2009). This interview study was designed as a snowball recruitment method to guide the researcher to find other participants to participate in the focus group. Also, it was an opportunity for the researcher to introduce the study to potential participants. A Focus group is also a good approach for capturing rich data from a knowledgeable group of participants whose lived experience is relevant to research (Guest, Namey, Taylor, Eley & Mckenna, 2017). Focus groups are critical in obtaining the opinions of multiple participants at a goal with limited time and resources. Making both methods and data gather very powerful and rich. The population for this research was purposefully sampled.

5.1 Interviews

Figure 13. Researcher interacting with an interview participant at the University Place Auditorium

The researcher conducted nine informal interviews with participants from the University Place Assisted Living Center: six were females, and three were males, all within the ages of 70 – 80 years. The aim was to inform participants about the research, recruit them for a focus group, learn about their experiences with fraud, and eventually generate leads for future focus group participants. The researcher explicitly asked about their personal experiences with scams and fraud, as well as whether they had any stories about other people, they knew who had been scammed and if they could link the researcher with them. Participants were recruited through the Life and Enrichment Office of University Place. Over two weeks, recruitment details were posted on the notice board in the buildings, and interested participants reached to the life and enrichment coordinator to participate. After their names were drafted down, the researcher visited the site to conduct the recruitment interviews. The researcher approached the interviews informally to make participants open up to discuss their experiences. Each interview varied from twenty minutes to thirty minutes. Upon their permission, the researcher audio recorded the conservation and took notes. In the end, all 9 participants qualified to participate, but only 7 attended the focus group. All participants were Caucasian older adults between ages 75-80. Three participants were male, and four were female. All participants had been targeted within the last two years. Three of the seven participants were victims and had lost a combined worth of Seven Thousand and Sixty dollars. A female victim who lost Sixty dollars recovered her money from her bank. Questions can be found in Appendix 1. Some important takeaways from the interviews were:

i. The family was the first source from which seniors sought scam and fraud-related information.
ii. Seniors were comfortable discussing fraud-related topics with family, among themselves, their caregivers, and religious figures in their lives.
iii. Seniors, particularly retirees, were far more advanced in using mobile and digital technologies than they get credit for.
iv. Fraud and scams targeted at seniors citizens' care centers were mostly through robocall and random computer screen pop-ups.

5.2 Focus Group

The focus group session followed two weeks after the interviews and recruitment. Due to limited time, lack of senior and assisted living organization volunteers; only one focused group

was conducted. All participants were cognitively active as per information from the institution. As highlighted in the previous chapter, two out of the nine recruited participants didn't make it to the focus group.

The focus group was conducted at the University Place Auditorium on Thursday, *March 5, 2020, at 4:30 P.M*. University Place was chosen as the research site because of the phenomenon that occurs there and because of the convenience of the participants. Owing to the time factor and other events at the venue, the researcher met participants at the welcome area before they went inside the conference room.

Figure 14. Focus Group Session at the University Place Auditorium

Data from this initial session was included in the analysis because of the relevant insights. When the session formally started, participants sat in a round chair formation whilst the researcher stood in the middle. An Ice breaker introduction was initiated to make the discussion less formal. The researcher started by giving details into the purpose of the study and its relevance to them and society. The researcher encouraged participants that there were no wrong answers but rather different points of view. Upon their consent, the researcher started recording the interactions and conversation as it began to. The researcher also encouraged them to talk in turns to facilitate better transcription, but not all participants followed the rules. While not everyone spoke up in response to any challenge, they agreed with the opinions of others by merely saying 'Yes' or 'No.' Following

the interview, I transcribed the data and wrote brief thoughts on the discussion and the insights I could personally gather from the focus group. Both the interview and focus group audio interviews were manually transcribed. Some insights from the focus groups included

i. All seven participants agreed that they had been targets of some form of fraud through robocalls, and four of them said they've learned not to pick calls from new numbers.
ii. When asked where they learn or seek information, four of the participants said they learn new things from their families, specifically their children, and the other three said they either learn on the television or the internet.
iii. All seven also emphasized how they enjoyed meeting up with each other during group games at the care center.
iv. Four out of the seven had tablets where they chat with their families, while five out the seven had computers in their rooms.
v. More people within this focus group were comfortable learning more about fraud-related information through group conversations or during playtimes.

5.3 Data Analysis

The data analysis method that was employed in this study was thematic analysis (TA), primarily a method for finding and interpreting trends of meaning across qualitative data. In this analysis, the researcher triangulated the literature review, interview, and focus group data synchronously. The main analysis stages involved familiarizing with the data and identifying items of potential interest, generating initial codes, searching for themes, reviewing potential themes, defining themes, and producing the report (Braun & Clarke, 2006). First developed by Gerald Holton in the 1970s (Merton, 1975), this recent approach and stages of TA developed by Braun & Clarke (2006, 2013) aligns very well with our data collection and lends the method of telling a descriptive story on the data about the research questions. Driven by grounded theory, thematic analysis helps reveal and interpret phenomenon rather than test them (Charmaz, 2006). Instead of approaching a theory that needs to be proven, the researcher starts with a general concept of a study and constructs themes and findings based on interactions with the data and previous studies. The outcome of this research method are propositions and an ultimate finding.

5.3.1 Familiarizing with the Data

As suggested by Braun & Clarke (2006), I spent a considerable amount of time was spent familiarizing myself with the data. This stage required a deep immersion to understand and identify the potentially interesting parts of the data. However, since two of the datasets were primary data, 'interview and focus group,' the researcher had to consider what insights from the literature review supported or discredit each other. The researcher also structured the transcription to improve the conversational tone. Interesting topic areas identified were particularly around potential solutions and how seniors learn new stuff.

5.3.2 Coding

The researcher then went on to categorize concepts and themes that were arising from the data after becoming acquainted with it. Atlas.ti 8 Windows was used for this coding stage. The codes were generated as labels that described the text or its connotation. This was more of a descriptive coding. The text was consistently reviewed and compared as the researcher conceptualized what it meant or aspired to be within the overall data. (Saldaña, 2015). In this initial coding, 52 codes were generated for the next stage.

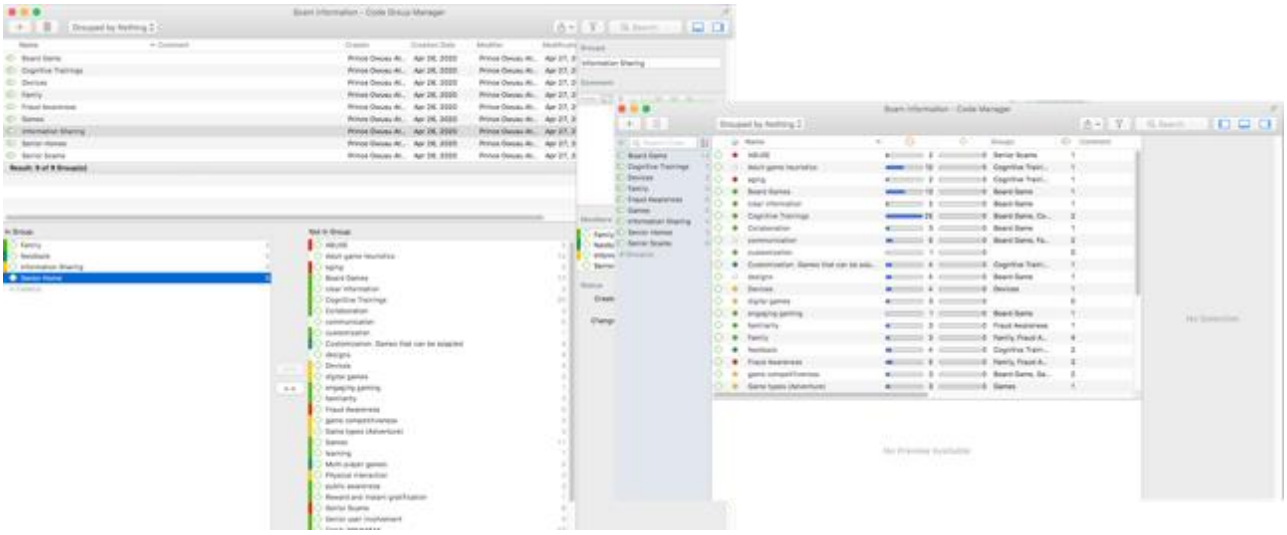

Figure 15. Atlas.ti User Interface Showing Groupings of the Open Codes and Their Corresponding Categories

5.3.3 Generating Themes

Themes are termed as a code group in Atlas.ti 8 Windows. Code groups were generated simultaneously with the initial coding. The themes were formed based on relationships and patterns between the other codes (Saldaña, 2015). The researcher reviewed memos from the initial coding and compared them with the code text whilst iteratively developing text for the themes as a category. Twenty-three themes (code groups) were formed out of the initial code. For example, all seven participants agreed that most of the "*group interactions*" happened before dinner and during "*in-house activities*" like games. Both codes, "group interaction" and the "in house activities," were then categorized as "*social interaction*" because both activities fostered interacting in groups. Participants acknowledged that before being served their food, they had to come down and sit around the table, and they had the opportunity to talk to each other.

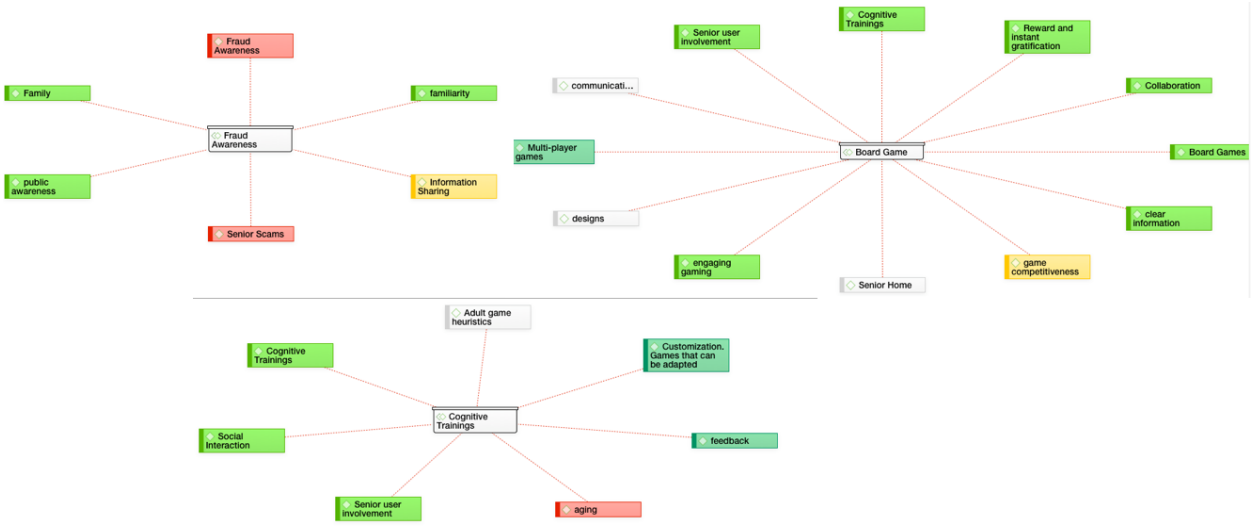

Figure 16. Twenty-three Code Groups (sub-themes) Connected to Some Three Common Themes

5.3.4 Reviewing Themes

After grouping the initial codes into themes, the researcher engaged the data again to reflect and establish if the data supported the themes. Whilst this was initially done simultaneously in the previous stage, reviewing it again ensured the codes were not overlapping and to find other

subthemes within the initial themes. Also, the themes were reviewed to see if they aligned well with the entire data and even the research questions. The next step was to bring the theme together to form a broad cohesive theme and define subthemes. All preliminary themes were collapsed, and new ones were formed to reflect a broader context. All the codes were distributed amongst themes under similar subthemes. For example, "*games"* and "*fraud awareness"* all went under "*Gamifying fraud awareness communication"* because they all fell under creative and engaging ways to help seniors learn. Three high-level themes were ultimately formed out of the twenty-three. Six new subthemes were also formed in order to group several codes under them. Each subtheme also offered a layer of meaning to the codes. Since multiple codes were brought together and others eliminated from the initial code, it indicated how patterns and trends were generated from the data.

5.3.5 Defining and Naming Themes

With three themes emerging from the data, it is at this stage that a description is given on what they mean and give some context about them.

Theme 1: Gamifying fraud awareness communication

Sub-theme 1: Creating a fun way for seniors to learn -

Most of the solutions that emerged out of the code centered around gamifying the learning experience for seniors. Whilst creating awareness is an important activity, it has to be delivered and consumed in a fun way. After five of the members agreed that they play games to keep their brains active, it was apparent that relevant information and learning had to be delivered either as a game or a gamified learning experience. Also, all participants agreed to have played board games at the senior home, and some also played games on their computers.

Sub-theme 2: Playing board games -

Throughout my interaction both within the interviews and focus group, participants kept referencing group board games and picture puzzles as of the activities they enjoyed playing. Given that board games were a game staple in American homes, it made sense as the context of the discussion. Five out of the participants revealed they enjoyed playing Game of Life and Monopoly.

Also, the physical interaction with board games along with the social interactions within them is important towards awareness communication.

Theme 2: Social Interaction

Sub-theme 3: Finding ways for family and friends to interact -

Loneliness is one of the causes of scams targeted at seniors. Fostering social learning and interaction is one of the important solutions to senior fraud. Creating solutions and establishing ways for multiple people to interact with the solution at a time is essential. Cognitive interventions in the form of games should be developed considering family, friends, and caregivers as users since they act as motivators and guides through the gaming and learning experience.

Sub-theme 4: Seeking information from family and the world -

Seniors are more likely to talk to their immediate families i.e., children, the spouse who visits and calls them frequently on topics of scams than others. Due to proximity and frequency, they find it convenient to open up to them about how they've been targeted or not. Commonly, seniors find it challenging to articulate their experience, so it's relevant to know family members can help them do this. Due to their constant interaction, immediate family members can communicate risk and the latest scams to seniors. Five of the seven participants talked to their families about everything. When questioned further, four out of the five had spoken to their families about been targeted by scams at the senior home. Two of the five mostly get their education on scams from their children. One participant highlighted that though he spoke to the Life and enrichment manager, his son is the one he expected to calm him down in such a situation.

Theme 3: Promoting software mediated solutions

Sub-theme 5: Seniors using a technology device -

Seniors are one of the largest demographics to be using computers today. They play games and chat on community platforms like Facebook. All seven participants agreed that they had computers in their room, and they talk with their families and play games like solitaire on them. Most of the time, they access their bank account. More broadly, they used it for anything regular people used it for.

Sub-theme 6: Opportunities for multiple solutions -

Computer-mediated solutions offer an array of opportunities over regular physical solutions. Essential amongst them is the ability to bundle multiple solutions into one software system and the ability to improve or change the data at different periods. For example, when considering the ubiquity of mobile apps today, it has a lot of functionality and can be updated multiple times with variations of solutions. It also offers the ability to be tailored around each user's experience. Offering solutions around this methodology would also be cost-effective and enhance social and virtual interactions with family and friends. For instance, five of the participants knew how to play solitaire very well and were comfortable having a solution like that.

5.4 User Modelling - Personas

To communicate key insights and the emerging users from the research, I drafted three personas to reflect the user stories and the users' scenarios, goals, needs, and motivation. The core elements of the personas were based on the nature of the study and the importance of the information that needed to be conveyed. Personas are mainly used to create fictional characters. They put a human face to the term 'user,' making it easy for designers to be more empathetic to their problems and narratives.

The three personas emerged as three distinct users who will interact with the potential solution.

Figure 17. Persona of Family

The first category is family and friends. They are the people with whom the seniors can have the most direct contact. They are also the individuals who would possibly identify the solution present to the seniors.

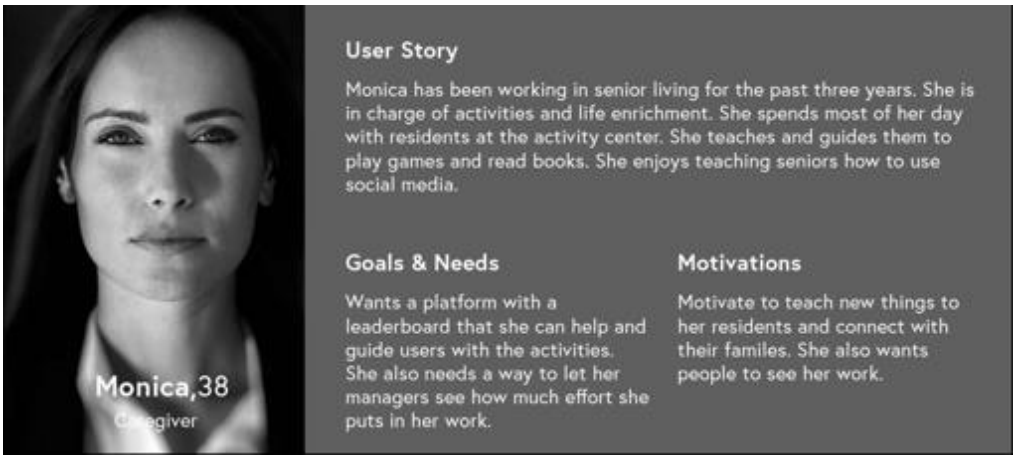

Figure 18. The Persona of a Caregiver

The caregivers, also known as care center personnel, are the second group. They have a significant impact on the lives of the elderly. From their day-to-day needs, either at home or at the care center, are usually supported by their individuals. Since they spend so much time with these seniors, they can also be sources of fraud awareness knowledge.

Figure 19. The Persona of a Senior

Finally, they are the seniors themselves. They are the ultimate beneficiaries of the final solution of this study. Their needs are not somewhat apparent to them themselves. A family or friend can be the individual who identifies their needs.

CHAPTER 6 DESIGN PROCESS

Following the User-Centered Design (UCD) approach, the design phase iteratively comes after the problem identification. Driven by the understanding and incorporation of the user needs at every touchpoint of the design process, UCD starts with the identification of the problem through research, brainstorm, and iterative refining of the ideas through testing and evaluation, then followed by the design, evaluation, and refinement (Nielsen, 2005). The thematic analysis has informed the problems identified from the three datasets: literature review, interviews, and focus group discussion. The following document discusses the design process in detail and highlights the key trades as the research changed over time.

6.1 Defining the Problem Statement

Fraud prevention, which was the focus of this study, drove the research towards two directions: understanding the problem better through existing literature and from the target audience (victims) and exploring solutions and opportunities from those sources. The themes generated reflect the focus of the opportunities for addressing the problem. The six themes reflect opportunities that can work as solution considerations or be independent leverage as solutions. Theme one, which talks about gamifying fraud awareness communication, centers around creating a fun way for people to communicate fraud. Cognitive training at that age also must be fun and somewhat easy for players to navigate. Since platforms like Better Business Bureau didn't offer a marketable way for people to discuss what other people posted there, this would be an opportunity to use the stories people shared to frame situated and more contextualized conversations about fraud. While exploring questions around gamification, the interest shown; the experience around board games were also interesting opportunities to explore. These two also discuss the importance of social interaction in the potential solution. This theme also stems from all the benefits seniors gain from interacting with family, friends, and acquaintances over time. Most seniors felt alone during the old age, making them susceptible to new fake virtual relationships that seek to take advantage of them. Creating a solution that leverages social interactivity, either in-person or virtually would open the door for family and friends to find fun ways to interact with fraud and other educational information. The last theme also reveals the considerations that pertain to

digitizing the solution. An app-mediated solution, as highlighted earlier, would open remote interactions, multivariate solutions, and even the ability to track cognitive training progress. Since all these identified opportunities open up great options, it was a great way to contextualize them through user stories by modeling them along with their pain points. To bring together users' needs and design requirements together. The problem statement was defined as: "develop a software mediated fraud awareness board game that helps improve cognitive abilities and promotes social interactions."

6.2 Designing the Physical Product

Board games are broadly considered an easy avenue to use the game and gamified experience to teach people complex topics for which fraud information is one of them, particularly when communicated to a rather aging population. (Castronova & Knowles, 2015; Torrente et al., 2011) Board games have three common components; theme, components, and mechanics. The theme is considered as the general understanding of the game and the stories and narratives within. The design and aesthetics of the game are part of the thematic experience needed to be considered in the design. This is where the Player establishes an emotional connection to what goes on in the game. The mechanics also explore the general rules, interactions, and strategies of play within the game as a system. The game balance, competitiveness, or cooperativeness are all established through the game mechanics. The components, which are the physical manifestation of the game, consists of everything that comes with the game. The board, cards, dice, and all other elements within the game box. (Beltrami, 2020; Silverman, 2013).

Given the explorative nature of this study, the brainstorming of the game was initial through sketching. Sketches serve as an easy pathway to explore several concepts quickly and fast. Several sketches were explored, but four concepts (stated below) were selected and refined more.

Concept 1: Into the Past

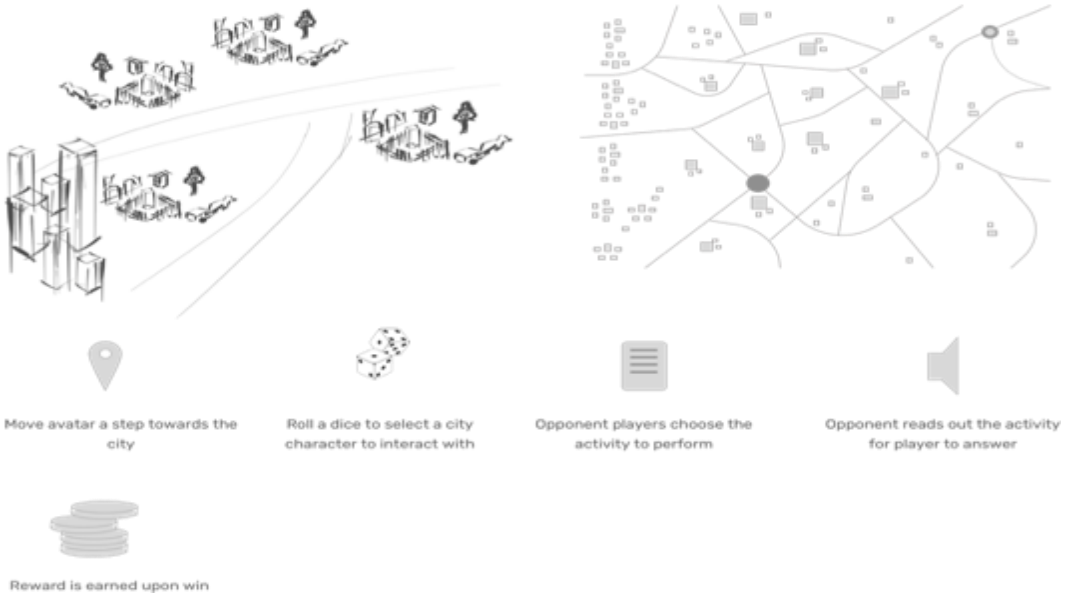

Figure 20. Into the Past Game Concept

Theme: Into the past future is a roleplaying game (RPG) set in the old and new world. The game explores past and present issues, locations, and cultures as a backdrop for its narrative. The Player roleplays as a sojourner character who has to travel and thrive within this world. Players choose to journey from the past to the future or vice versa while interacting with other characters in towns and cities to complete specific activities for reward. Players go on journeys of self-discovery but contact other players on the same mission and collaborate with them. A player gets help from other players to answer questions posed to them from cards they get after rolling a six-color wheel. Each while contains a reward and a scam activity.

Mechanics: This is a mobile application. A game that can be played by two to five players indoors or remotely on a mobile device. It is designed to be competitive. To set up, a player selects a character, chooses a location to start, and chooses the period.

How to play: 1. gameplay starts with one player moving their avatar a step closer to the city, 2. Next, they roll some dice to select a city to interact with 3. Opponents choose the activity to perform 4. The opponent reads out the movement to the Player to answer. 5. A reward is earned, then it repeats with another player.

Concept 2: Megarizin

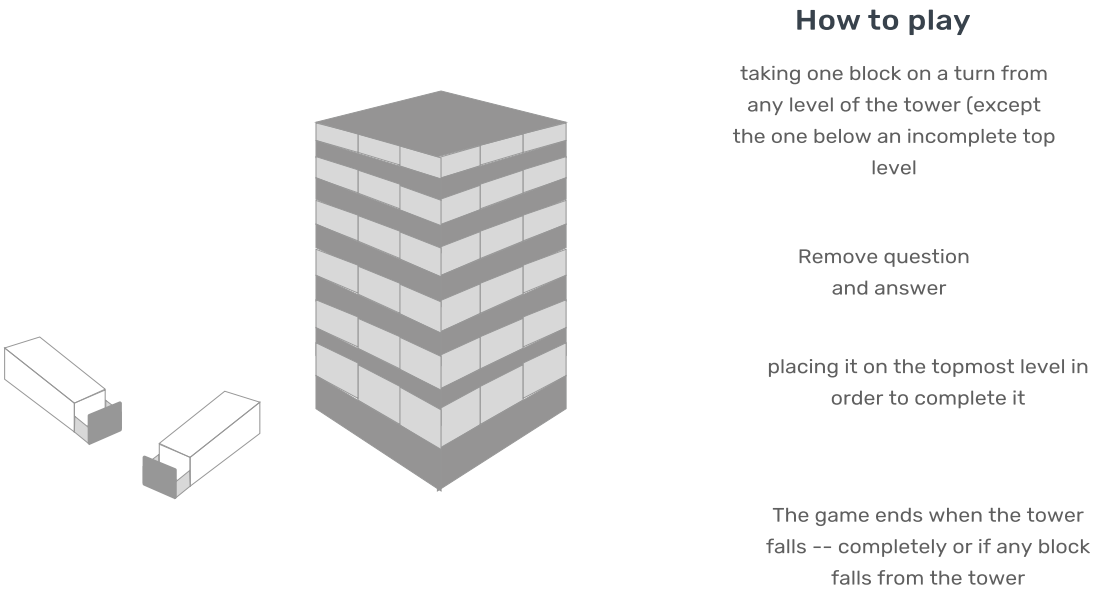

Figure 21. Megarizin Game Concept

Theme: Megarizin is a game of discovery where players find interesting questions to solve by playing a Jenga-themed experience. Players win rewards by answering questions found in the boxes. The game explores existing interactions that most people are familiar with to make the game fun.

Mechanics: Megarizin is a competitive game that can be played between at most ten people. It is a trivia and quiz game, so the interactions are limited to questioning and answering.

Gameplay: 1. The Player takes one block on a turn from any tower level (except the one below an incomplete top level). 2. The Player removes question and answer. 3. If the answer is correct, then place it at the top level to complete it. 4. The game ends when the tower falls (completely or if any block falls from the tower).

Concept 3: WeScam

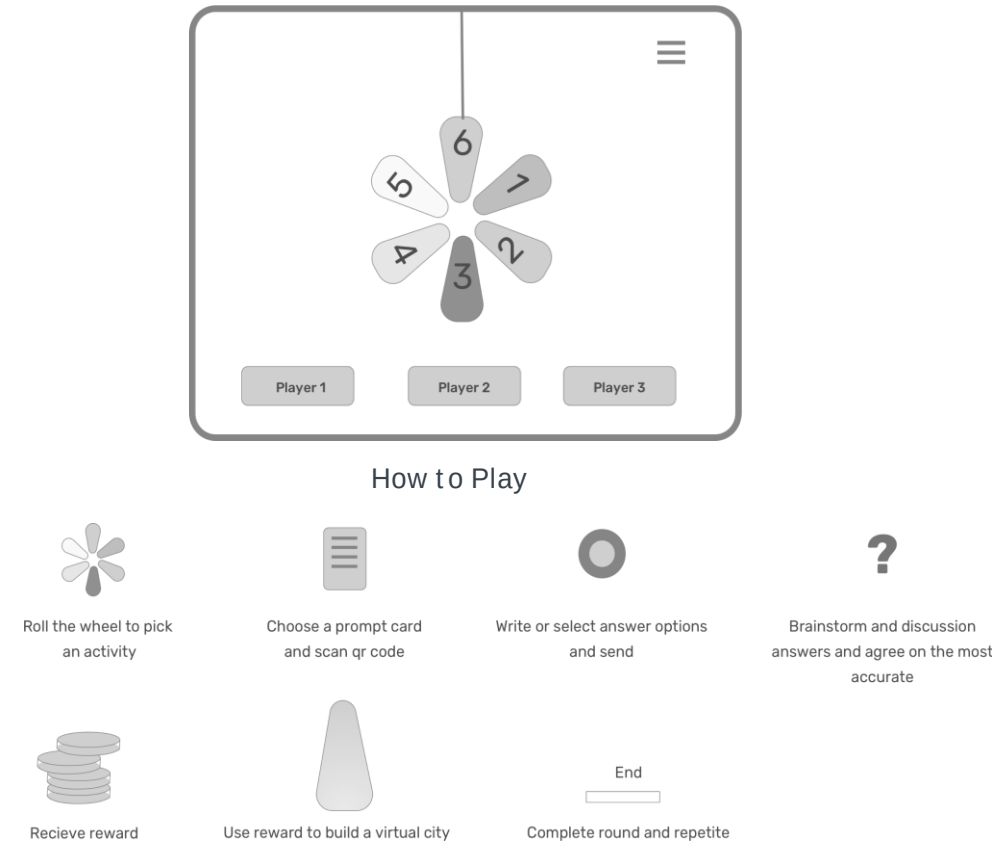

Figure 22. WeScam Game Concept

Theme: WeScam is a collaborative, quasi-competitive game that promotes collaborative learning and discovery. Driven by the concept of reading, acting out, and finding answers, players collaborate to find, agree, and select the best solutions to questions from activities.

Mechanics: As highlighted, this game is collaborative and competitive at the same time, mainly because each person answers their question, but the group joins in to discuss it. About two to ten people can play this game indoors, remote, or outdoors. This is a mobile and physical game. An app as well as a prompt card. To set up each player and their accounts on the app, players select their avatars and lay prompt cards on the table

Gameplay: 1. A player rolls the on-screen wheel to pick an activity 2. Then chooses a promote card. Contains questions and activities Have a QR Code to scan for answer option list for 3. Write or select answer options, then send 4. Receives reward 5. Users can use the reward to buy an item to build a virtual city. Complete the round the repeat.

Concept 4: Puppy Valley

Figure 23. Puppy Valley Game Concept

Theme: Puppy Valley is a roleplaying game set in a small island country. Players explore the life of acquiring a puppy and raising it until it grows safely and correctly. As owners and caretakers of the puppy, each Player's primary goal is to make life choices and take steps to harm the puppy. Players must find ways of getting a puppy by adoption, buying, etc., then raise. Whiles taking care of the puppies, players must deal with other characters whose actions could cause them to lose. A major activity involves a player stealing and hiding a puppy and the other player working to find it. The players' characters will have to interact with several characters in the city.

Mechanics: Puppy valley will be designed for two to five players. It will use a mobile app with physical dices. The game will be competitive and be played indoors or remote. To set up, players must select a puppy, select a character, experience level, and level of difficulty.

Gameplay: 1. Player one rolls a dice 2. Move several steps 3. Complete the specified tasks in location 4. Take a turn with the other Player and repeat **Gameplay:**

1. Player one rolls a dice.
2. Move several steps.
3. Complete the specified tasks in the location.

4. Take a turn with the other Player and repeat.

6.3 Design Selection and Playtesting

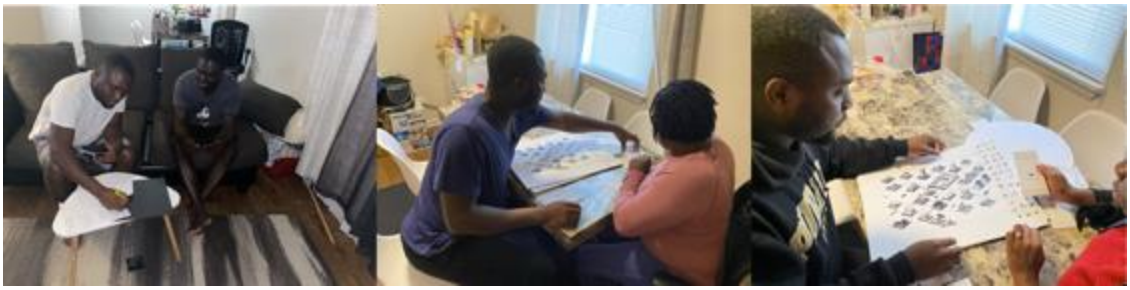

Figure 24. Conducting Playtests on the Three Variations

After the brainstorming and sketching session, the four concepts were critiqued, and review based on their narrative, game mechanics, and content. The informal critiques were conducted over the phone and video conference with five target audiences and four experts, including two designers and two design educators. Six of the critics thought concepts One and two were interesting, but their narratives didn't have a strong connection with the audience. Concept one had familiar game mechanics but lacked the cognitive exercises to help the audience build their cognitive abilities. All participants agreed the cooperative and group involvement was the fun aspect of concept three and could be leveraged in other game iterations. All reviewers expressed great interest in the puppy valley narrative. The idea of raising a puppy is a common activity in American culture. Though the narrative was interesting, the gameplay and balance could be improved by blending concepts three and four while improving the interaction and overall components. From this point, three iterations of the puppy valley were developed to test out. Due to the 2020 pandemic, only three players between the age of 30 to 65 were able to test in person.

Figure 25. Puppy Valley Map-based Explorations

Figure 25 shows the first iteration of the puppy valley map which explored the step-based interaction. It also has another theme where a person moves into a new city and acquires a puppy and raises it there. The mechanics for this involved rolling dice in order to move according to the step on the number. At each step, there was an activity where the Player was supposed to be involved in. Also, the map shows where the activity would happen. With the complexity of the project, one crucial aspect that needed to be factored into the proposed approach was that it needed to be individually played on a board, even though the solution was mobile-based. However, during the playtesting, it was identified that the activity scope demanded that each step should contain a lot of layers of random activities in order to make the game fun. For instance, furnishing a home, which is the second activity, required a whole card list of activities surrounding the activity on furnishing a house, making it complicated. The activities also were too many on the board. The map became redundant because it became irrelevant as a component, even though the benefit of the map was to promote spatial perception. This led to the next iteration, which explored the way of using the map.

.

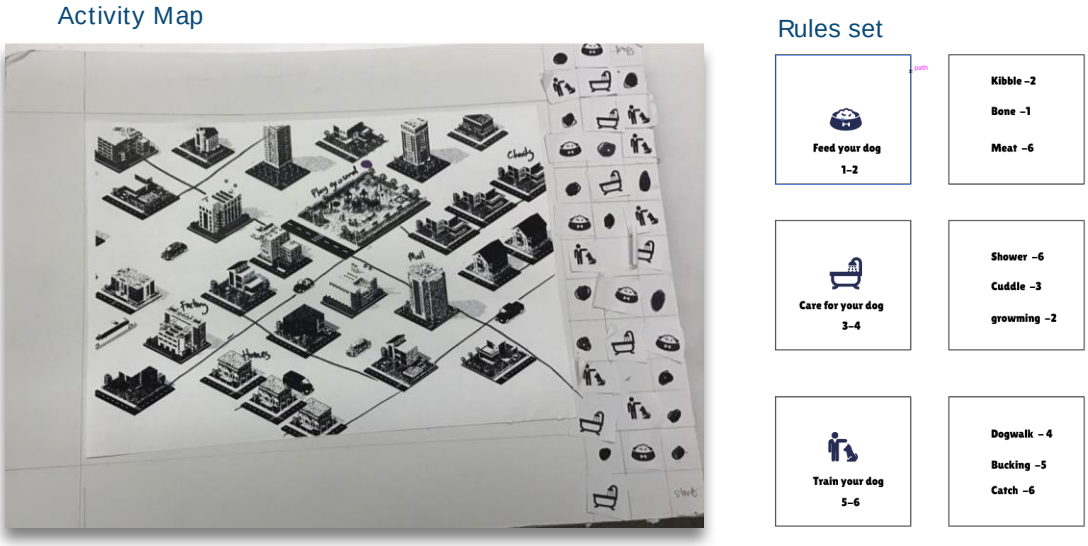

Figure 26. Routine Style Game Variation

To simplify the activities, I designed a new variation to leverage the simple routine of taking care of a puppy. This was investigated while iterating on the map design. It explores the idea around three activities. Players have to feed, train and groom their puppies. Each activity has a different reward it gives. A player has to roll a dice to get each activity. At each activity, the player has to answer a question. This activity also allowed the study to learn more about the idea of chance that comes with rolling dice. It was too simple and boring during the playtests, bringing no excitement to the game. The conversations generated were also not attractive. After that, an exploration to rethink the dice, which is a very typical board game component, leads to the ideation toward a spinning board, which was inspired by the Game of Life. For this concept, the activities would be selected by spinning the wheel with this concept. This concept also works well with the interactions between mobile and board games. For instance, when an activity is chosen after spinning, the exact activity will be selected on the map, either on the mobile or on the physical board, and then the cards will be placed at the location. Several activities around raising a puppy were explored based on the location it could occur. For instance, a puppy can get lost at the mall or the park. The activities involve answering or discussing fraud-related questions that would earn the winners' prizes.

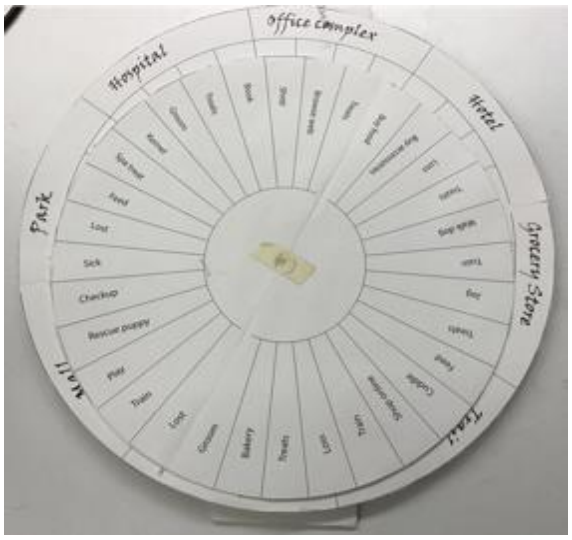

Figure 27. Wheel Style Iteration of the Board and Dice

Following the playtest, it was discovered that this iteration seemed to be more appealing, because the map and wheel interaction was interesting, and could be done with a physical board game. The only challenge was that it had too many repeating activities, and it was recommended for a reduction or limitation of its locations and activities. Also, this would work well with the application and would help with remote interaction of the game and the ability to randomize questions, after this exploration, the wheel concept.

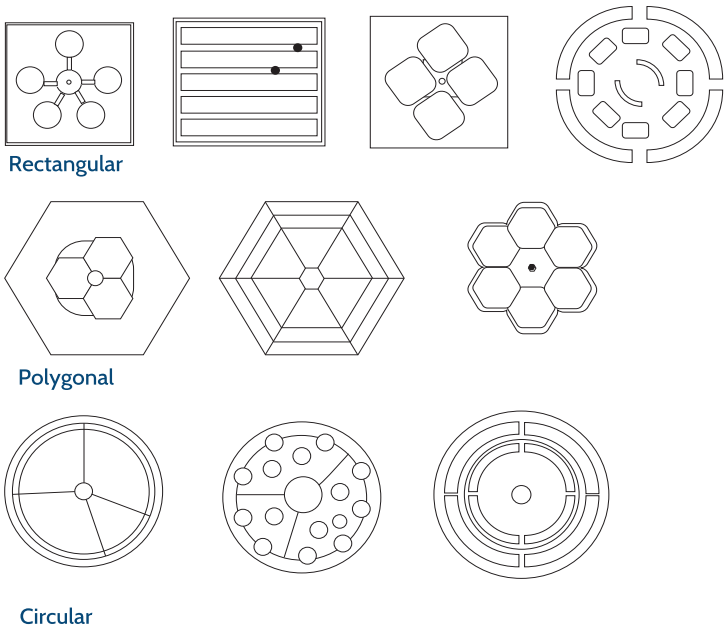

Figure 28. Wheel Design Exploration

After considering the wheel style activity selection, observations are that there are several explorations around the design and form factor. Several concepts were explored based on generic shape styles. There was rectangular, polygonal, and circular style exploration. After several critiques, it became apparent that the original circular style was better. The next stage was to continue with an exploration of the activity positioning. Figure 23 shows the exploration before and after building the prototype.

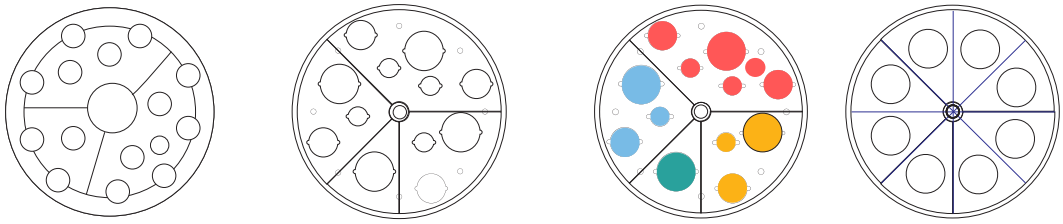

Figure 29. Wheel Iterations

As seen in figure 24, the initial prototype of the wheel was as well modified severally based on the size of the activities. The last in the series of images show the final shape without the activity. The prototype creation started with the randomized positioning and size of the activities on the board, but after creating the prototype with the laser cutter it became apparent that the size of the activities was too small. Ultimately, the sizes were unified by removing some of the activity options and increasing the remaining size.

Figure 30. Prototype Iterations (a selected concept in the last picture from the right)

With the concept completed, the activity was also explored to have specific features. The activities were scoped for four distinct locations in this study. The home, park, mall, and veterinary. At each location, an activity can happen there that could lead to someone getting defrauded. For example, in gameplay, when a player selects a home, there is a scenario where a person tries to

buy dog feed online and is targeted by fraud. For each other location, the activities for the study were inspired by some of the common activities around taking care of the puppy. Also, the content narratives were inspired by the stories shared on the better business bureau website. This initiates the selection of cards from either the screen or the map by the opponent. Each of the activities was ascribed colors.

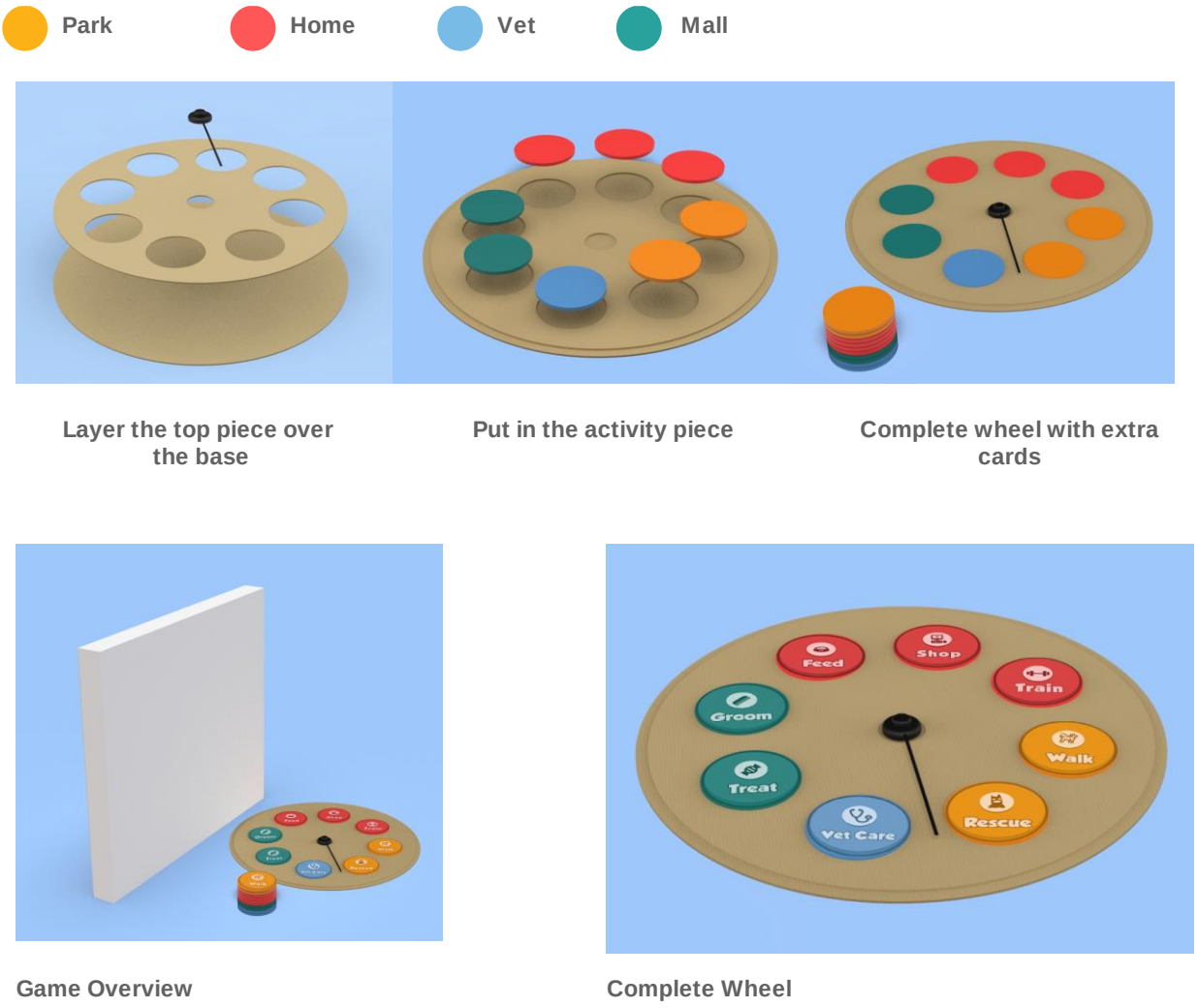

Figure 31. Prototype Iterations (a final concept in the last picture from the right)

Figure 32.A Player placing the Activity Cards in the Wheel

Figure 33. The Game Wheel Activities

6.4 Interface Design of the Mobile Application

The interface design was explored along with the physical product design. This stage involved the task analysis, wireframing and visual design.

6.4.1 Hierarchical Task Analysis

While iterating and refining the narratives and developing the wheel prototypes, the gameplay was also explored in detail by breaking down the key tasks and subtasks within the game, using Hierarchical Task Analysis (HTA). As explained in the methodology section, the HTA. The HTA also aided the researcher in determining the scale of the prototyping and other possible edge case narratives for the game.

Figure 34 breaks down the initial tasks of the gameplay. It assumes the Player in this chart has already walked through the initial part of the app, like the splash screen, and sets up a new game. It covers tasks for both the physical wheel and all other functions on the app. All cards are accessed from the app. The multiplayer game uses one iPad app and interacts within turns. Figure 35 is a continuation of the core game tasks, as it shows a separate mini task for reading and answering an activity card. A diamond chart is used to show player actions. Both Player one and Player two play at this point are involved in the game reward system. The system randomly selects a player to read cards if there is a third player or an odd number of players.

Figure 36 is also an extension of the HTA, which shows what happens when a player goes bankrupt. This is an edge case that wasn't originally part of the game flow. When a player loses all money and goes bankrupt, that player can enter a restart of 'borrow money from the bank.' A player must answer scam questions at the bank and earn money to get back into the game.

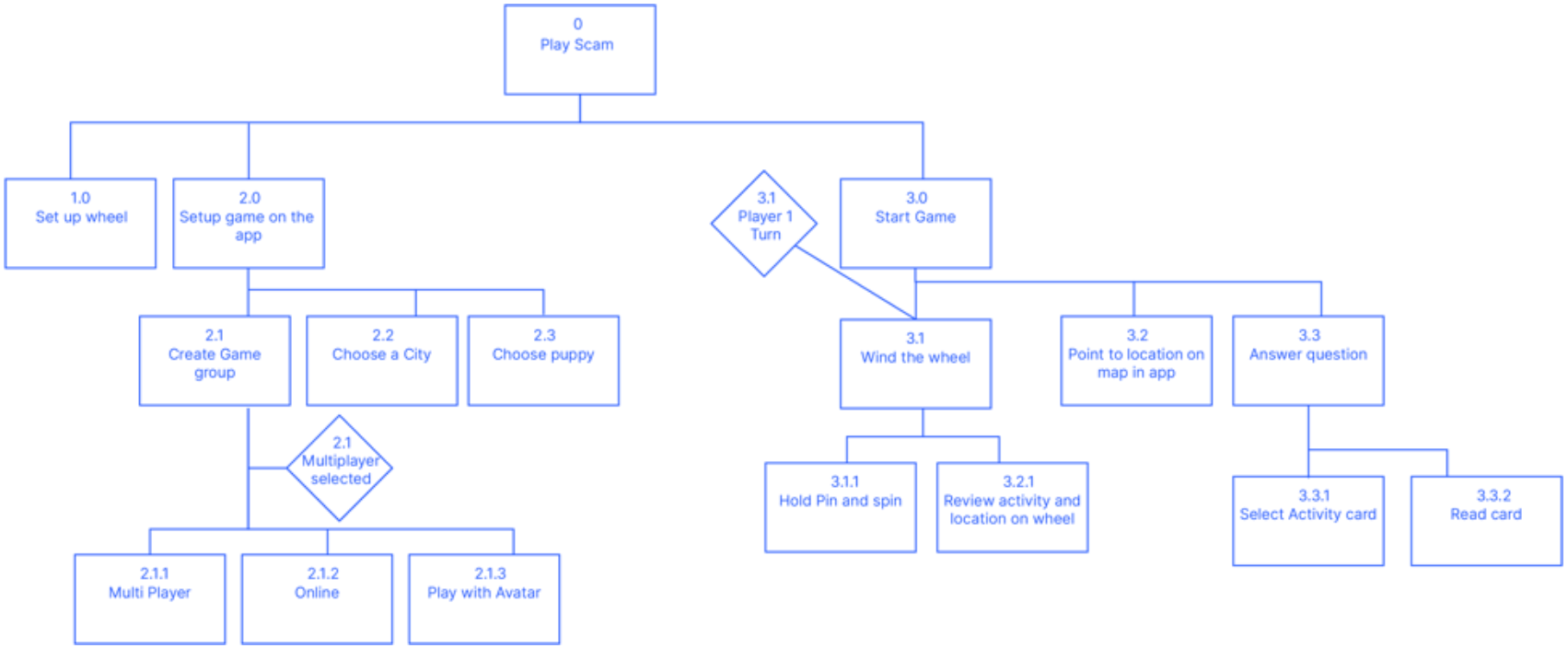

Figure 34. HTA Chart for the Setup and Onboarding

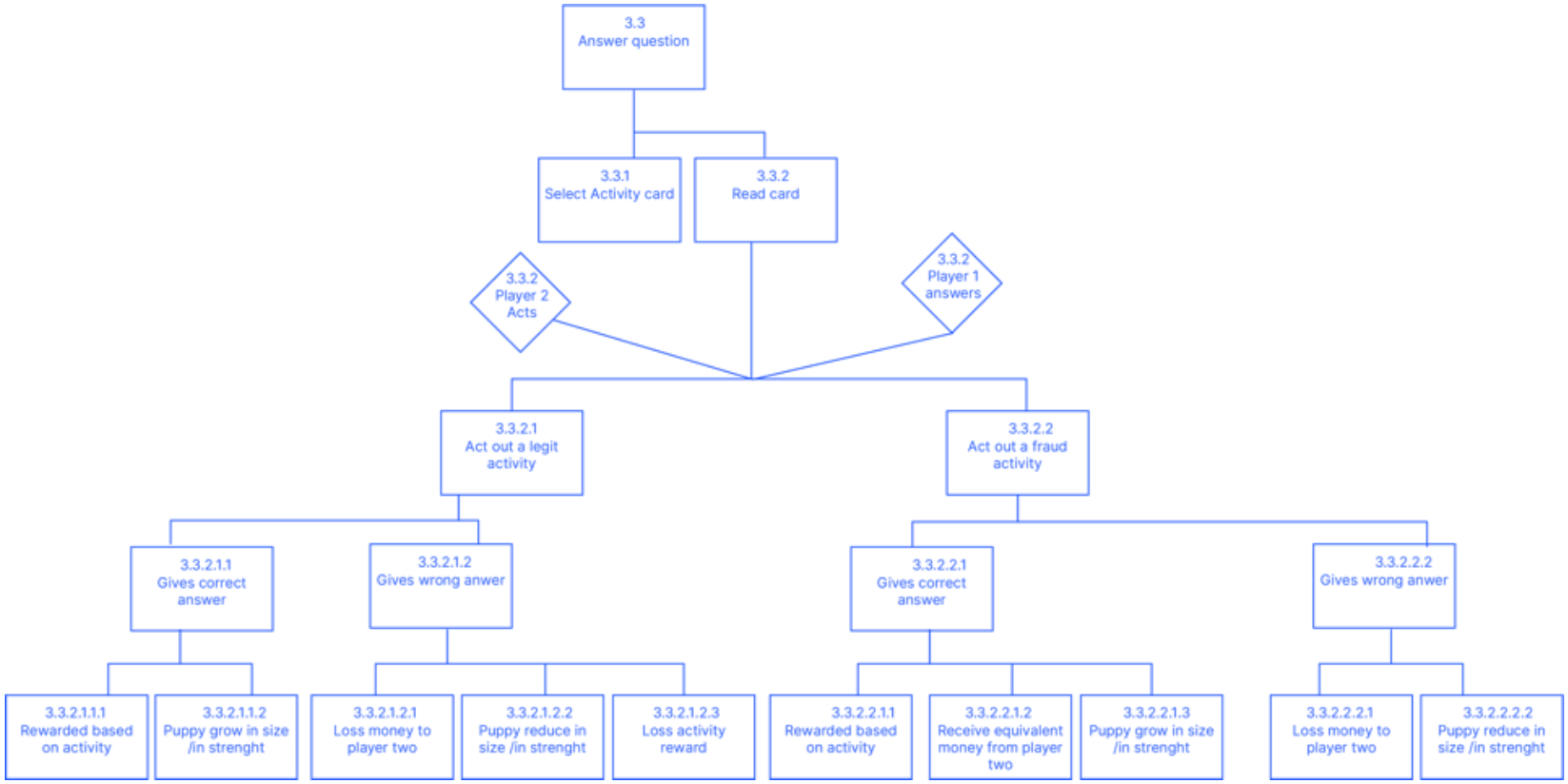

Figure 35. HTA Chart for the Card Read Through

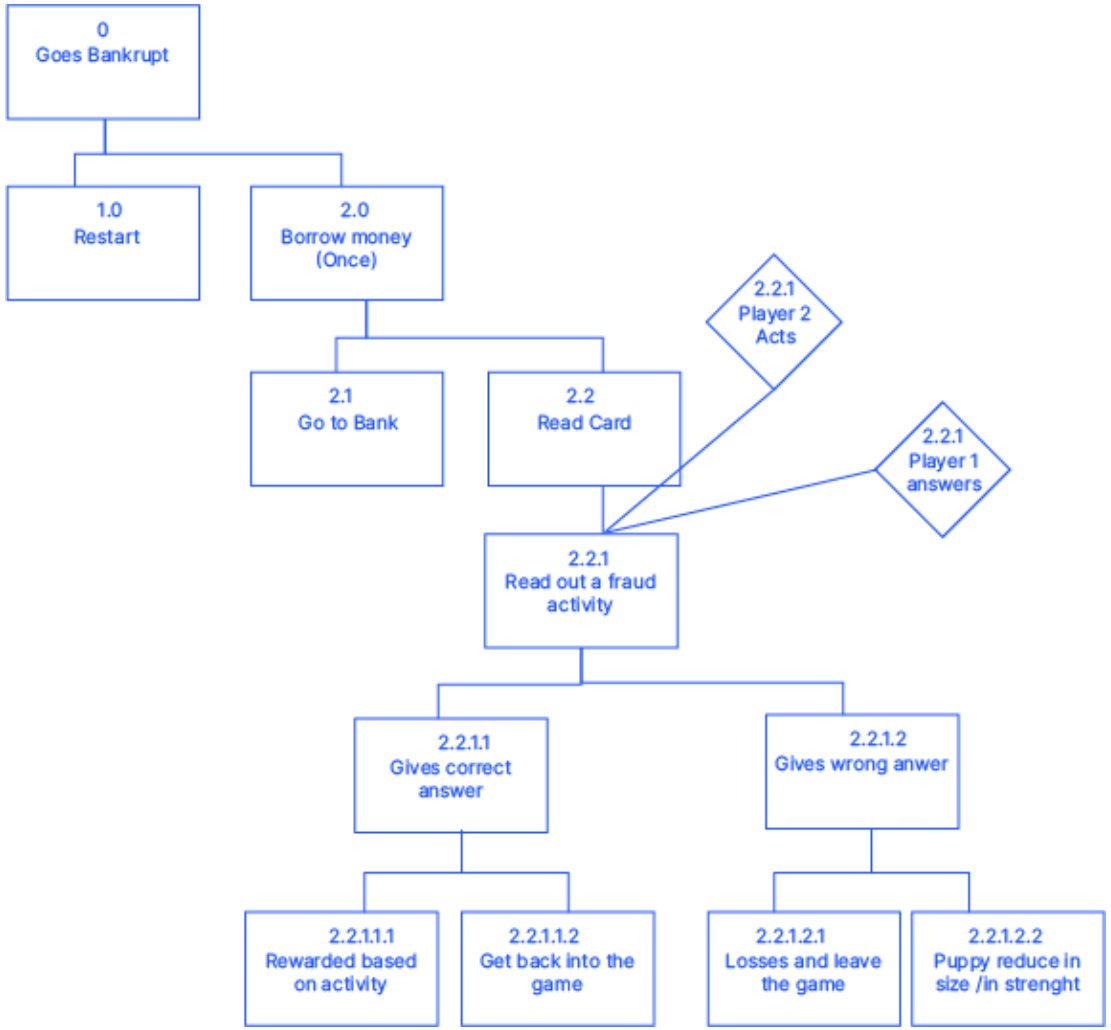

Figure 36. A Chart for the Edge Case Scenario for Bankruptcy

6.4.2 Wireframing

To represent key design features and structure the interface design, I framed the content through wireframing. This allowed exploring low-fidelity ideas and iterating on them. While the visual design took a huge part in the iteration, this stage was more into the general structure of the application/game. The wireframes were progressively evaluated for the position of key design elements and interactions. Through this stage, it was observed that simplicity was key to making things stable. Also, it was observed that adding text to icons was important for users to contextualize its use. The game activity needed to have its page to make it easy to read. Another important observation was that the fonts needed to be as big as possible from the beginning of the game.

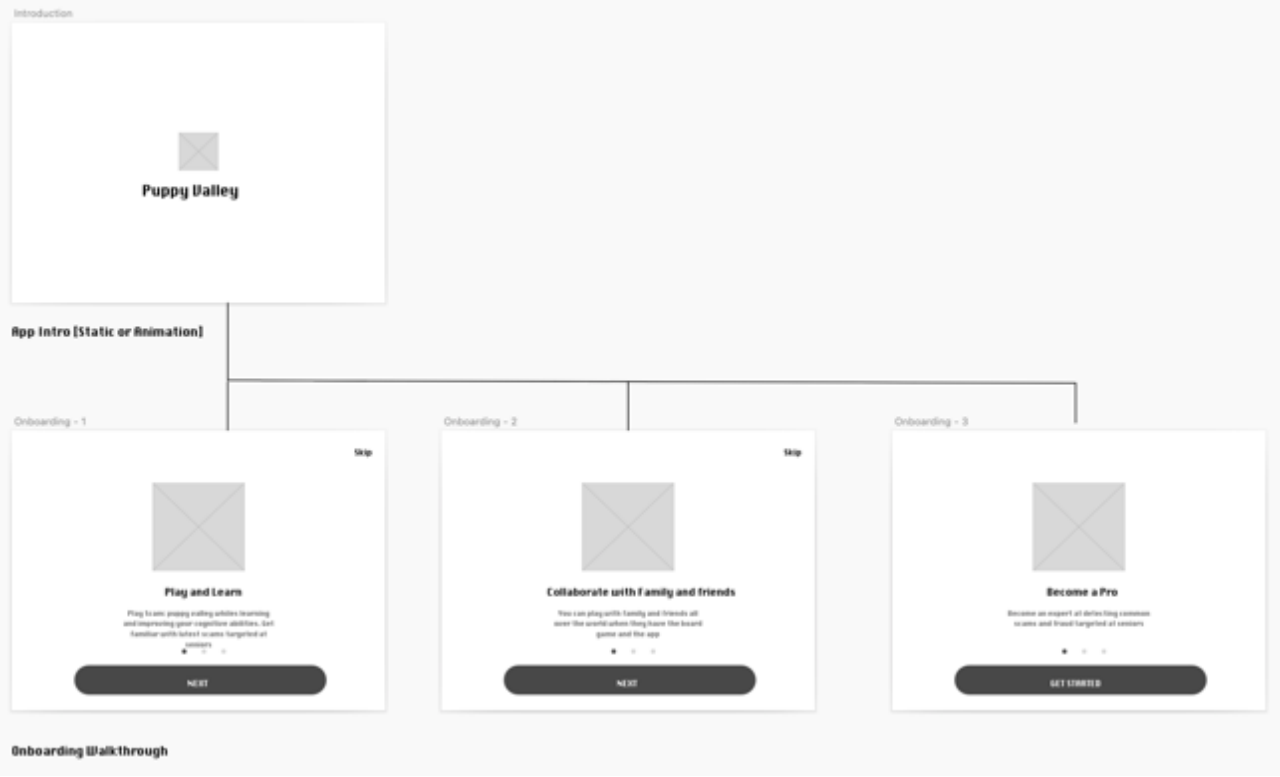

Figure 37. Wireframe Exploration of Product Walkthrough

Figure 37 shows some walkthrough messages for users when they first enter the application. Auxiliary features like these were considered midway within the design exploration to orient users. Setting the users for success through splash screens and product walkthrough is essential.

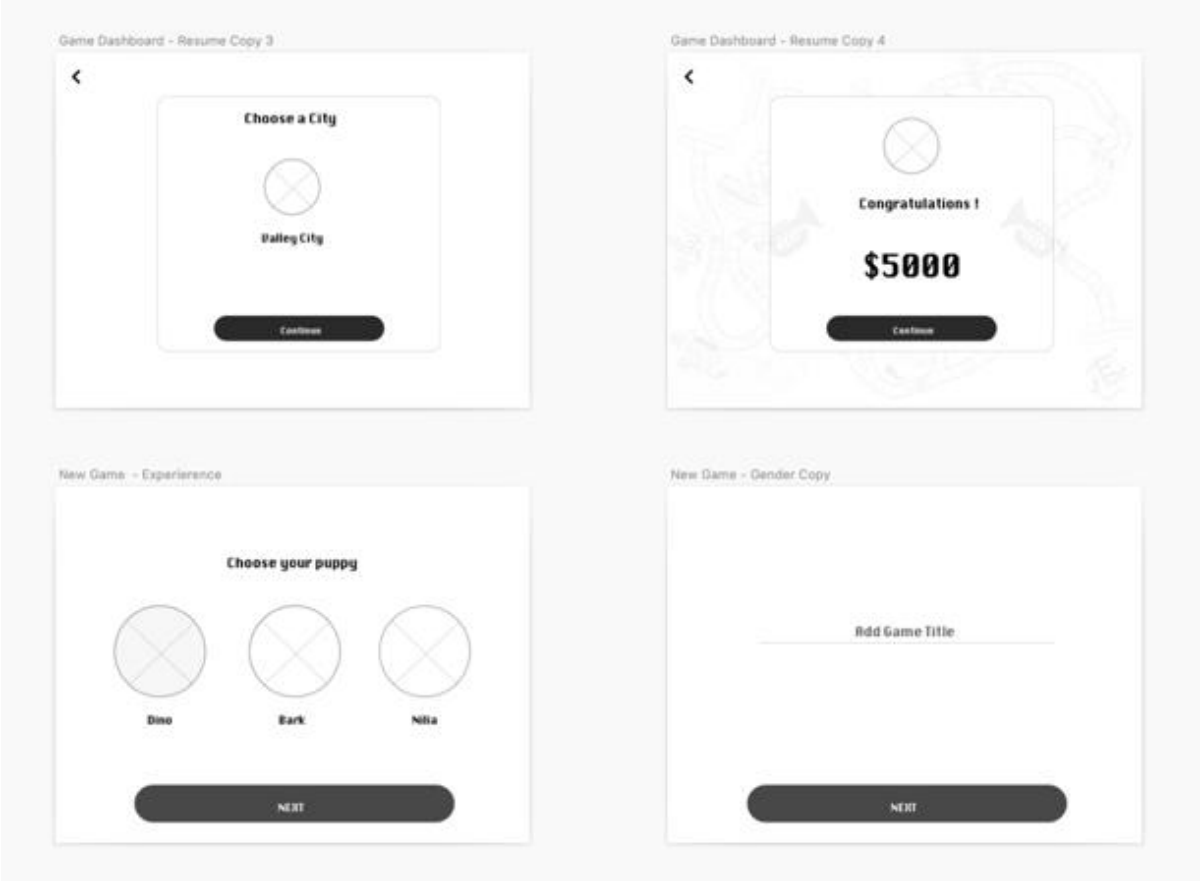

Figure 38. Wireframe of the Onboarding Explorations

Figure 38 explores various interfaces for the onboarding experience. The design shows the city design selecting, selecting a puppy, creating a game name, and a congratulatory message after earning the startup of five thousand dollars. The game naming was eventually removed because it added extra clicks to the game they were supposed to enjoy.

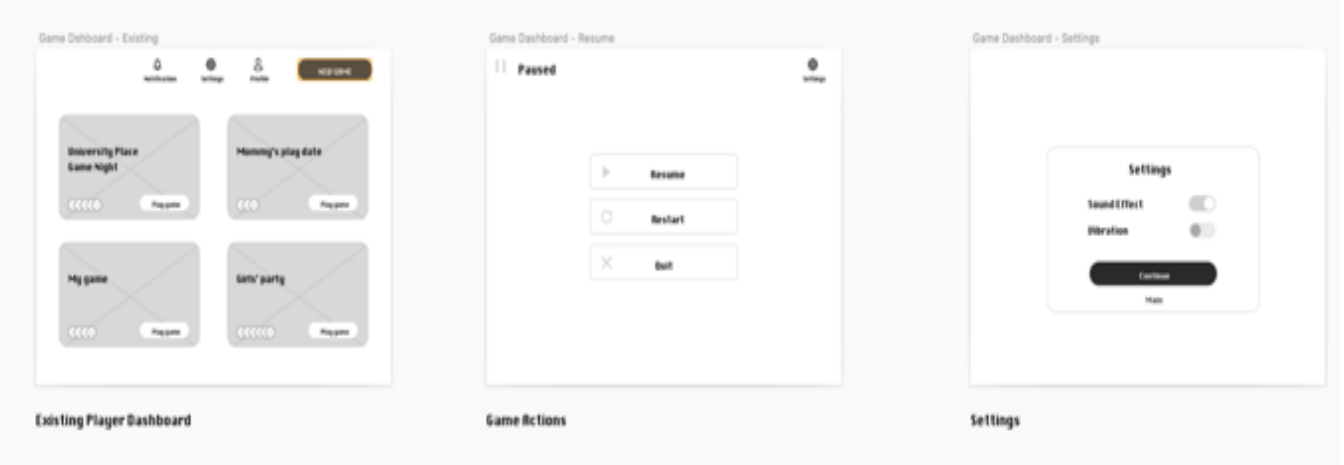

Figure 39. Wireframe of the Homepage Dashboard Exploration

The three dashboards in Figure 39 show an exploration of the existing and ongoing games, game setting, and the action of pausing or resuming the game. The sound and vibration are provided as accessibility modes of controlling the game experience.

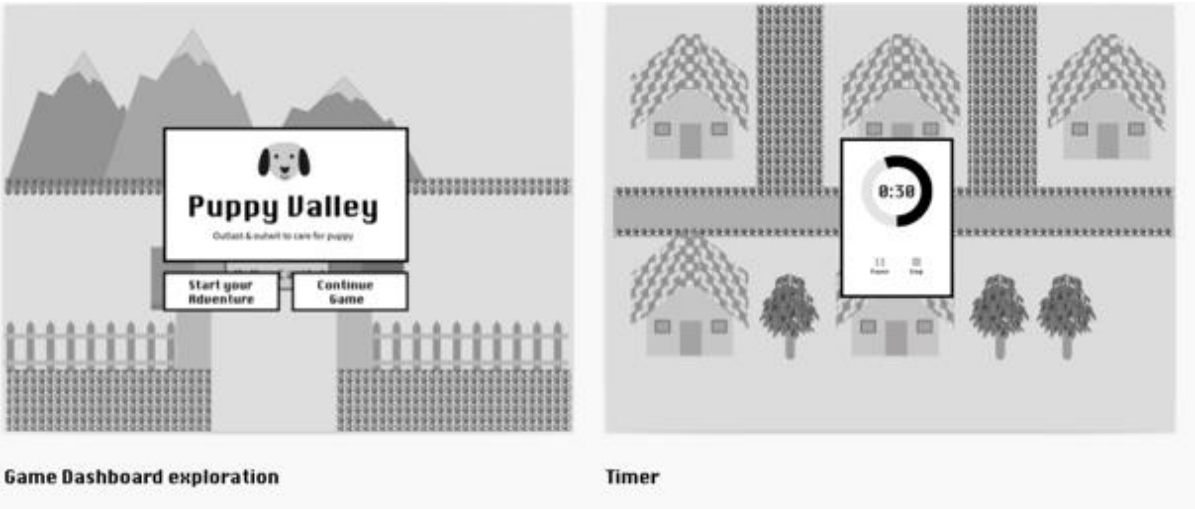

Figure 40. Wireframe of the Game Interface.

The game dashboard exploration was considered as an alternative but was selected as the main style. They set the tone for the general theme of the game. The timer view also shows the counter in action during a spin.

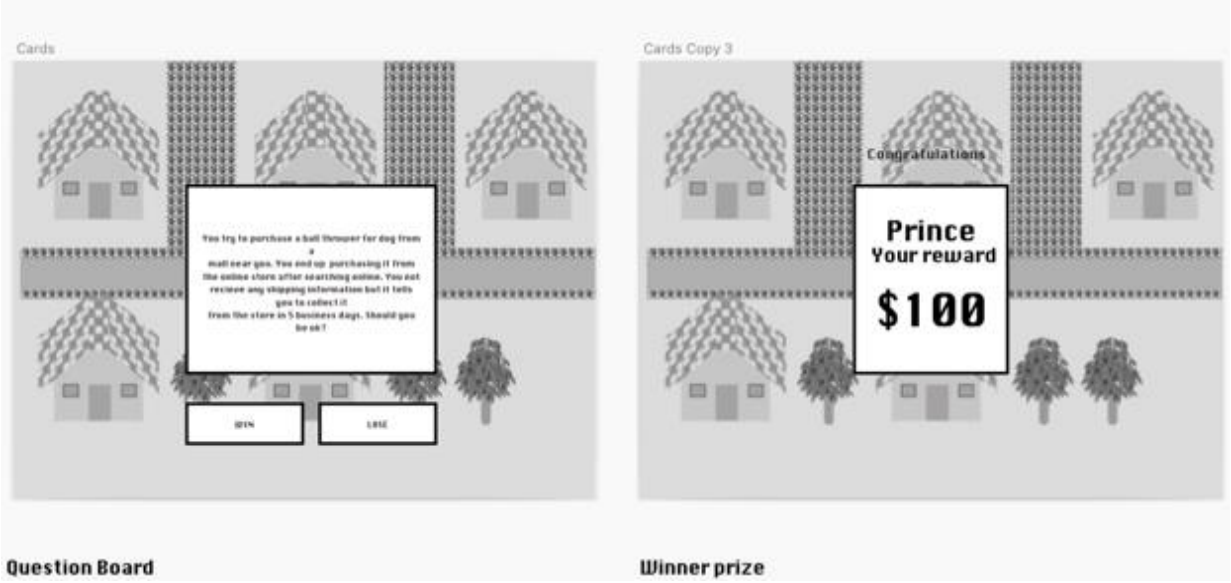

Figure 41. Wireframe of the Game Interface

Figure 41 explores the question view and the congratulatory view. During the gameplay, the map selection would be covered with a dark layer after a simple interaction. The question view would be a swipe or flipped for the answer to appear.

6.4.3 Visual Design of Key Features

After exploring design elements and layout in the wireframing stage, the visual design followed, having learned and prioritized some features. This section details the key interface design features within the supporting mobile application.

Figure 42. Puppy Valley App Store Banner

Puppy valley is an app-mediated trivia board game that promotes social interactions and fraud awareness and improves senior citizens' cognitive abilities in America. The game centers around raising a puppy within valley city, where players interact with certain locations in the town while performing a selected activity and growing the puppy in strength and speed. In the scope of this research, four sites were designed, including home, mall, park, and veterinary, where someone attempts to defraud the Player when they interact with those locations. Figure 43 Gives a quick guide to the gameplay; for instance, someone attempts to purchase an item from the mall and becomes vulnerable to fraudulent attacks. Figure 43 also shows some of the locations players could interact with. While the city is light-filled, it offers key locations, potential spaces, and narratives generated.

Figure 43. Quick Guide for Puppy Valley

Figure 44. Map Design from Wireframe to Finished Design

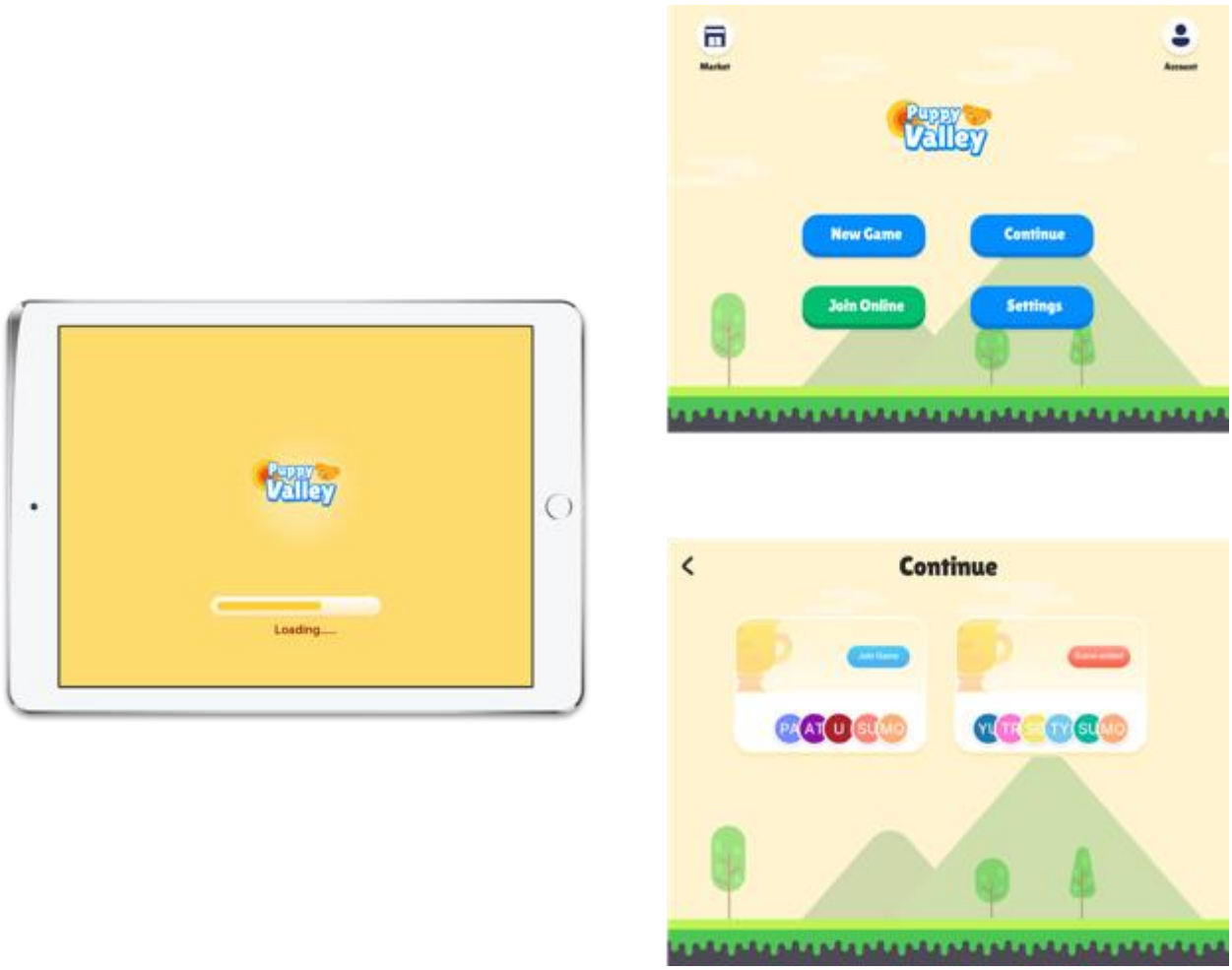

Figure 45. Shows the Intro Screen on the Left, the Homepage on the Top Right, and the Continue Page Underneath

The homepage (see Figure 45.) gives an overview of the main activities players have to interact with when applying. The new game is for players seeking to start a new game, and the continue buttons take players to the screen underneath (see Figure 46). to join an ongoing game. The green button is also is for players who have been invited to join the game remotely. An option to set up an account is also provided. Also, though out of the scope of this research, there is a market option to purchase brand awareness programs for family and friends.

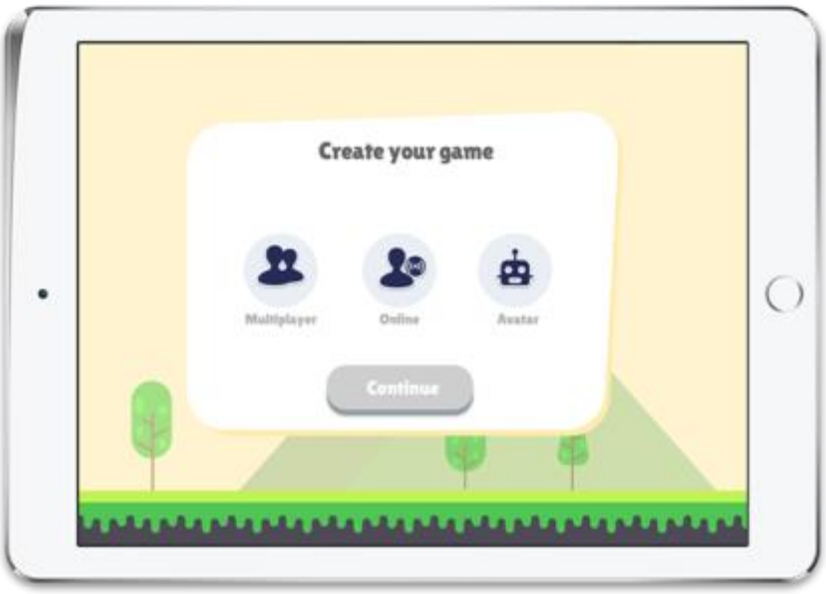

Figure 46. Mode of Inviting Other Players

To begin a new game, the player must first set it up so that he or she has the choice of inviting another player or playing alone. Multiplayer allows two people to play on the same iPad. The online mode allows people to send game links via SMS as an invite, and a player can use the avatar option. With the avatar option, interactions are created to mimic a remote person. They also need a wheel to play for distant players (the decision to let people interact with the wheel physically also a business benefit if commercialized). After selecting the medium, the Player chooses a city map (the scope of this study didn't explore different maps), which gives a different city view.

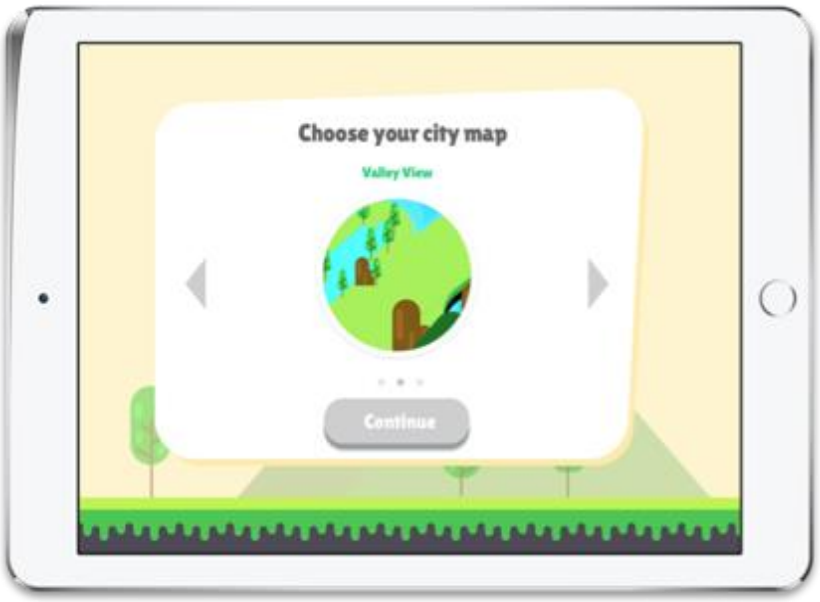

Figure 47. Map Design and Location Option Selection

After setting up or inviting other players, there is an option to choose the city design that people play within (see Figure 47). Though the research scope didn't explore different maps, it is beneficial to randomize the view seniors interact with. This is intended to improve their visual-spatial memory. This involves their ability to recall objects based on their form, pattern, and color.

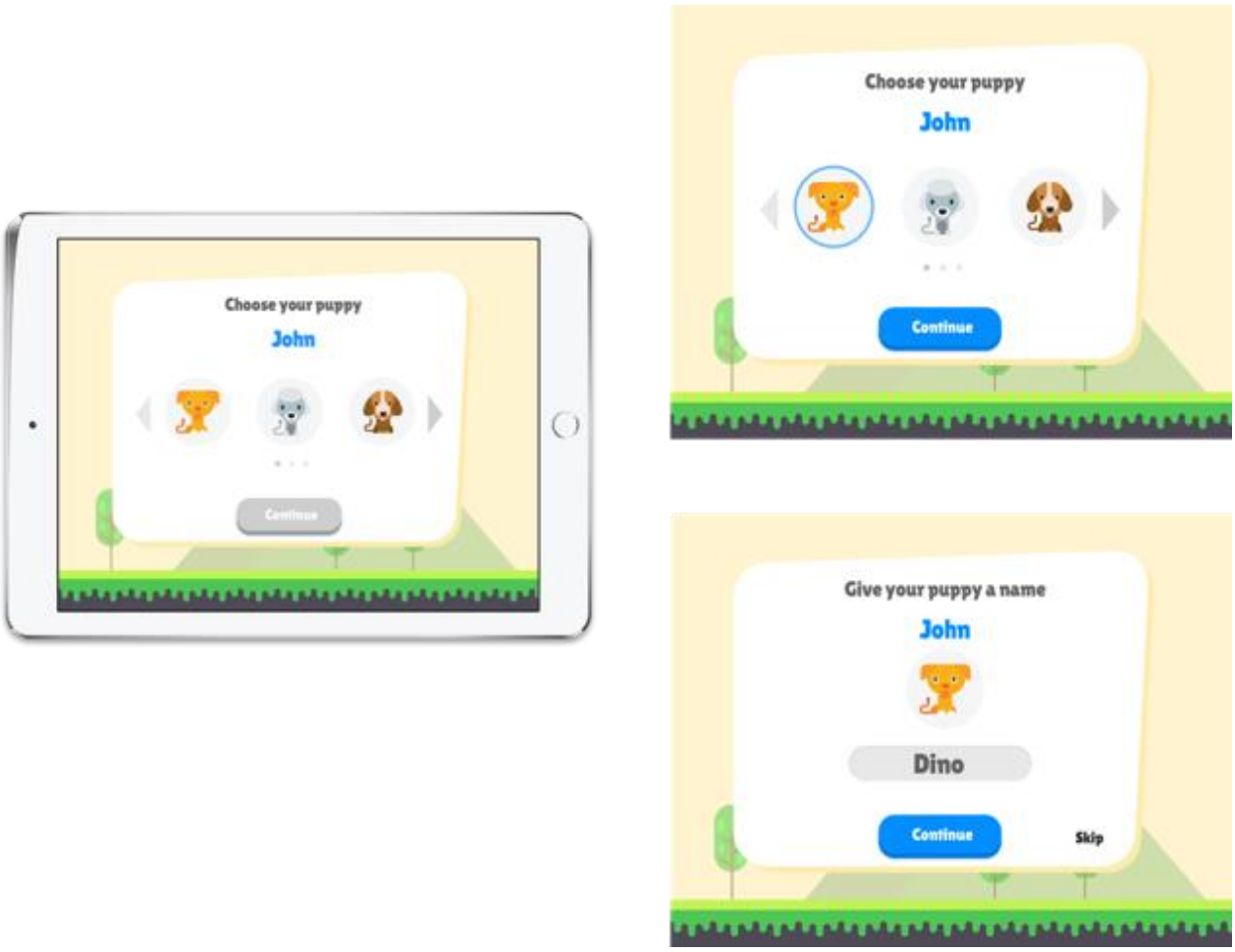

Figure 48. Puppy Selection and Naming

Players also have the choice to select a puppy that becomes their avatar during the gameplay. The puppies are the main characters of this narrative: players' earnings and rewards within the game center around raising the puppies. Players have the option to name their puppy as well. (see Figure 48)

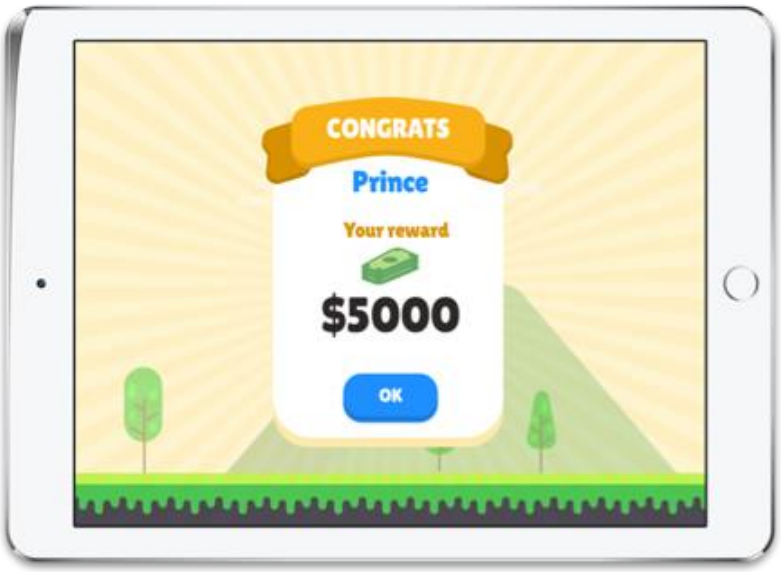

Figure 49. Reward Screen After Setup and Onboarding a Game

After the onboarding, the players are given start cash to increase or maintain a good amount to win. Players could win more cash by answering certain questions or get losses by attempting to scam an opponent player (see Figure 49).

Figure 50. Joined Players and Initiating the Gameplay Between Two Players

For each game, players are paired with each other. For each round, 'Player 2' reads activities for 'Player 1.' Game rounds are based on the number of players. If there are three players, the game could be six rounds, and for six (6) players, the rounds are 3. But the default number for a convenient experience is four rounds (see Figure 50).

Figure 51. Timer Screen at the Start of the Game Round

The timer screen (see Figure 51) shows that players must spin the wheel to select an activity between each period. Players are given thirty seconds to complete the spin. They can always pause or stop the count, giving them natural control over the game.

Figure 52. Welcome and Tutorial Screen

Figure 52 indicates the tutorial page that pops up at the start of the game. A video tutorial is linked for players to view. A video option was chosen to make the learning experience around the game easy.

Figure 53. Map Design and the Activity Option

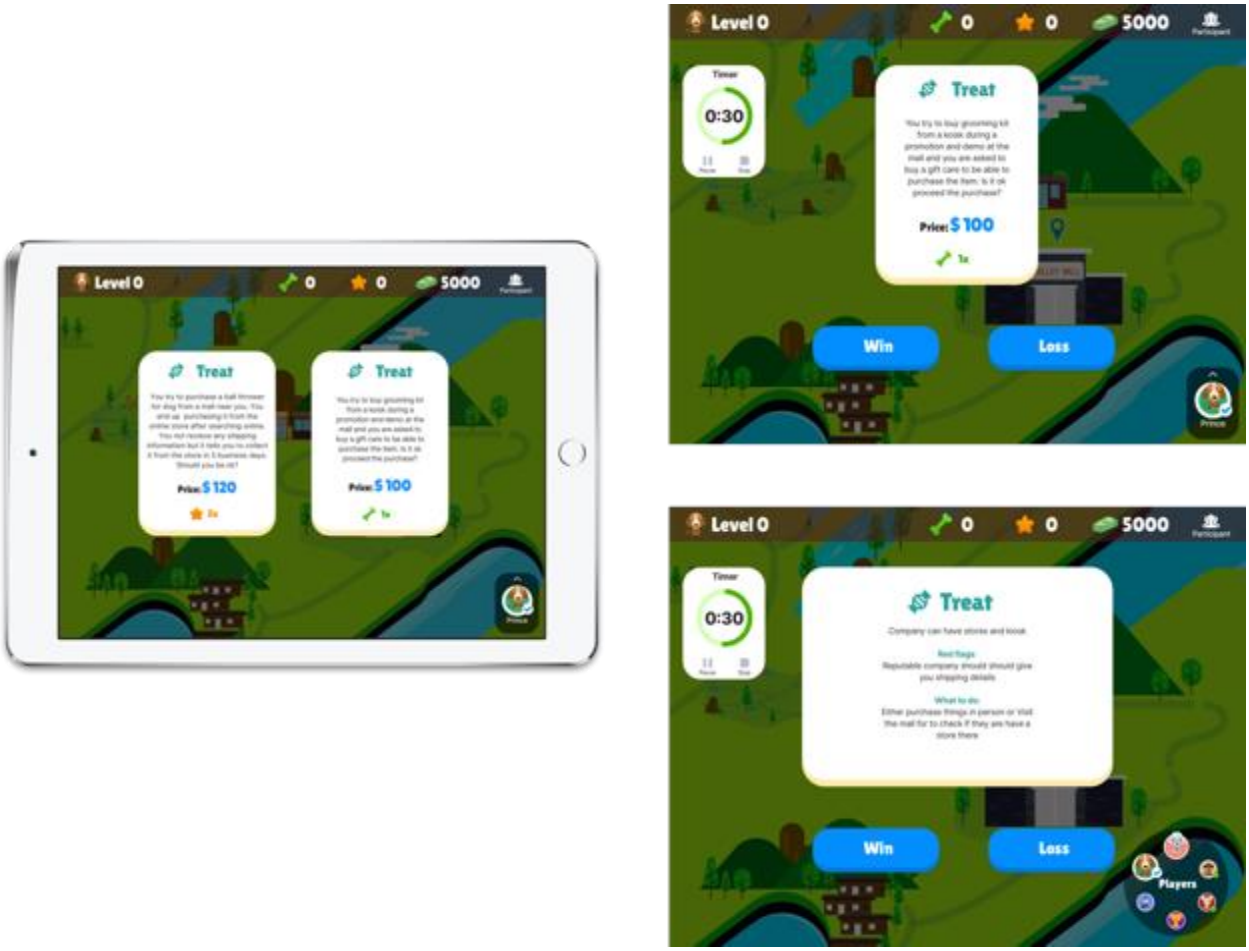

Figure 54. Trivia Interaction Screens

Activity questions open after selecting one of the options in Figure 54. 'Player 2' has the choice to select a tough question or an easy question. Players start the game with startup cash of five thousand dollars to purchase items. If a player doesn't have enough money, they cannot play the game. The answers' view also shows the answer, red flags, and what to do. Answers given by players are also opened to be wrong or right. Though the system provides answers, the game gives options for players to determine if the answer is correct. Several activity questions can be found in Appendix 3.

Figure 55. Loser's Screen and Winner's Congratulations Screen

As shown in the HTA chart, a player loses money when they answer wrongly, and their opponent also loses money if the other player gets the answer correctly. Figure 55 shows the congratulatory screen and loser's screen.

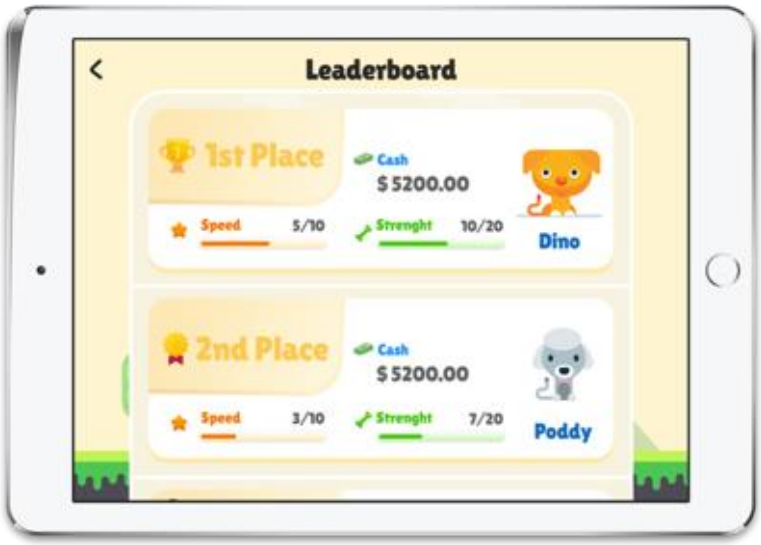

Figure 56. The Leaderboard for a Specific Game

Players can view their progress as they play. The leaderboard shows a combination of all rewards earned. The board is specific to each game and doesn't populate a universal performance of the owner. As mentioned in earlier documentations, the fun and enjoyable experience around this game center around the conversations generated through the gameplay.

CHAPTER 7 DESIGN EVALUATION

In order to validate the success and effectiveness of the design, inspected usability and experience flaws, and ultimately gain a well-defined recommendation for improvements, the researcher conducted a design evaluation, bringing together multiple heuristic principles from general design and game design to assess the final solution proposed in Chapter 6. This chapter details the process for defining the heuristics, the evaluation, key finds, and design refinements made after the evaluation.

7.1 Defining the Evaluation Heuristics

Defining the heuristic or usability principle for design evaluation is the first step towards a successful design evaluation. Different researchers have developed and refined universal principles that can be leveraged in a variety of contexts, whilst evaluation in itself is not the most effective in every context or period within the design process (Greenberg & Buxton, 2008). It is one of the most widely accepted methods of assessing the effectiveness and efficacy of a design solution, due to the time and the cost involved in organizing. Given all these issues, selecting or defining the right heuristic is important for the evaluation process. (Nielsen, 1995, 2005; North et al., 1997; Quiñones & Rusu, 2017). According to Quiñones and Rusu (2017), researchers may use existing heuristics or create new ones based on the context to define a heuristic principle for a thorough evaluation, which is exactly what this study did. Heuristic principles were drawn from three existing heuristics, and specific principles were selected based on their context of this study and the principle's ability to communicate the design, usability, and experience flaws within the solution. Ultimately, five main heuristic and twenty-one sub heuristics were formed. Evaluation questions and heuristic statements were defined around the heuristics. Following Nielsen's Heuristic evaluation methodology, this study adopts the severity scale of issues identified with the design. It is defined based on three core factors, the frequency, the impact, and the persistence of the problem. They were combined on a single rating scale between 0 - 4.

0 - The problem doesn't seem to be a usability issue

1- A superficial or cosmetic issue that doesn't require an immediate fix

2 - Minor violation of the heuristic, but a challenge for users. It is of low priority

3 - Major problem which occurs frequently and persistently and is a high priority

4 - Catastrophic issue that needs urgent attention before it gets to a user

#	Problem Descriptions	Heuristic	Sub-Heuristics	Heuristic Statement	Severity Ratings	Problems Identified	Recommendations	Attachments
1	Do you think the interface design is appealing enough to draw you to play the game?	Aesthetic	A1 - Attractiveness	The aesthetic appeal of the game that makes you want to play.				
2	Do you think the spinner's form factor and surface design look like a well design game kit?	Aesthetic	A2 - Form factor	The form factor of the physical product should be a standard design.				
3	Do you think the game interface provided enough information or feedback about the state of the game?	Usability	B1 - Visibility of Status	The game should always inform users about the current state of the game and each player.				
4	Do you think the buttons, game elements, tabs, and icons are created to make you understand?	Usability	B2 - Affordance	The game should employ elements, visual, textual, direct or metaphoric cues and that communicate to the user what to do.				
5	Does the game provide means for players to undo unintended actions?	Usability	B3 - User control and freedom	During the gameplay the game design should intuitive enough for players to navigate their way out of an error and emergency.				
6	During the gameplay, does the design alert the players about errors and guide them out of it?	Usability	B4 - Error prevention and recovery	The system must provided error messages to help users recover from a problem.				
7	Is the design consistent and devoid of confusion?	Usability	B5 - Consistency and standards	The design should be standardized across board. Players should not be in state of confusion about where they are in the game				
8	Does the game provide feedback when an action is taken? For example, when you select something on the map?	Usability	B6 - Feedback	Feedback involves send back an information when an action is taken.This serves as confirmation of an action				
9	Do you think the game is designed with less clutter and redundancy?	Usability	B7 - Minimalist design	Simplicity is key in communicating relevant information to users. Minimal design help the user focus on what is necessary.				
10	Does the game provide enough information to help people archive their goal?	Usability	B8 - Help and documentation	A digital game needs to provide a good amount of help and documentation to support the game play.				
11	Is the game play and experience design to be flexible and efficient?	Usability	B9 - Flexibility and efficiency of use	Leveraging accelerators and affordance in the game experience help users achieve a flexible experience in the game.				
12	Do you find the game to navigate?	Fuctionality	C1 - Game navigation	A core requirement for a good game is the ease for players to navigate through key touchpoints.				
13	Do you think the overall gameplay is well-orchestrated?	Fuctionality	C2 - Game play	It is important for the overall game narrative to be well linked to every game mechanic, element and interaction.				
14	Do you think the interactivity between the elements (Spinner, map and question cards) of the game is effective	Fuctionality	C3 - Interactivity	Seamless flow of a good game is when every is interactivity connected and relevant.				
15	Do you think a potential player would be able to comprehend the tasks easily?	Cognitive Involvement	D1 - Challenge	The game challenge and details must be well explained for the players to understand.				
16	Does the game provide enough information for the players to understand the gameplay?	Cognitive Involvement	D2 - Competence	A good game must help players learn it early and build their competence over time.				
17	Do you find this game fun and interesting?	Cognitive Involvement	D3 - Playfulness	As a standard requirement, games are supposed to be fun.				
18	Do you find the content in this game easy to understand, retain or potentially remember?	Cognitive Involvement	D4 - Learnability	Given that this game is an educational and awareness creation game, it is important to have the content easy to understnd and learn				
19	Did you feel you had control over the interactions within the game?	Emotions	E1 - Game Control	Game controls should communicate the player's intent in a way the player expects and create a feeling of full control.				
20	Are there any interesting surprises within the game?	Emotions	E2 - Surprise and Impressiveness	A healthy does of surprise is what a great game needs to be built on. Users need to be usher into new experiences at every touch point.				
21	Do you find the game enjoyable?	Emotions	E3- Enjoyment	A great game should strive to be enjoyable and satisfying. This is what keeps player involved in the game and come back after play.				

Table 1. Evaluation Form

7.2 Evaluation Process

7.2.1 Recruitment of Evaluators

Expert evaluators are a key aspect of design evaluation. Their experience and understanding of design principles are what make them a good source of expertise for evaluation. The evaluators for this assessment were user experience designers and design students. Three of the evaluators were students, while the other two were business design professionals. All of the students were in their final year of graduate school, and the professionals were graduate students who had been in the industry for two years. All the participants are present or former Purdue University students.

7.2.2 Procedure

After developing the evaluation principles and document, the researcher created an interactive prototype using PrincipleforMac, to be used with the physical wheel. After this step, the researcher went on to recruit expert evaluators. Due to the order against in-person interactions arising from the pandemic, this evaluation was conducted remotely over the Zoom conference mobile application. Table 1 shows the evaluation form created and hosted on Airtable for the evaluation session.

#	Problem Descriptions	Heuristic	Sub-Heuristics	Heuristic Statement
1	Do you think the interface design is appealing enough to draw you to play the game?	Aesthetic	A1 - Attractiveness	The aesthetic appeal of the game that makes you want to play.
2	Do you think the spinner's form factor and surface design look like a well design game kit?	Aesthetic	A2 - Form factor	The form factor of the physical product should be a standard design.
3	Do you think the game interface provided enough information or feedback about the state of the game?	Usability	B1 - Visibility of Status	The game should always inform users about the current state of the game and each player.
4	Do you think the buttons, game elements, tabs, and icons are created to make you understand?	Usability	B2 - Affordance	The game should employ elements, visual, textual, direct or metaphoric cues and that communicate to the user what to do.
5	Does the game provide means for players to undo unintended actions?	Usability	B3 - User control and freedom	During the gameplay the game design should intuitive enough for players to navigate their way out of an error and emergency.
6	During the gameplay, does the design alert the players about errors and guide them out of it?	Usability	B4 - Error prevention and recovery	The system must provided error messages to help users recover from a problem.
7	Is the design consistent and devoid of confusion?	Usability	B5 - Consistency and standards	The design should be standardized across board. Players should not be in state of confusion about where they are in the game
8	Does the game provide feedback when an action is taken? For example, when you select something on the...	Usability	B6 - Feedback	Feedback involves send back an information when an action is taken.This serves as confirmation of an action
9	Do you think the game is designed with less clutter and redundancy?	Usability	B7 - Minimalist design	Simplicity is key in communicating relevant information to users. Minimal design help the user focus on what is necessary.
10	Does the game provide enough information to help people archive their goal?	Usability	B8 - Help and documentation	A digital game needs to provide a good amount of help and documentation to support the game play.
11	Is the game play and experience design to be flexible and efficient?	Usability	B9 - Flexibility and efficiency of use	Leveraging accelerators and affordance in the game experience help users achieve a flexible experience in the game.
12	Do you find the game to navigate?	Fuctionality	C1 - Game navigation	A core requirement for a good game is the ease for players to navigate through key touchpoints.
13	Do you think the overall gameplay is well-orchestrated?	Fuctionality	C2 - Game play	It is important for the overall game narrative to be well linked to every game mechanic, element and interaction.
14	Do you think the interactivity between the elements (Spinner, map and question cards) of the game is ...	Fuctionality	C3 - Interactivity	Seamless flow of a good game is when every is interactivity connected and relevant.

Table 2. Evaluation heuristics

15	Do you think a potential player would be able to comprehend the tasks easily?	Cognitive Involvement	D1 - Challenge	The game challenge and details must be well explained for the players to understand.
16	Does the game provide enough information for the players to understand the gameplay?	Cognitive Involvement	D2 - Competence	A good game must help players learn it early and build their competence over time.
17	Do you find this game fun and interesting?	Cognitive Involvement	D3 - Playfulness	As a standard requirement, games are supposed to be fun.
18	Do you find the content in this game easy to understand, retain or potentially remember?	Cognitive Involvement	D4 - Learnability	Given that this game is an educational and awareness creation game, it is important to have the content easy to understnd and learn
19	Did you feel you had control over the interactions within the game?	Emotions	E1 - Game Control	Game controls should communicate the player's intent in a way the player expects and create a feeling of full control.
20	Are there any interesting surprises within the game?	Emotions	E2 - Surprise and Impressiveness	A healthy does of surprise is what a great game needs to be built on. Users need to be usher into new experiences at every touch point.
21	Do you find the game enjoyable?	Emotions	E3- Enjoyment	A great game should strive to be enjoyable and satisfying. This is what keeps player involved in the game and come back after play.

Table 3. Evaluation heuristics (Cont'd)

The tasks for the evaluation were simple gameplay, from joining an ongoing game and playing as player two and one. The evaluators were given the task of playing multi-player and remote game with six people. The researcher would be player one and the evaluator would be player two. The two players will then interchange their character for the evaluator to evaluate from the two perspectives. The evaluation with the five experts lasted an average time of forty-five. Link to the interactive prototype and evaluation form was shared with participants for them to interact with. Evaluators were supposed to review the heuristic, identify the flaws, grade the severity of the issues, and list some recommendations. The success and positive feedback were also shared during the discussions after the evaluation. Ultimately, the insights and key findings were grouped summarized. Figure 54 below shows the severity ratings given by the evaluators, which have been averaged down.

	Name	Problem Descriptions	1...	2...	3...	4...	5...	Results
1	B6 - Feedback	Does the game provide feedback when an action is taken? For example, when you select something on the map?	0	1	3	3	3	2.0
2	B3 - User control and freedom	Does the game provide means for players to undo unintended actions?	2	2	0	4	0	1.6
3	B8 - Help and documentation	Does the game provide enough information to help people archive their goal?	1	2	2	2	1	1.6
4	D2 - Competence	Does the game provide enough information for the players to understand the gameplay?	1	1	1	4	1	1.6
5	B1 - Visibility of Status	Do you think the game interface provided enough information or feedback about the state of the game?	1	2	2	1	1	1.4
6	B4 - Error prevention and recovery	During the gameplay, does the design alert the players about errors and guide them out of it?	2	2	1	0	1	1.2
7	C1 - Game navigation	Do you find the game to navigate?	1	1	1	3	0	1.2
8	D1 - Challenge	Do you think a potential player would be able to comprehend the tasks easily?	1	1	1	1	2	1.2
9	D4 - Learnability	Do you find the content in this game easy to understand, retain or potentially remember?	1	1	2	2	0	1.2
10	B2 - Affordance	Do you think the buttons, game elements, tabs, and icons are created to make you understand?	1	1	0	3	0	1.0
11	C3 - Interactivity	Do you think the interactivity between the elements (Spinner, map and question cards) of the game is effective	1	1	3	0	0	1.0
12	B9 - Flexibility and efficiency of use	Is the game play and experience design to be flexible and efficient?	0	2	1	2	0	1.0
13	A2 - Form factor	Do you think the spinner's form factor and surface design look like a well design game kit?	2	1	1	0	0	0.8
14	D3 - Playfulness	Do you find this game fun and interesting?	0	2	0	0	2	0.8
15	B5 - Consistency and standards	Is the design consistent and devoid of confusion?	1	2	0	0	0	0.6
16	C2 - Game play	Do you think the overall gameplay is well-orchestrated?	1	1	0	1	0	0.6
17	E3- Enjoyment	Do you find the game enjoyable?	0	1	1	1	0	0.6
18	A1 - Attractiveness	Do you think the interface design is appealing enough to draw you to play the game?	1	1	0	0	0	0.4
19	E1 - Game Control	Did you feel you had control over the interactions within the game?	0	0	1	0	1	0.4
20	B7 - Minimalist design	Do you think the game is designed with less clutter and redundancy?	0	1	0	0	0	0.2
21	E2 - Surprise and Impressiveness	Are there any interesting surprises within the game?	0	0	0	0	0	0.0

Table 4. Severity Rating List after Evaluation

#	Name	Problems Identified (from Evaluation 1)	Problems Identified (from Evaluation 2)	Problems Identified (from Evaluation 3)	Problems Identified (from Evaluation 4)	Problems Identified (from Evaluation 5)
1	A1 - Attractiveness	Generic but easy to navigate	The interface is simple but visually appealing, but the map itself falls into the middle groun...			
2	A2 - Form factor	Missing Spinner Icon		I think it's a little limited		In the future it could be a simple button powered.
3	B1 - Visibility of Status	Add celebration sound or image when winning	Missing any tutorial information or help feature	Maybe this is because of the prototype but more feedback on actions could help	It is unclear how you get to the next page/screen.	
4	B2 - Affordance	Uniform Icons Movement of dog along path More dog interaction			There is a lack of buttons.	
5	B3 - User control and freedom	Undo button	I don't recall seeing any sort of undo button during the demo		There were not obvious ways to back out or undo what you did.	
6	B4 - Error prevention and recovery	Error buttons?	Also didn't recall seeing anything about errors, specifically			More interactive alert coult help.
7	B5 - Consistency and standards	Rejoining game - Does your money stay the same? What happens if you get scammed out of ...	Player being asked the question isn't the one who interacts with the interface to answer th...			

Table 5. Problems List after Evaluation

#	Name	Problems Identified (from Evaluation 1)	Problems Identified (from Evaluation 2)	Problems Identified (from Evaluation 3)	Problems Identified (from Evaluation 4)	Problems Identified (from Evaluation 5)
8	B6 - Feedback			I think the game to be providing voice or textual information as feedback	The game proceeds to the next page, but there is no confirmation page.	it needs a few feedabck built into it the wait period and answer stage
9	B7 - Minimalist design					
10	B8 - Help and documentation	Clue Button	No ability to continue to continue with the same dog and continue levelling up	It's still a little limited	The users learn what is right and wrong through trial and error, but if neither ...	
11	B9 - Flexibility and efficiency of use		The gameplay is efficient but less flexible.	Somehow but, I'm not sure if all the players will find it that way.	This game is flexible, as it lets the user determine their own spinner and what they...	
12	C1 - Game navigation	Navigation for older demographic?	No recommendations on map for first time users		The game is hard to navigate and to figure out what you can click.	
13	C2 - Game play	Easy-to-use but could add a few more elements to enhance exeperience			There is the question as to if you are trying to gain money or to rise your dog.	
14	C3 - Interactivity	Lost Spinner	No tutorial			
15	D1 - Challenge	Demographics could affect this			It is slightly confusing how problems will be asked if their original opponent does not ...	The ages group could still struggle with the interactions. That doesn't mean that it doesn't wor...
16	D2 - Competence	What if it's not a scam?			There is only a video that is available once, during a loading screen, that lets the ...	
17	D3 - Playfulness					
18	D4 - Learnability	Addressing people with Dementia or Alzheimer's		I think the content might need a lot of explanation when playing alone.	It was difficult to understand where to press to see the correct answer and ...	
19	E1 - Game Control					
20	E2 - Surprise and Impressiveness					
21	E3- Enjoyment			The activities within the game could be a shown ahead of time to build more excitment.	There is not a clear path, which could lead to frustrations.	

Table 6. Problems List after Evaluation (Cont'd)

7.3 Defining the Design Refinement Based on the Problem List

After the evaluation, the researcher summarizes some of the key issues of which mostly centered around the game flow experience. While the evaluators didn't have issues with most of the design elements present, more issues were raised about what was present. The summaries and points listed here are issues that were within the scope of the research. This list summarizes the top five issues, but all the issues mentioned in Table 5 and 6 will be investigated outside of the scope of the report.

1. Creating a confirmation page for an action
2. Implementing an undo button
3. Walking players through the location of the button
4. Adding the ability to review the tutorial again
5. Building excitement before the game starts by showing some activities.
6. Locating the leaderboard ahead of time for people to assess.
7. Puppies interacting could interact with the location.

Figure 57. Refined Trivia Question Page

Issues about feedback and button that informs users to see the answer was an important issue raised in the evaluation. The initial concept centered around swiping to reveal the answer but because there was limited affordance, users could struggle. So, an indication message that informed users to swipe to reveal the answer was shown. Figure 57 also shows the swipe back indication.

The leaderboard and the pause which appeared at the end of previous iterations were also positioned at the top of the score overview for players to be able to review their score in between games. This was to generally give the users the affordance and reach as they played the game.

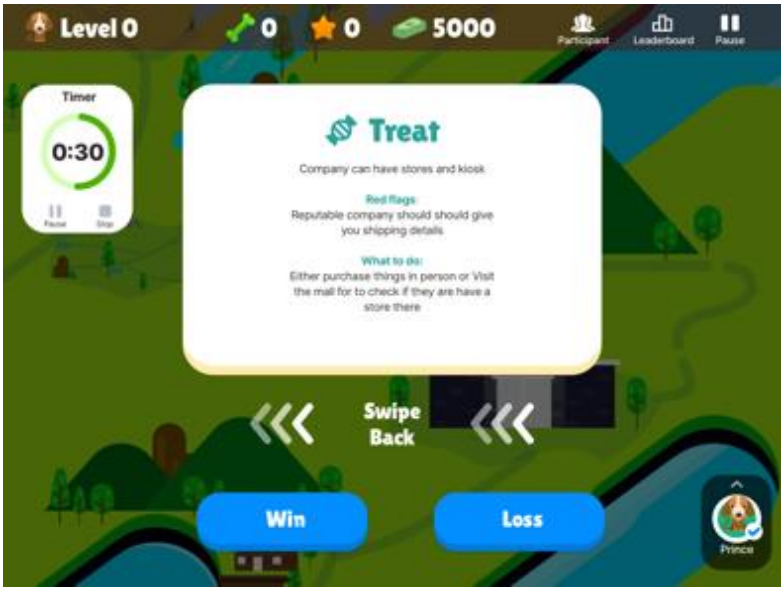

Figure 58. Refined Trivia Question Page with Back Indication

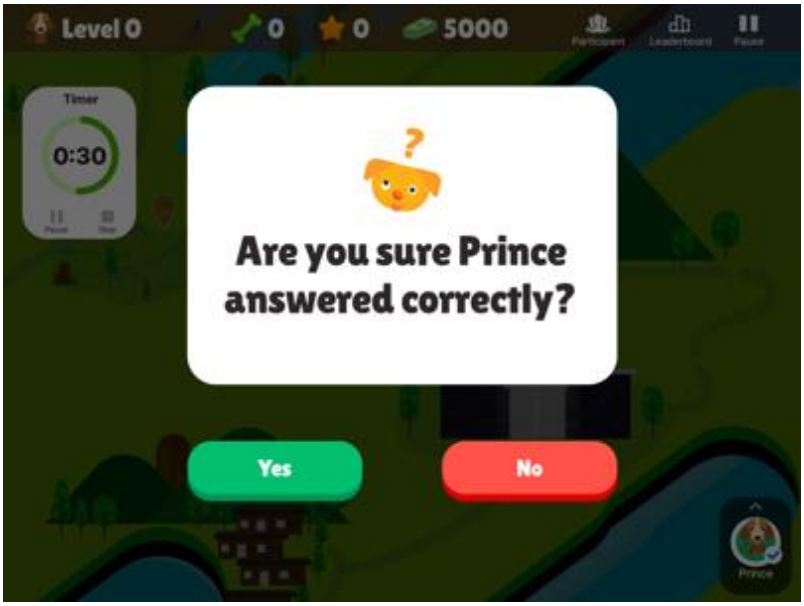

Figure 59. New Confirmation Page

A new confirmation page was introduced to indicate to users that an action had been initiated. This was part of the overall improvement on giving users feedback when an action is initiated. Also, it was to ensure each action taken was the right one.

Figure 60. Refined Activity Selection Option

Another screen that was improved based on the feedback was the activity selection page which lacked information and orientation about what action the user could perform. The improvement made here was a request for the player to select one option.

Figure 61. Point of Interest Icons on Locations

Another enhancement was the addition of a point of interest indicator to the map, which was placed on top of all the locations in which players could interact. While this had been missing in the final design, it was initially explored in a single location. This refinement indicates the POI on all the locations.

CHAPTER 8 CONCLUSION

This research aimed to address the broad social issue of senior fraud in the united states, as the CDC has classified it as one of the health risks affecting most Americans, older adults, and even the younger generation.

To address this problem, the researcher leverages a user-center design process by first conducting primary and secondary research, starting with a literature review which led the research to gain insights from the previous and current study about this context. The researcher learned about vital causative issues like the lack of awareness about recent frauds or the mediums they target the audience. The general cognitive decline related to aging, medication, and biological issues also leads to victimization. The researcher also the problem arising from limited social interaction, loneliness, and the lack of family, which leads to victimization. The researchers also learned about the existing solutions that attempted to address parts or whole of the causative issues. The researcher learned about creative ways to improve the cognitive abilities of seniors and methods of creating experiences for seniors even more through this review. To understand the problem from the target audience's point of view, the researcher interviewed, and the focus group discussion helped generate key themes and design direction towards designing an app-mediated board game. The researcher also developed three user types that would interact with the solution. Insights from the research phase were leveraged to brainstorm ideas and concepts. After the iterative brainstorming and playtesting, Puppy Valley was selected and refined as the solution.

Puppy Valley is an app-mediated trivia board game centered around raising a puppy. The software and physical product interact because the software aids in quickly expanding the activity card options and assisting connection over the internet. The goal of puppy valley is to open conversations about scams and fraud through the gamification of real-life narratives. Players must select questions by spinning the game wheel, which has activities based on location. After choosing an action, the opponent player must read the question by choosing a difficult or easy pool. A player's puppy is then rewarded with the power of strength and speed after a win. When a player wins, the opponent loses money, and vice versa. Trivia questions are inspired by real-life stories from the Better Business Bureau (BBB) Scam Tracker platform and other fraud-related

resource websites. Puppy valley's remote gameplay feature promotes social interactions for people seniors who have families away. This interaction is to fill the void that most scams are used to taking advantage of. The conversation around scams is supposed to help the senior's families and friends have the platform to discuss scams. The game is ultimately designed to help improve the cognitive abilities of aged seniors. Following the Seidenberg Multiple Ability Self-Report Questionnaire's (MASQ) five cognitive domains, namely, language, verbal memory, attention and concentration, visual perception, and visual-spatial memory, the game, through its key element and touchpoints, address the problem at hand.

- Language - Users can improve their language cognitive abilities by listening and answering questions. Reading questions as an opposing player also could enhance the formulation of sentences and general confidence in speaking. After each round of the game, discussing questions and answers with other players helps build general communication abilities.
- Verbal Memory - Listening to a question, retaining the verbal instruction, and responding can help improve a person's verbal memory. The trivia and quiz game style involves retaining all game activities, which can also improve verbal memory.
- Attention / Concentration - The general process of listening and answering questions requires attention and concentration, which can be improved over time. Reading questions requires concentration to be able to articulate the activity to the opponent. This interactive experience improves the cognitive domain. Cognitive Domain
- Visual-Perceptual - Users can improve this domain by recognizing icons related to specific activities. Interacting with locations on the map is supposed to enhance the recognition of visuals, and it's an association with an activity. Recognizing activity colors is a vital aspect of the game that improves visual perceptual memory.
- Visual-Spatial Memory - Recalling the connection between an icon and activity helps with improving this cognitive domain. Recalling each color and the activity associated with it improves the part of cognitive ability.

This study had faced a lot of challenges. First, it was initiated at the time of the COVID-19 Pandemic, cutting off the communication with the target user group from this study. During this period, stay-at-home order and restriction to senior home meant a lot about the methodology of this research would change. The researcher had to rely on expert designers and colleagues and the

research committee to critiques and evaluated critical parts of the studies. Whiles all accommodations were implemented to obtain the most accurate results from each activity, the results and solutions for this study cannot fully be generalized. With that in mind, the researcher hopes to expand on this research outside of the university, where it was conducted as part of a Master of Fine Arts degree project.

This research focuses on a social problem that continues to worsen in American society. Senior fraud can only be solved by a profoundly innovative approach, which this study has successfully opened. With further in-person testing and validation, Puppy Valley can be a game in every home or senior care center for the aged communities to learn about fraud. I will be forever grateful for launching this innovative effort to combat senior fraud in the United States of America.

REFERENCE

2019 Internet Crime Report Released. (n.d.). [Story]. Federal Bureau of Investigation. Retrieved April 3, 2021, from https://www.fbi.gov/news/stories/2019-internet-crime-report-released-021120

A Support Net: Can you help someone in need? (n.d.). OpenLearn. Retrieved April 29, 2021, from https://www.open.edu/openlearn/health-sports-psychology/mental-health/support-net-can-you-help-someone-need

Akl, E. A., Gunukula, S., Mustafa, R., Wilson, M. C., Symons, A., Moheet, A., & Schünemann, H. J. (2010). Support for and aspects of use of educational games in family medicine and internal medicine residency programs in the US: A survey. *BMC Medical Education*, *10*, 26. https://doi.org/10.1186/1472-6920-10-26

Annett, J. (2003). Hierarchical task analysis. *Handbook of Cognitive Task Design*, *2*, 17–35.

Anonymous. (2016). Watch out for these four types of elder fraud. *New Pittsburgh Courier*, C1–C2.

ATLAS.ti: The Qualitative Data Analysis & Research Software. (n.d.). ATLAS.ti. Retrieved April 29, 2021, from https://atlasti.com/

Beltrami, D. (2020, December 22). *A board game design process: A game is a system*. Medium. https://uxdesign.cc/a-board-game-design-process-a-game-is-a-system-5469dfa4536

Blanton, K. (2012). The Rise of Financial Fraud. *IDEAS Working Paper Series from RePEc*. http://search.proquest.com/docview/1698185007/?pq-origsite=primo

Boote, D. N., & Beile, P. (2005). Scholars before researchers: On the centrality of the dissertation literature review in research preparation. *Educational Researcher*, *34*(6), 3–15.

Boyatt, R., Joy, M., Rocks, C., & Sinclair, J. (2014). What (Use) is a MOOC? *The 2nd International Workshop on Learning Technology for Education in Cloud*, 133–145.

Braucher, J., & Orbach, B. (2015). Scamming: The Misunderstood Confidence Man. *Yale Journal of Law & the Humanities*, *27*, 249–290.

Braun: Successful qualitative research: A practical... - Google Scholar. (n.d.). Retrieved May 2, 2020, from https://scholar.google.com/scholar_lookup?title=Successful%20qualitative%20research%3A%20A%20practical%20guide%20for%20beginners&author=V.%20Braun&author=V.%20Clarke&publication_year=2013

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher*, *18*(1), 32–42. https://doi.org/10.3102/0013189X018001032

Burnes, D., Henderson Jr, C. R., Sheppard, C., Zhao, R., Pillemer, K., & Lachs, M. S. (2017). Prevalence of financial fraud and scams among older adults in the United States: A systematic review and meta-analysis. *American Journal of Public Health*, *107*(8), e13–e21.

Carvalho, S., & White, H. (1997). *Combining the quantitative and qualitative approaches to poverty measurement and analysis: The practice and the potential*. The World Bank.

Castronova, E., & Knowles, I. T. (2015). *A Model of Climate Policy Using Board Game Mechanics* (SSRN Scholarly Paper ID 3068203). Social Science Research Network. https://papers.ssrn.com/abstract=3068203

Cercone, K. (2008). Characteristics of Adult Learners with Implications for Online Learning Design. *AACE Journal*, *16*(2), 137–159.

Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. SAGE.

Cheng, Y.-M., & Johnson, C. (2007). Applying task analysis to facilitate the design of context-aware technologies. *Complexity in Design and Engineering*.

Clark, R. C., & Mayer, R. E. (2012). *Scenario-Based e-Learning: Evidence-Based Guidelines for Online Workforce Learning*. Center for Creative Leadership. http://ebookcentral.proquest.com/lib/purdue/detail.action?docID=1097790

Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic analysis. *Qualitative Psychology: A Practical Guide to Research Methods*, 222–248.

Conaway, W., & Zorn-Arnold, B. (2016). The Keys to Online Learning for Adults: The Six Principles of Andragogy, Part II. *Distance Learning*, *13*(1), 1–6.

Curry, L. (1983). *An organization of learning styles theory and constructs.*

Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. Transaction publishers.

Dib, C. Z. (1988). Formal, non-formal and informal education: Concepts/applicability. *AIP Conference Proceedings*, *173*, 300–315.

Dun et al. (n.d.). *Dunn: Manual: Learning style inventory—Google Scholar*. Retrieved April 1, 2019, from https://scholar.google.com/scholar_lookup?title=Manual%3A%20learning%20style%20inventory&author=RD.%20Dunn&author=K.%20Dunn&author=G.%20Price&publication_year=1985

Dzunic, Z., Stoimenov, L., & Dzunic, M. (2011). Trust in eLearning systems based on virtual community of practice. *Technics Technologies Education Management*, *6*(4), 1235–1245.

Escanero, J. F., Soria, M., Guerra, M., Silva, J., & Gargiulo, P. Á. (2015). *Learning styles and strategies: The importance of the tool selection*. Springer International Publishing.

Esteban, M., & Ruiz, C. (1996). Estilos y estrategias de aprendizaje. *Anales de Psicología*, *12*(2), 121–122.

Feng, S., Hossain, L., & Paton, D. (2018). Harnessing informal education for community resilience. *Disaster Prevention and Management: An International Journal, Disaster Prevention and Management*, *27*(1), 43–59. https://doi.org/10.1108/DPM-07-2017-0157

Fighting Fraud: U.S. Senate Aging Committee Identifies Top 10 Scams Targeting Our Nation's Seniors (S. Rept. 114-208). (N.D.).

Gallego, D. J. (2013). Ya he diagnosticado el estilo de aprendizaje de mis alumnos y ahora?` qué hago? *Journal of Learning Styles*, *6*(12).

Ganzini, H., Mcfarland, H., & Cutler, H. (1990). Prevalence of Mental Disorders after Catastrophic Financial Loss. *The Journal of Nervous and Mental Disease*, *178*(11), 680–685. https://doi.org/10.1097/00005053-199011000-00002

Gjedde, L. (2015). *Designing for motivational immersive learning through narrative role-play scenarios*. 337–341. https://www.learntechlib.org/primary/p/152030/

Gottfredson, L. S. (1997). Why g matters: The complexity of everyday life. *Intelligence*, *24*(1), 79–132. https://doi.org/10.1016/S0160-2896(97)90014-3

Greenberg, S., & Buxton, B. (2008). Usability evaluation considered harmful (some of the time). *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 111–120.

Greenfield, P. M. (2009). Technology and informal education: What is taught, what is learned. *Science*, *323*(5910), 69–71. https://doi.org/10.1126/science.1167190

Grimes, G. A., Hough, M. G., Mazur, E., & Signorella, M. L. (2010). Older Adults' Knowledge of Internet Hazards. *Educational Gerontology*, *36*(3), 173–192. https://doi.org/10.1080/03601270903183065

Gross, E. A. (2001). *Elderly victims of telemarketing fraud: Demographic, social, and psychological factors in victimization and willingness to report* (2001-95006-282). ProQuest Information & Learning.

Gross, R. (2012). *Psychology: The Science of Mind and Behaviour 6th Edition*. Hodder Education.

Guest, G., Namey, E., Taylor, J., Eley, N., & McKenna, K. (2017). Comparing focus groups and individual interviews: Findings from a randomized study. *International Journal of Social Research Methodology*, *20*(6), 693–708. https://doi.org/10.1080/13645579.2017.1281601

Hall, J. E. (2016). *Elder abuse surveillance: Uniform definitions and recommended core data elements* (Version 1.0.). Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, Division of Violence Prevention. http://purl.fdlp.gov/GPO/gpo73200

Herrington, A., Herrington, J., Oliver, R., Stoney, S., & Willis, J. (2001). *Quality Guidelines for Online Courses: The Development of an Instrument To Audit Online Units*.

Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology, Research and Development*, *48*(3), 23. https://doi.org/10.1007/BF02319856

Hochleitner, C., Hochleitner, W., Leitner, J., Haller, M., Geven, A., & Tscheligi, M. (2010). *Using Heuristics to Evaluate the Overall User Experience of Video Games and Advanced Interaction Games* (pp. 233–256). https://doi.org/10.1007/978-1-84882-963-3_13

Honey, P., & Mumford, A. (1992). *The manual of learning styles* (Vol. 3). Peter Honey Maidenhead.

How to Learn Board Game Design and Development. (n.d.). Game Development Envato Tuts+. Retrieved April 16, 2021, from https://gamedevelopment.tutsplus.com/articles/how-to-learn-board-game-design-and-development--gamedev-11607

Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior*, *29*(3), 340–362.

Illeris, K. (2017). *How we learn learning and non-learning in school and beyond* (Second edition..). Routledge. http://ebookcentral.proquest.com/lib/Purdue/detail.action?docID=4717783

Inc, S. G., & America, U. S. of. (1981). *Dictionary of Criminal Justice Data Terminology-1981*.

Judges, R. A., Gallant, S. N., Yang, L., & Lee, K. (2017). The Role of Cognition, Personality, and Trust in Fraud Victimization in Older Adults. *Frontiers in Psychology*, *8*. https://doi.org/10.3389/fpsyg.2017.00588

Keefe, J. W. (1988). *Profiling and Utilizing Learning Style. NASSP Learning Style Series*. Publication Sales, National Association of Secondary School Principals, 1904 Association Drive, Reston, VA (Stock No.

Kennedy, P. (2009). How to combine multiple research methods: Practical triangulation. *Jonny Holland Magazine*.

Kircanski, K., Notthoff, N., Deliema, M., Samanez-Larkin, G. R., Shadel, D., Mottola, G., Carstensen, L. L., & Gotlib, I. H. (2018). Emotional Arousal May Increase Susceptibility to Fraud in Older and Younger Adults. *Psychology and Aging*, *33*(2), 325–337. https://doi.org/10.1037/pag0000228

Knowles, M. S. (1970). *The modern practice of adult education: Andragogy verus pedagogy* (1973-03227-000). Association Press.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge university press.

Machado, T., Gopstein, D., Nealen, A., & Togelius, J. (2019). Pitako-recommending game design elements in cicero. *2019 IEEE Conference on Games (CoG)*, 1–8.

Mallett, C. J., Trudel, P., Lyle, J., & Rynne, S. B. (2009). Formal vs. Informal Coach Education. *International Journal of Sports Science & Coaching*, *4*(3), 325–364. https://doi.org/10.1260/174795409789623883

McGhee, J. L. (1983). The vulnerability of elderly consumers. *International Journal of Aging & Human Development*, *17*(3), 223–246. https://doi.org/10.2190/7J2P-DGE5-GYHH-DCRX

Merriam, S. B. (1993). *An Update on adult learning theory*. Jossey-Bass.

Merriam, S. B. (2001). Andragogy and Self-Directed Learning: Pillars of Adult Learning Theory. *New Directions for Adult and Continuing Education*, *2001*(89), 3–14. https://doi.org/10.1002/ace.3

Merton: Thematic analysis in science: Notes on Holton's... - *Google Scholar*. (n.d.). Retrieved May 2, 2020, from https://scholar.google.com/scholar_lookup?title=Thematic%20analysis%20in%20science%3A%20Notes%20on%20Holton%E2%80%99s%20concept&author=RK.%20Merton&journal=Science&volume=188&issue=4186&pages=335-338&publication_year=1975

Mortenson, W. B., Sixsmith, A., & Kaufman, D. (2017). Non-Digital Game Playing by Older Adults. *Canadian Journal on Aging / La Revue Canadienne Du Vieillissement*, *36*(3), 342–350.

New FTC Data Shows that the FTC Received Nearly 1.7 Million Fraud Reports, and FTC Lawsuits Returned $232 Million to Consumers in 2019. (2020, January 22). Federal Trade Commission. https://www.ftc.gov/news-events/press-releases/2020/01/new-ftc-data-shows-ftc-received-nearly-17-million-fraud-reports

Nielsen, J. (1995). How to conduct a heuristic evaluation. *Nielsen Norman Group*, *1*, 1–8.

Nielsen, J. (2005). *Ten usability heuristics*. http://www. nngroup. com/articles/ten-usability-heuristics/(acc-essed ….

North, C., Shneiderman, B., & Plaisant, C. (1997). Visual Information Seeking in Digital Image Libraries: The Visible Human Explorer. *Information in Images*.

Opdenakker, R. (2006). Advantages and disadvantages of four interview techniques in qualitative research. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, *7*(4).

Oxford, R. L. (2003). Language learning styles and strategies: An overview. *Learning Styles & Strategies/Oxford, GALA, 2003*, 1–25.

Phd, B. D. J., Phd, P. A. B., & Md, D. A. B. (2014). Correlates of Susceptibility to Scams in Older Adults Without Dementia. *Journal of Elder Abuse & Neglect*, *26*(2), 107–122. https://doi.org/10.1080/08946566.2013.821809

planning, F. B. F. L. D. K. is an expert on retirement, insurance, Ownership, H., Basics, L., investments, more D. has 10+ years of experience reporting on, RothIRA.com, personal finance for outlets like, Bulletin, A., magazine, E., administration, in addition to being the "Bank of D. column writer for F. com H. earned both his B. of S. in business, & Kurt, his M. of A. in communication from M. U. L. about our editorial policies D. (n.d.). *What Is the Better Business Bureau?* Investopedia. Retrieved April 11, 2021, from https://www.investopedia.com/what-is-the-better-business-bureau-5024818

Quiñones, D., & Rusu, C. (2017). How to develop usability heuristics: A systematic literature review. *Computer Standards & Interfaces*, *53*, 89–122. https://doi.org/10.1016/j.csi.2017.03.009

Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the Nutrition Society*, *63*(4), 655–660. https://doi.org/10.1079/PNS2004399

Recognition of Non-formal and Informal Learning—Home—OECD. (n.d.). Retrieved March 30, 2019, from http://www.oecd.org/education/skills-beyond-school/recognitionofnon-formalandinformallearning-home.htm

Ryan, F., Coughlan, M., & Cronin, P. (2009). Interviewing in qualitative research: The one-to-one interview. *International Journal of Therapy and Rehabilitation*, *16*(6), 309–314.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Sage.

Sato, T., Haegele, J. A., & Foot, R. (2017). Developing Online Graduate Coursework in Adapted Physical Education Utilizing Andragogy Theory. *Quest*, *69*(4), 453–466. https://doi.org/10.1080/00336297.2017.1284679

Schmeck, R. R., & Ribich, F. D. (1978). Construct Validation of the Inventory of Learning Processes. *Applied Psychological Measurement*, *2*(4), 551–562. https://doi.org/10.1177/014662167800200410

Schneider, S. L., & Kogan, I. (2008). The International Standard Classification of Education 1997: Challenges in the application to national data and the implementation in cross-national surveys. *Mannheim: MZES*.

Seidenberg, M., Haltiner, A., Taylor, M. A., Hermann, B. B., & Wyler, A. (1994). Development and validation of a multiple ability self-report questionnaire. *Journal of Clinical and Experimental Neuropsychology*, *16*(1), 093–104.

Takatalo, J., Häkkinen, J., Kaistinen, J., & Nyman, G. (2010). Presence, involvement, and flow in digital games. In *Evaluating user experience in games* (pp. 23–46). Springer.

Torrente, J., Vallejo-Pinto, J. A., Moreno-Ger, P., & Fernandez-Manjon, B. (2011). *Introducing Accessibility Features in an Educational Game Authoring Tool: The <e-Adventure> Experience*. 341–343. https://doi.org/10.1109/ICALT.2011.106

Tu, H., Doupé, A., Zhao, Z., & Ahn, G. (2016). SoK: Everyone Hates Robocalls: A Survey of Techniques Against Telephone Spam. *2016 IEEE Symposium on Security and Privacy (SP)*, 320–338. https://doi.org/10.1109/SP.2016.27

Tweedell, C. B. (2000). *A Theory of Adult Learning and Implications for Practice.*

User Centered System Design: New Perspectives on Human-computer Interaction. (n.d.). Routledge & CRC Press. Retrieved April 8, 2021, from https://www.routledge.com/User-Centered-System-Design-New-Perspectives-on-Human-computer-Interaction/Norman-Draper/p/book/9780898598728

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the Development of Children*, *23*(3), 34–41.

Walny, J., Haber, J., Dörk, M., Sillito, J., & Carpendale, S. (2011). Follow that sketch: Lifecycles of diagrams and sketches in software development. *2011 6th International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT)*, 1–8.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, xiii–xxiii.

Woolfolk: Educational Psychology—Google Scholar. (n.d.). Retrieved April 1, 2019, from https://scholar.google.com/scholar_lookup?title=Psicolog%C3%ADa%20Educativa&author=A.%20Woolfolk&publication_year=1996

APPENDIX 1

Introduction

Thank you for agreeing to participate in this study. This research is focused on gaining insight into how to develop solution that will improve seniors' cognitive abilities whiles creating awareness of scams and acts of fraud among older adults. It seeks to understand how learning through playing games could provide a potential avenue for creating awareness about latest scams that are targeted at seniors' citizens of the United States. Today, you will be introduced to the research study through a semi-structured interview where you will be asked demographic questions about your age, gender, educational background, and personal or other's experience with scams and fraud.

Context

The prevalence of scam and fraud at targeted older adults has been on the rise within the last decade. The Center for Disease Control defines fraud as "Deception carried out to achieve personal gain while causing injury to another party. An intentional distortion of truth initiated to convince another to part with something of value or to surrender a legal right." 1 in18 independent and cognitive functioning senior citizens is victim of a scam in the last few years. Multiple reasons contribute to this issue. Two predominant issue is the decline in cognitive abilities of some victims and the limited knowledge of current scams and how the deceptions used are unfamiliar. The urgency to improve seniors' cognitive abilities while education and creating awareness on upcoming scams cannot be overstated.

Time involved

The first phase is this initial recruitment interview which will take about 15-20 minutes to complete.

To facilitate our notetaking, we would like to audio tape our conversations today. Please read and sign the consent form. For your information, only researchers on the project will be privy to the tapes which will be eventually destroyed after they are transcribed. Thank you

If interested, I will further on with the following questions below:

Interview Questions

We have planned this interview to last no longer than twenty minutes. During this time, we have about five questions that we would like to cover. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

Participant ID _____

A. Interviewee Background

1. Your age: _____
2. Your gender: ◯Female ◯Male
3. What is your highest degree? _____
4. How long have you lived in the senior care? _____
5. What was your profession before you retired? _____

B. Internet / Device

1. Do you use any of these devices?
   - ◯Personal computer
   - ◯Tablet
   - ◯Mobile phone
   - ◯Home phone
2. Do you describe yourself as some who can you a smart phone?
3. Do you know how to use the internet?
   [Probe] If Yes, what do you usually do on the internet?

C. Experience

4. Have you ever been a target of scam? If yes, can you share your experience_____
5. Do you know anyone who have ever been scammed or been targeted? If yes, can you share your experience_____

APPENDIX 2

Focus Group Interview

Thanks for taking the time to join us to talk and find ways to solve scams and fraud targeted at seniors. This event is a focus group discussion. Our discussion will center around understand how learning through playing games could provide a potential avenue for creating awareness about the latest scams that are targeted at seniors' citizens of the United States.

You were invited for this discussion because you have participated in our first interview, and you showed interest in joining today's focus group.

There are no wrong answers, but rather different points of views. Please feel free to share your point of view even if it differs from what others have said. Keep in mind that we're just as interested in negative comments as positive comments, and at times the negative comments are the most helpful.

Time involved

The total time commitment is limited to the 60-90-minute discussion period.

To facilitate our notetaking, we would like to audio tape our conversations today. Please read and sign the consent form. For your information, only researchers on the project will be privy to the tapes which will be eventually destroyed after they are transcribed. Thank you

If interested, I will further on with the following questions below:

Interview Questions

We have planned this discussion to last no longer than ninety minutes. During this time, we have about five questions that we would like to cover. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

1) What are some common scams that you've heard of? Have you experienced any of the ones you mentioned?

2) How do you hear about new fraud and scams?
3) Supposed someone tried to defraud or scam you, who will you first talk to and why?
4) How did you react when you hear someone has been scammed? If you had the opportunity what would you do to help the person.
5) In your opinion, how or what can be done to prevent scams and fraud among seniors.
6) What games do you play in your free time?
7) Supposed that you were given a computer game, board game, mobile phone game which one would you like to play and why?
8) Let talk about things we mostly do one the internet.
9) If you want to learn something new where or how do you learn it?
10) What Of all the things we've talked about, what is most important to you?

APPENDIX 3

Below are some sample questions based on each location and activity.

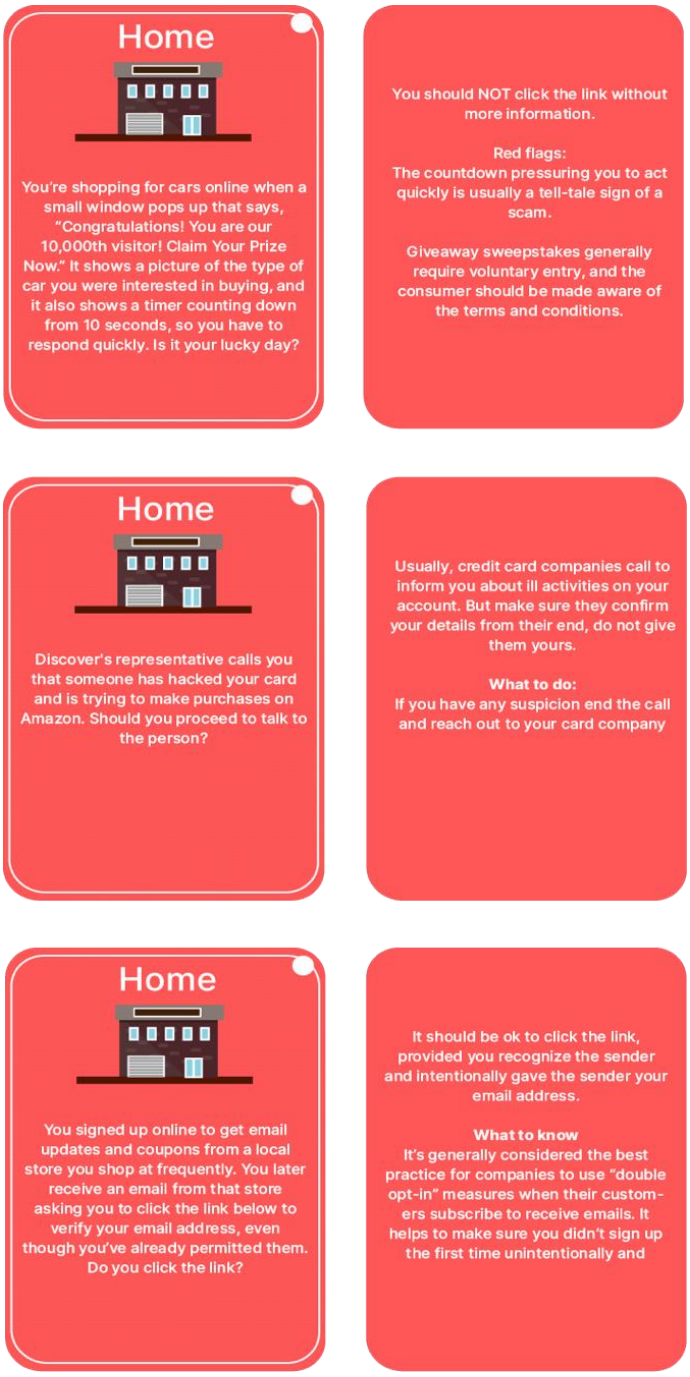

Figure 62. Questions for Home Activities

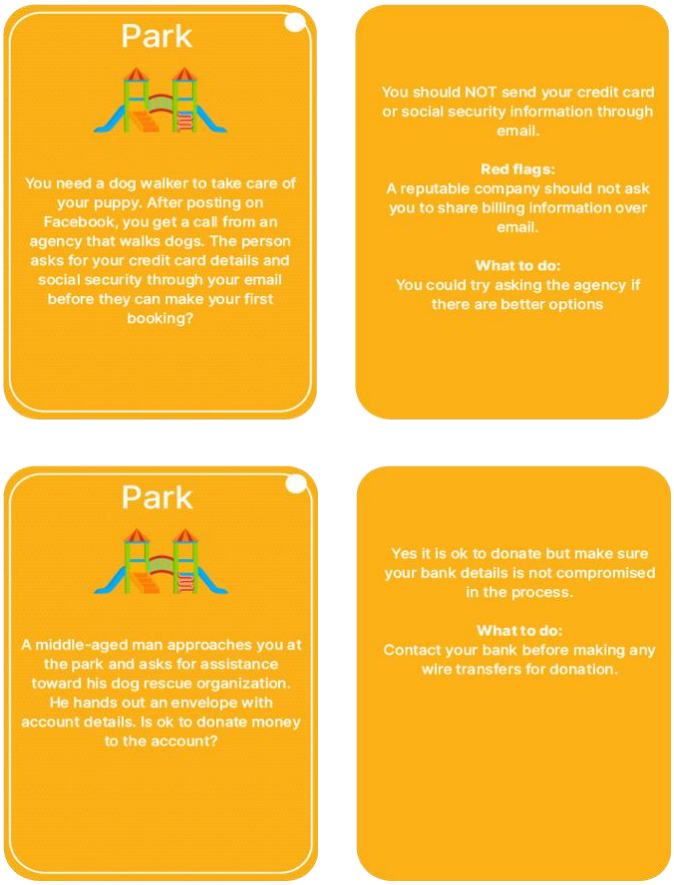

Figure 63. Questions for Park Activities

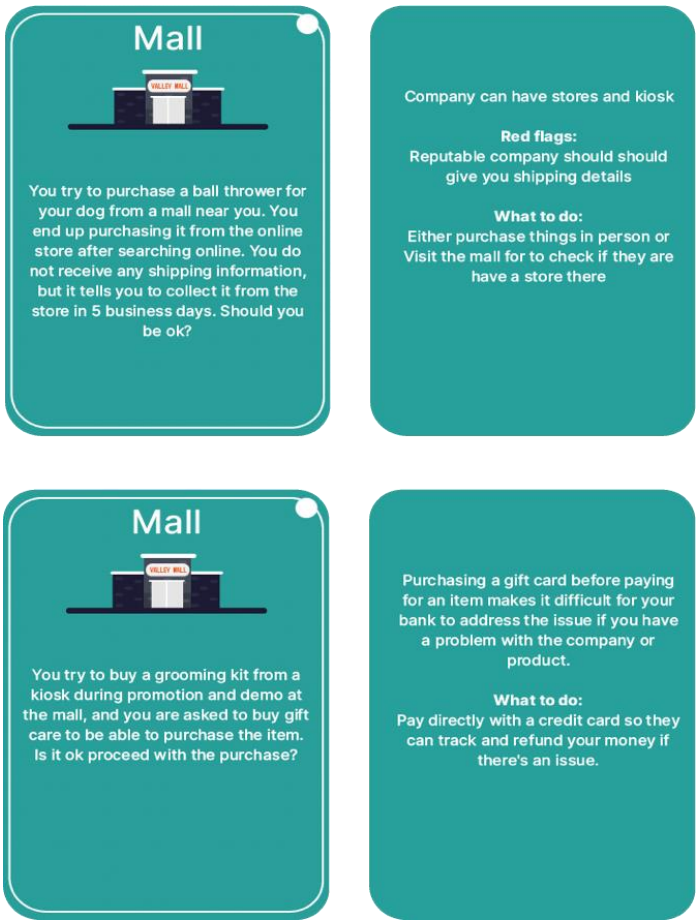

Figure 64. Questions for Mall Activities

Figure 65. Questions for Veterinary Activities