

Balancing Act

by

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Abstract

Balancing Act is a card matching game for 2 players that aims to inform players about basic money management principles. The purpose of the game is to educate players on different money management concepts in a fun and engaging manner. This paper will discuss the story of *Balancing Act*, the development of the game, and how the design of the game seeks to inform the player of its purpose. It will also include a post mortem that details the challenges of developing both a board and card version of the game, the overall outcomes of the project, and future directions for the game.

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1. Introduction

The number of games that teach about personal finance and money management continue to be few and far between. Most students are not taught financial literacy skills and the games designed to address this issue are often neither fun nor engaging (Greene 2018). Few schools also formally teach these skills such as budgeting, balancing a checkbook, or differences between a stock and a bond, leaving families to fill the void in knowledge (Greene 2018).

However, there is still the potential for students to learn financial lessons through the design of an interactive, educational game. In this project, I will discuss my attempts at developing a money management game and the resulting outcomes of this game.

The goal of my game, *Balancing Act*, is to inform players of money management topics in a fun and engaging manner. For this project, I created 2 iterations of my game. The first version of the game was a multiplayer life simulation board game for up to 4 players. As players progressed through the game, random events would occur that would force them to make difficult choices on whether to spend or save. In the second iteration of the game, I created a card matching game for 2 players. In the game, players try to match question and answer cards together while learning topics about housing, insurance, credit and investments. Testing was completed on the card game to determine the effectiveness of the game in teaching money management to players.

Balancing Act is targeted towards players ranging from 18 to 22 years old, as well as educators and students who are interested in learning more about

economics or personal finance. It is hoped that by playing the game, players will gain a deeper understanding of basic finances in order to make better informed decisions about money management.

2. Background

2.1 Financial Literacy in Young Adults

Financial literacy is defined as “the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being” (Hung, Parker, & Yoong 2009). The ability to manage personal finances is increasingly important in today’s world. For many young adults, their financial situation is characterized by increasing levels of debt. This is a concern, given that many young adults may lack sufficient knowledge to successfully navigate through financial decisions (Lusardi 2010). A study at the University of Illinois at Urbana-Champaign on young adults found that nearly a third were “financially precarious” because they had poor financial literacy, lacked money management skills, and income stability. The study found that “the differentiator between people in financially precarious and at-risk groups from their peers was that they experienced less financial socialization, defined by the researchers as formal or informal learning of financial concepts and money-management behaviors” (Forrest 2018). Knowledge of financial literacy has been shown to help increase the likelihood of young adults from ages 25 to 34 in building savings and planning for retirement, while decreasing the likelihood of using high cost borrowing methods (de Bassa Scheresberg, 2010).

2.2 Financial Literacy and Games

Games are not only developed and employed for entertainment purposes but can also be incorporated as learning and training tools for a broad range of different areas (Hawlitshchek & Joeckel, 2017). Research on the design and effects of educational games suggests that they increase learners' investment of mental effort and learning outcome (Hawlitshchek & Joeckel, 2017). One such area where educational games can be utilized is in financial education. In an ever-evolving world, financial literacy is crucial for consumers, who must make a wide range of financial decisions every day (Mitchell & Abusheva, 2016). However, challenges to financial literacy exist. These include the lack of a defined financial literacy structure, the perception of personal finance classes as boring, expensive, and not widely available, the lack of mandatory financial literacy courses in universities and schools, and a limited number of teachers who feel qualified to teach personal finance (Mitchell & Abusheva, 2016). However, there is the potential for video games to engage and build the financial literacy of its players due to their popularity and immersive qualities (Maynard 2012). While more research is needed, analysis of financial education games suggests that they can be successful at engaging players, building financial capacity, and enabling them to take real world financial action (Maynard 2012). For example, "Bite Club" is a video game created by the Doorways to Dreams (D2D) Fund, a Boston based non-profit organization that works to improve the finances of low- and middle-income consumers (The Economist, 2013). In "Bite Club," players run a night club for vampires and collect money by serving

customers the blood type they want, while storing away cash for retirement (The Economist, 2013). Other titles that have been released by D2D include “Farm Blitz” and “Celebrity Calamity.” In “Farm Blitz”, players are challenged to harvest crops to pay off loans while fending off rabbits (which represent debt) (The Economist, 2013). In “Celebrity Calamity”, players act as a money manager for a Hollywood starlet to keep her out of debt (The Economist, 2013). Evaluation of *Farm Blitz* and *Bite Club* was conducted with user groups consisting of nine to 18 participants (Maynard 2012). For “Beta” testing and preliminary testing, users completed a pre- and post-test of financial confidence questions and financial knowledge questions (Maynard 2012). Quantitative results showed that there were overall positive gains in financial knowledge and self-confidence (Maynard 2012).

Another example of a financial education game called the “Financial Literacy Game,” was developed by a multidisciplinary team at Ohio University using the Second Life platform (Liu 2011). In the game, the player takes on the role of an 18-year-old who has just graduated from high school (Liu 2011). As the game progresses, the player must make different decisions, such as whether to go to college or find a job right away, whether to buy or lease a car, and when to rent an apartment or move to a house (Liu 2011). The game also features a number of quests that test player’s knowledge of different financial situations. For example, a player may be presented with a car quest in which they go to a car dealership to buy a car. The car quest will then feature a video on a typical situation that a person might go through when trying to purchase a car (Liu

2011). After viewing the video, the player will then be asked a series of multiple-choice questions that tests the player's knowledge of that particular topic (Liu 2011). Results of the study suggested that players felt the game helped improve their financial skills and provided enjoyment in learning about finance topics (Liu 2011).

2.3 Balancing Act's Goal

Money management is defined as the "practice of handling one's personal finances" ("Money management"). Balancing Act's aim is to inform players of basic money management concepts in a fun and engaging way. As many young adults lack financial literacy and money management skills, there is an urgent need for them to have a better understanding of how to handle personal finances as they transition into adulthood (Forrest 2018). In an article by the Financial Times, one in five young adults reported not being confident about managing their money, with nearly two-fifths saying that they did not know where to go to get help with their finances (Barrett 2018). This game will help them learn more about financial literacy and money management as they graduate from college and join the workforce and continue the transition to adulthood.

2.4 Target Audience

I have selected an age group of 18-22 year old because my research has shown that young adults have low levels of financial literacy. A study by the Brookings Institution found that "overall, undergraduate students in the U.S. demonstrated low levels of financial literacy" (Conzelmann & Lacy, 2018).

Therefore, I would like to test the efficacy of my game as a viable platform for teaching money management to undergraduate students.

3. Development Overview

Influences

3.1 Pay Day

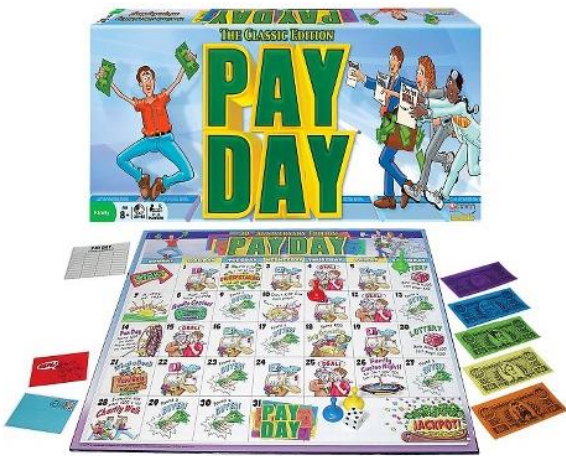


Figure 1. Pay Day (Parker Brothers, 1975) Source: [URL](#)

Pay Day is a board game originally made by the Parker Brothers that simulates money management. The game board resembles a calendar month, with players deciding how many months the game should be played. Over the course of the game, players will accumulate bills and expenses to pay, while also having the opportunity to make deals on property and earn money. At the end of each month, players will pay off all their bills, collecting their monthly wages at the end of the month on pay day. The winner of the game is the player who has the most money at the end of the last month of play. Like *Pay Day*, *Balancing Act* is similar in that it is also a money management game. However, the game differs in that it

seeks to inform players of money management concepts related to housing, insurance, credit, and investing.

3.2 Cashflow 101

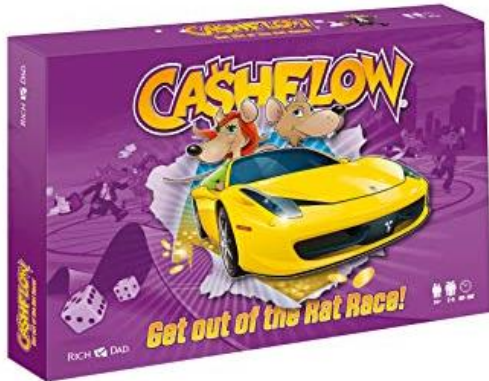


Figure 2. Cashflow 101 (Robert Kiyosaki, 1996). Source: [URL](#)

Cashflow 101 is a game developed by author Robert Kiyosaki to serve as a tool for players to learn basic financial strategies and accounting principles. Financial strategies are defined as “the practices an individual adopts to pursue their financial objectives” (“Financial strategies”). Accounting principles are defined as “a collection of rules, procedures, and conventions that define accepted accounting practice” (“Accounting principles”). Investment techniques are defined as “actions or operations that are undertaken with the intention of generating some form of future income” (“Investment Methods”). The game teaches players how to take charge of their personal finances, understand cash flow principles and develop the ability to make investing and real estate decisions. The game is similar to *Balancing Act* in that it seeks to teach its players personal finance lessons. However, *Balancing Act* is different in that it seeks to inform players about money management concepts instead of investing techniques.

3.3 Spent



Figure 3. *SPENT* (McKinney, 2011). Source: [URL](#)

Spent is an online game about surviving poverty and homelessness. It was developed by the ad agency McKinney for the Urban Ministries of Durham to help them tap into the power of social media and help them reach a new group of givers and volunteers (Northern 2011). Throughout the game, players make a series of decisions which impacts their income and affects different areas of their life such as health, level of education, and ability to provide for their family members. The game ends when players run out of money before the end of the month or make it through with money left over. Like *Spent*, players in *Balancing Act* must make decisions according to different scenarios that are presented to them. However, *Balancing Act* differs in that it is about money management, not poverty.

4. Inspiration

Balancing Act is a card matching game for 2 players that aims to inform them of money management principles related to housing, insurance, credit, and investments. The main idea for creating this game came from a game proposal that I had previously worked on. In my Game Design Studio class that I took with Professor Lee Sheldon, I pitched an idea for a life simulation game dealing with

poverty that the class could make as a group. My idea for that game was to create a single player game in Unity that would simulate the conditions of living in poverty and the challenges associated with it. Players would be immersed in a virtual world where they would be given a limited amount of money and resources and must decide how to spend their money over a specified amount of time. While my game idea was not selected to be made, I wanted to expand on this idea and see if I could make a version of this game myself. I started to brain-storm ideas on how to create my game and thought about ways that I could improve it from my original proposal. After deliberating for several weeks on direction on I wanted to take my game, I finally settled on the idea of money management. My decision to do this came partly from my own personal experiences- my dad's passing last year in 2018 shocked me into realizing that I did not have a good idea of what was going on with my family's finances and how to manage them. My talks with some friends from college also led me to feel that it would have been helpful if we had learned more about personal finances earlier in our lives and paid more attention to it. Therefore, I thought it would be both helpful and educational if I changed my life simulation game to be geared more towards money management so that players could learn something from it while also having fun.

5. Development of the Game

Throughout the process of developing the game, I made 2 iterations of my project. The first game was a multiplayer life simulation board game for 4 players. The second game that was produced in response to feedback from the first game was a card matching game for 2 players.

5.1 Research

This game required me to delve into research into the principles of money management. To do this I utilized books such as “*Why Didn’t They Teach Me This In School: 99 Principles of Money Management*” by Cary Siegel and *Focus on Personal Finance* by Jack Kapoor. Siegel’s book consists of 99 personal money management principles that is targeted towards both high school and college students. Kapoor’s book is a 14-chapter book that covers critical topics from personal finance courses, such as budgeting, taxes, credit, insurance, and investing.

5.2 First Iteration

In my first iteration of the game, I created a multiplayer life simulation game that involved money management. The goal of the game was to have players balance their incomes and expenses while also looking after their health, happiness, and relationship levels. At the beginning of the game, players received \$2000 in play money and chose a job and house to live in. Players then rolled a die and made a money management decision based on cards they drew that featured real life issues. Each player also received a set of happiness, health and relationship tokens, and would gain or lose their tokens depending on whether they chose to spend or save their money in the game. The first player to reach the maximum level of health, happiness, and energy tokens or have the most amount of cash remaining when all the cards run out wins the game.

5.2.1 Equipment

The game pieces in *Balancing Act* include:

Tokens



Happiness



Health



Relationships

Game Board

The design of this game board proved to be a significant challenge. As a multiplayer game with up to 4 people playing, this presented a design challenge as the view of the game board would look correct to only one person and distorted to the other 3 people playing the game. My first attempt at creating the board was to make a 3D version of a city, where players could move from building to building depending on what cards they drew and where the cards directed them to go.

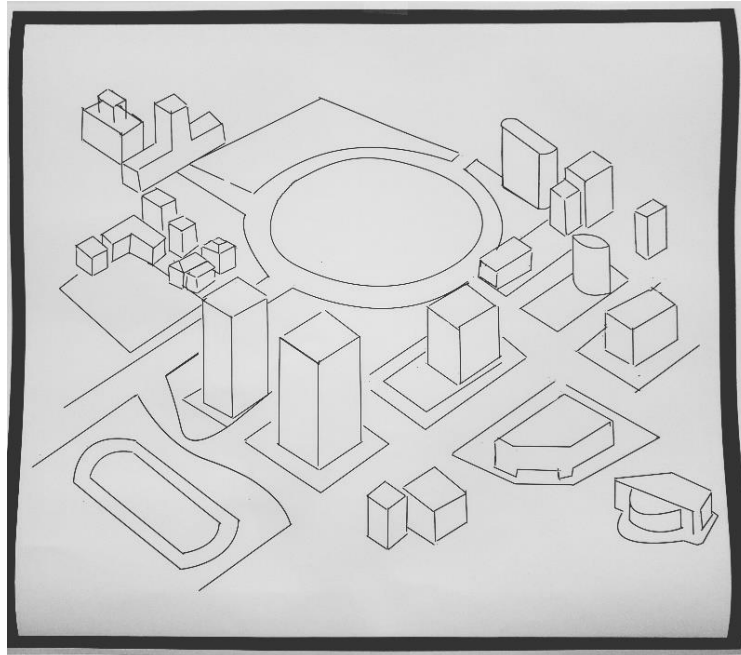


Figure 4. First Sketch of the Board

I then thought about designing the board from an orthographic perspective, so that the view would be the same for all players, however it would be hard to distinguish which building was which.



Figure 5. Orthographic View of the Board. Credit: Tianze Chen

I then tried to see if I could incorporate both residential areas and buildings on all 4 sides of the board. I put inner city housing on the innermost center of the board, with smaller houses and bigger houses on the outer edge. I then put the buildings on all 4 corners for players to travel to. However, the problem with this design was that the board became too crowded, leaving little room for space in between buildings. In addition, the buildings would look upside down to some players depending on where they were sitting.

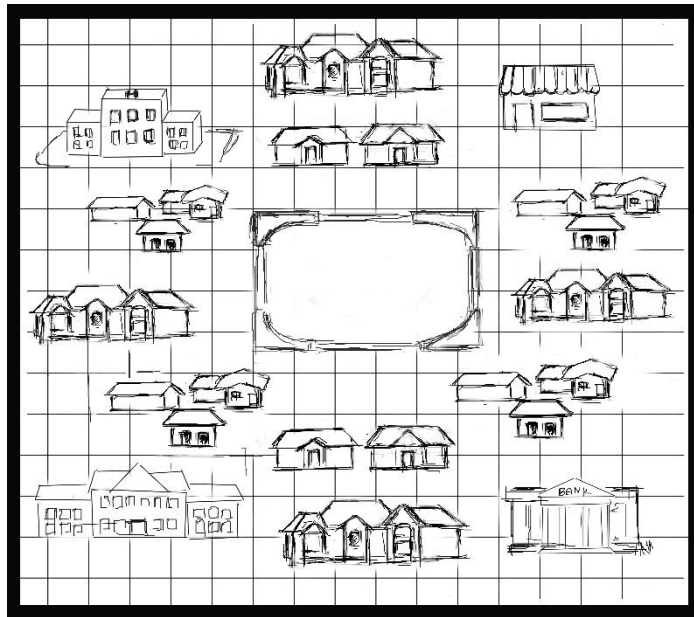


Figure 6. Second Sketch of the Board

I deliberated for a long time on how to design the board so that players on all 4 sides could view the board correctly from each person's perspective. The final solution that I came up with was to design the board in an 'X' shape, and to put each of the residential houses inside those areas. I removed the buildings from the board due to space constraints and because their functionality ended up not being used in the game. I also included the addition of a token grid containing

happiness, health, and relationship categories where the player would either gain or lose these tokens depending on how they fared during the game.

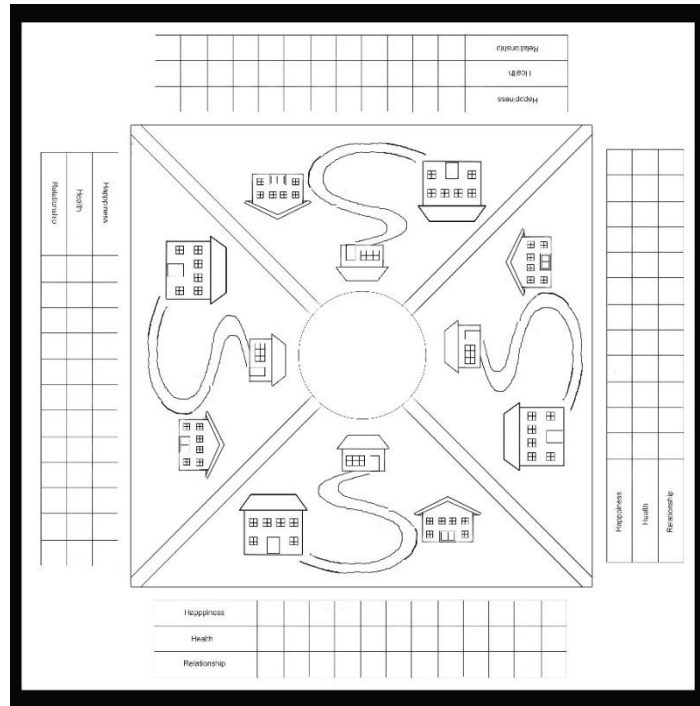


Figure 7. Game Board with Residential Areas

The final game board featured a residential area with different types of housing that the player could choose from. I added an arrow that went from red to green which would reflect the players' health, happiness and health levels in the game. The outer edge of the board contained a chart in which players could move their different tokens across the spaces on the board to monitor their progress in the game.



Figure 8. Final Game Board

Event Cards

There were 6 categories of event cards, which included Bad Luck, Good Luck, Health, Money, Work, and Relationships. To select a card, players rolled a custom die with the following 6 symbols and select the top card of a stack corresponding to the symbol on the die.

😊 - Good Luck

☹️ - Bad Luck

💰 - Money

🏥 - Health

👜 - Work

🤝 - Relationships

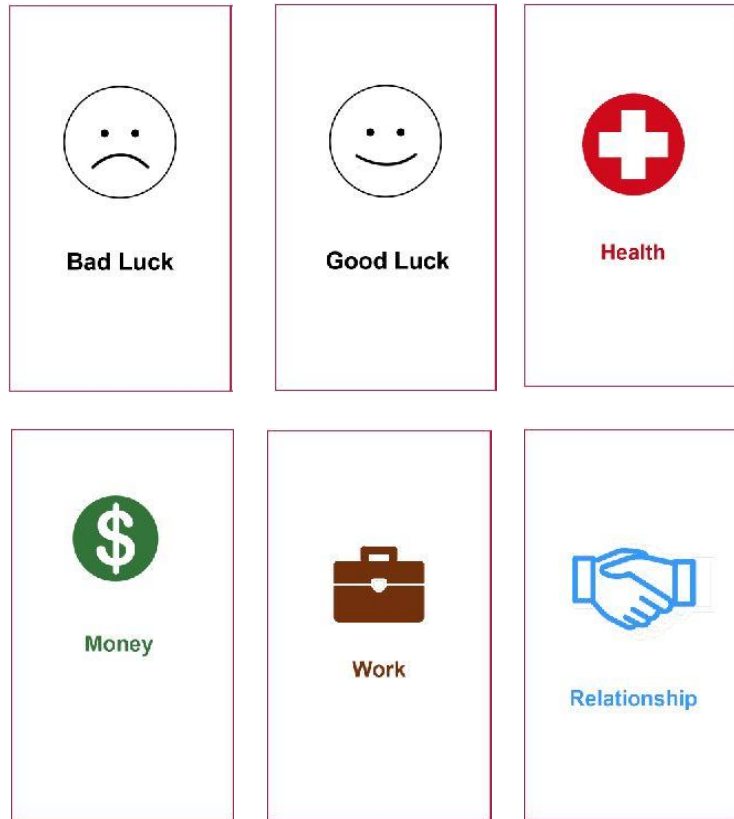


Figure 9.. Event Card Categories

Players would then follow the directions on the card and proceed to either spend or save their money according to the scenarios on the card.

5.2.2 Feedback

A playthrough of my game was conducted over spring break with 4 professors from the IMGD department. The feedback that I received from the playthrough of the game indicated that the game's mechanics and gameplay needed to be improved. First, the game was taking players too long to play. There were also too many things to keep track of, such as when players should receive salaries, when they should pay rent, as well as having to keep track of the amount of

money in their hand. Second, using the dice as a core mechanic of the game to have players decide which cards to draw proved to be problematic. This was because the random nature of the die prevented players from seeing the same cards as well as prevented them from being able to make any strategic moves in the game. In addition, many of the cards did not teach money management lessons to the player. Based on this feedback, I decided to make a second iteration of this game to resolve these problems.

5.3 Second Iteration

For the second iteration of my game, I decided to create a card matching game about money management for 2 players. I focused the contents of my cards around the topics of Housing, Insurance, Credit, and Investments. I created 20 question cards with scenarios and decisions and 20 answer cards for each category, with each card featuring a different money management principle. The following table illustrates examples of topics in the game, their teaching mechanism, and evaluation questions.

Topic	Game Mechanic	Evaluation Question
<p>Renting vs. owning</p> <p>Understand the differences between renting vs owning and the benefits of each.</p>	<p>There are several different cards that discuss the differences between renting vs. owning. For example:</p> <p>1. You would like to completely redesign your bathroom.</p>	<p>1. What are the benefits of owning? (Check all that apply)</p> <ul style="list-style-type: none"> <input type="radio"/> Personalizing your living space <input type="radio"/> Less costly repairs <input type="radio"/> Mobility

<p>Benefits of renting:</p> <ul style="list-style-type: none"> • Less costly repairs • Easier relocation if moving in the future <p>Benefits of owning:</p> <ul style="list-style-type: none"> • Ability to personalize your living space • Ability to build personal wealth • Being able to deduct mortgage interest from taxable income 	<p>Do you:</p> <p>A) Try remodeling B) Leave it alone.</p> <p>Answer: B) You are not able to update or personalize your living space in an apartment.</p> <p>2. How does owning a home help increase personal wealth? A) Builds equity B) Lowers mortgage payments</p> <p>Answer: A) You can build equity when owning a home (the market value of the home minus what you owe on it).</p>	<ul style="list-style-type: none"> ○ Deducting mortgage interest from taxable income ○ Building wealth <p>2. If you want to personalize your living space, it is easier to do so when:</p> <ul style="list-style-type: none"> ○ Renting ○ Owning
<p>Insurance</p> <p>Understand the purpose of insurance and the benefits of renters and homeowners insurance.</p>	<p>1. While you were out, a fire broke out in your apartment. Which option will help you protect your personal belongings?</p> <p>A) Renters insurance B) Homeowners insurance</p> <p>Answer: A) Renters insurance is used to cover property damage in the event of an emergency such as a house fire or theft.</p>	<p>1. What is renters insurance?</p> <ul style="list-style-type: none"> ○ Financial protection provided for your home in the event of an accident or disaster ○ Financial protection provided for your personal property in the event of an accident or disaster ○ Financial protection provided for your apartment in the event of an accident or disaster

<p style="text-align: center;">Investing</p> <p style="text-align: center;">Understand investment topics such as:</p> <ul style="list-style-type: none"> • Diversifying your investments to lessen risk • Benefits of a 401k plan • What an investment vehicle is 	<p>1. What is an advantage of investing in a 401k plan?</p> <p>A) Allowing your money to grow tax-free</p> <p>B) Having your employer match a portion of your contribution</p> <p>C) Not having to pay taxes once with withdraw from the account</p> <p>Answer: A, B) You don't have to pay taxes on money you put into your 401k account, and companies often match anywhere from 1-5% of your gross salary.</p>	<p>What is an advantage of investing in a 401k plan?</p> <ul style="list-style-type: none"> ○ Allowing your money to grow tax-free ○ Having your employer match a portion of your contribution ○ Not having to pay taxes once with withdraw from the account
<p style="text-align: center;">Credit</p> <p style="text-align: center;">Understand the importance of credit and the factors that impact a credit score.</p>	<p>1. Which of these shows your credit history?</p> <p>A) Credit score</p> <p>B) Credit report</p> <p>C) Both</p> <p>Answer: B) Your credit report shows your credit history. Your credit score is just a number.</p>	<p>1. Which of these shows your credit history?</p> <ul style="list-style-type: none"> ○ Credit score ○ Credit report ○ Both

5.3.2 Equipment

The game pieces in *Balancing Act* include:

Tokens

Each player receives a set of housing, credit, and investment tokens, which are used to move along the track:



Housing



Investing



Credit

Track Cards

Each player receives a track card with the following categories:

Housing/Insurance, Credit, and Investments.

Housing/Insurance										
Credit										
Investments										

Figure 10. Track Card for Tokens

Question and Answer Cards

Balancing Act utilizes a question and answer card system. There are 6 decks of cards (3 questions, 3 answers), featuring topics on Housing/Insurance, Credit, and Investing (See Appendix B).

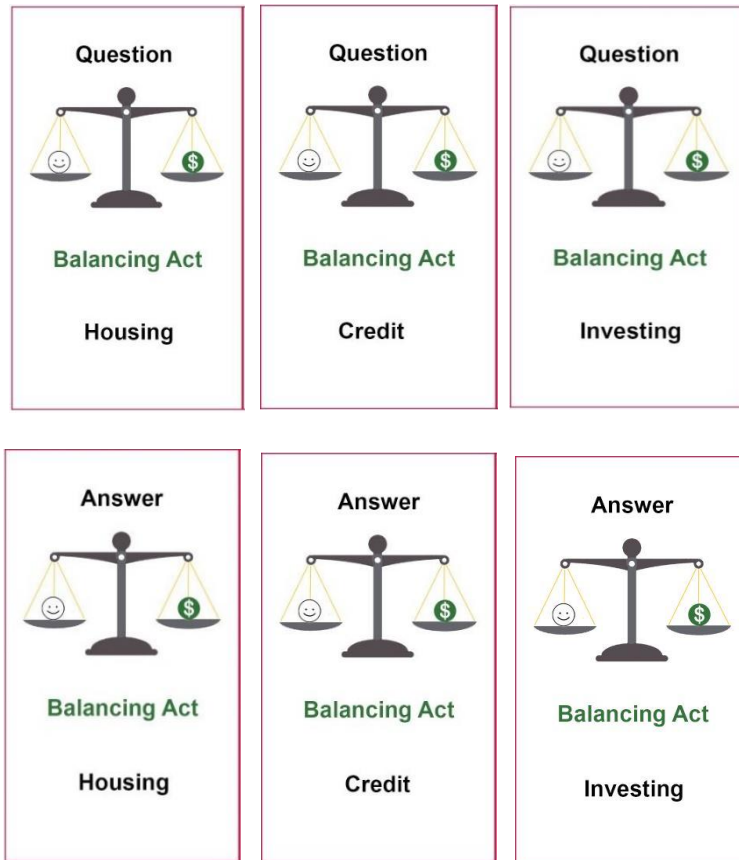


Figure 21. Question and Answer Cards

5.2.3 Gameplay

The goal of the game is for players to match the question and answer cards from each of the 3 categories of cards (Housing/Insurance, Credit, and Investments) to form a matching pair. The rules of the game are detailed below.

Game Rules

Number of players: 2

Time to Play: 40min

Contents

- 60 question and answer cards, 30 questions and 30 answers, featuring topics on Credit, Investing, Housing, and Insurance.
- 6 tokens, 1 per player: 2 Housing, 2 Credit, 2 Investing tokens
- 2 token track cards

Setup

- Players each receive a token track card
- Players each receive 1 Housing, Credit, and Investment token, which will be placed on the first space on the grid
- Shuffle the question and answer cards

Goal

Each player attempts to move all 3 of their tokens to the end of the track by matching question and answer cards.

How to Play

Both players will draw 6 cards, 3 each from the question and answer decks.

The oldest player plays first.

They will read the question cards in their hand and see if they can match any of the answer cards in their hand. If not, the player will read a question card aloud and ask their opponent if they have the answer card that they need. Matches are created when the card identifiers at the bottom of the two cards match.

Players get one play per turn, either matching cards in their hand or matching a card with the other player.

If their opponent has the matching card, they read it aloud and give it to the first player who matches it, puts the pair aside and moves their Savings, Credit, or Investment token up the grid. They move the token on the corresponding track one space, then draw 2 cards to replace their match.

Each player has an opportunity to attempt a match with only one of their cards on each turn, whether it is in their own hand, or if they attempt a match with the other player. If they do not have a match, they can discard two of their cards to the bottom of the appropriate deck and draw 2 new cards.

The first player's turn ends when they have attempted to match the cards and have moved their tokens forward on the track. Then it is the other player's turn.

On each turn players will draw 3 cards and repeat their attempts to match them. Gameplay will continue in this fashion until all the cards are matched. The first person to reach the 10th space on the track for each of the Housing, Credit, or Investment tokens will win the game.

5.2.4 Game Flow

Players start the game by receiving 3 tokens (1 Housing, 1 Credit, 1 Investing) and placing them before the 1st space on the track card. Players will shuffle the cards and pick a category of cards to start with (Housing/Insurance, Credit, or Investing). Players will then draw 3 question cards from the question deck, and 3 answer cards from the answer deck. They will read the question cards in their hand and see if they can match any of the answer cards in their hand. A sample question card could feature a scenario such as this:

You have accepted a job in a new city but are not sure how long you will stay there. Which option will give you more mobility?

- A) Renting
- B) Owning

Housing 4

Next, the player may draw from the pile of answer cards and receive a matching answer such as this:

Renting gives you more mobility if you think you might move cities or change jobs in the near future.

Answer: A

Housing 4

Players will read the question and answer card texts to each other aloud.

Matches are created when the card identifiers at the bottom of the two cards match. If a match is made, the player can move their Housing, Credit, or Investment token up on the track.

On the next turn, a player may receive a question card with a scenario such as this:

Which of these shows your
credit history?

A) Credit score

B) Credit report

C) Both

Credit 2

The player may then draw an answer card from the corresponding pile with an answer such as this:

Make payments in full.
Carrying a credit card balance
means you'll be in debt
longer and accumulate
massive amounts of interest.

Answer: B

Credit 3

Since the player is not able to make a match, they will read their question card aloud and ask their opponent if they have the answer card that they need. Players get one play per turn, either matching the card in their hand or matching a card with another player. If their opponent has the matching card, they will read it aloud and give it to the first player who matches it, then puts the pair aside and moves their Savings, Credit, or Investment token up the track. They will then move the token on the corresponding track one space and draw 2 cards to

replace their match. Each player has an opportunity to attempt a match with only one of their cards on each turn, whether it is in their own hand, or if they attempt a match with the other player. If they do not have a match, they can discard two of their cards to the bottom of the appropriate deck and draw 2 new cards.

The first player's turn ends when they have attempted to match the cards and have moved their tokens forward on the track. Then it is the other player's turn.

On each turn players will draw 3 cards and repeat their attempts to match them. Gameplay will continue in this fashion until all the cards are matched. The first player to reach the 10th space on the track for that category wins the round.

Players will then proceed to the next category of cards and continue playing until all the deck of cards are finished. Whichever player reached the end of the track first for 2 out of the 3 categories will win the game.

6. Assessment

Testing for *Balancing Act* took place in March and April 2019. An IRB application was submitted and approved (See Appendix D). Playtesting sessions were conducted in groups of 2 people, after the prototype version of the game was completed. Subjects were recruited by reaching out to students individually or via email, and by going to different classes to recruit participants. The majority of students came from the Interactive Media & Game Development program at WPI, but also included students from other majors as well.

My research into assessment scales in financial literacy revealed that most data collection relies on self-administered surveys. For example, the Jump\$start

Coalition instrument consists of 56 questions comprising financial literacy (Mandell 2008). Rand (2004) utilized 48 knowledge-based questions to assess financial literacy in low-income workers. As such, I decided to use the pre and post-test survey methodology in combination with live observation to evaluate the effective of my game in teaching money management. The question I wanted to address in my evaluation is “Did players learn more about housing, insurance, credit, and investing topics after playing this game?”

6.1 Methods

Before playing the game, players were given a pre-test consisting of 10 questions that asked them what they knew about money management using an online form such as Google Forms (See Appendix C). While people were playing the game, I took notes and observed the players to gauge their reactions and level of interaction with the game. Once the playtesting session was finished, players completed a post-test with the same questions as the pre-test to assess what money management concepts they learned from the game. The evaluations that were collected from post-test were compared with pre-test results collected at the start of the game. The results were then used to assess what players learned from playing the game.

Testing was conducted on 14 players to evaluate the effectiveness of the game. Users volunteered about 40 minutes of their time to participate in the study. Two subjects were tested each time, and I supervised each test. Before the test, subjects were given written and verbal consent explaining their participation in the study. Once the study had been explained, subjects filled out

a pre-test survey online, which asked them 10 questions regarding their knowledge of money management. After completing the pretest, players proceeded to play the game and played for an average of 40 minutes. After the players finished the game, a post-test was given, featuring the same 10 questions as the pre-test along with an additional 2 questions that inquired about players' experiences with the game. Once the post-test was completed, the players left, and data was stored.

6.2 Results

Overall, the results showed that there was a significant improvement in the number of questions that were answered correctly on the post-test from the pre-test. When looking at question one, regarding the benefits of owning a home, we can see a change in users' answers before and after the game was played. The number of people who correctly checked "deducting mortgage interest from taxable income" changed from 7 to 14, and those who checked "building wealth" changed from 8 to 13. Interestingly the number of people who checked

“personalizing your living space” decreased from 14 to 12.

What are the benefits of owning a home? (Check all that apply)

14 responses

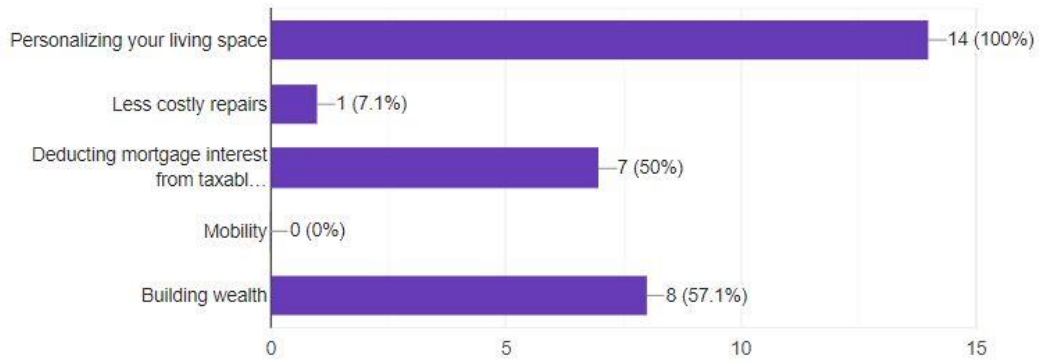


Figure 12. Pre-Test answers for question one

What are the benefits of owning a home? (Check all that apply)

14 responses



Figure 13. Post-Test Answers for Question 1

Looking at question number two, regarding the benefits of renting, there was also a change in results. The number of users who answered “less costly repairs”

shifted from 11 on the pre-test to 13 on the post test, and those who answered “mobility” shifted from 12 on the pre-test to 14 on the post test. However, this question had less of a shift in results compared to the previous question on owning. This suggests that more players knew about the benefits of renting as compared to owning before playing the game.

What are the benefits of renting a home? (Check all that apply)

14 responses

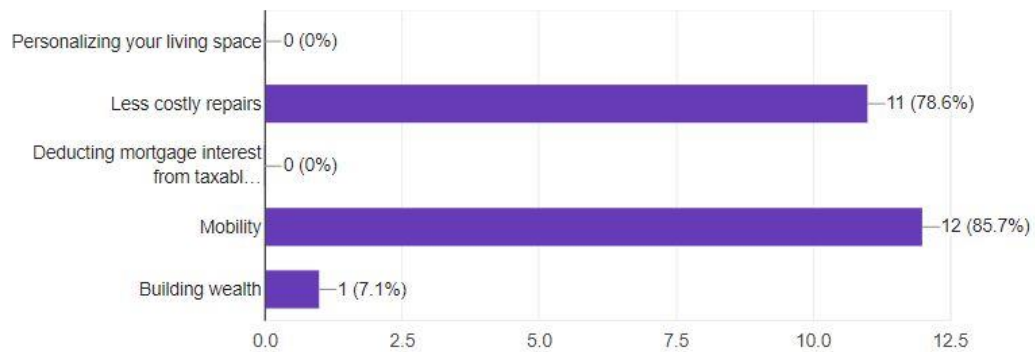


Figure 14. Pre-Test Answer for Question 2

What are the benefits of renting a home? (Check all that apply)



14 responses



Figure 15. Post-Test Answer for Question 2

For Question 3, on personalizing your living space, there was no change in results between the pretest and posttest. It can be inferred here that players already knew this concept before playing the game.

If you want to personalize your living space, it is easier to do so when:

14 responses

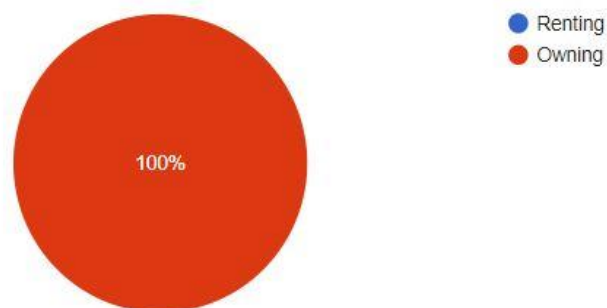


Figure 16. Pre-Test Answer for Question 3

If you want to personalize your living space, it is easier to do so when:

14 responses

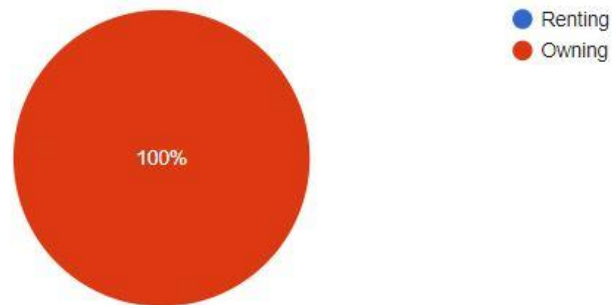


Figure 17. Post Test Answer for Question 3

For Question 5, regarding credit history, there was a large shift in answer change between pretest and post-test. On the pre-test, 3 players selected “credit report” as the correct answer, 9 players selected “both”, and 2 players selected “credit score.” On the post-test, 11 players selected “credit report” as the correct answer while 3 players selected “both.”

Which of these shows your credit history?

14 responses

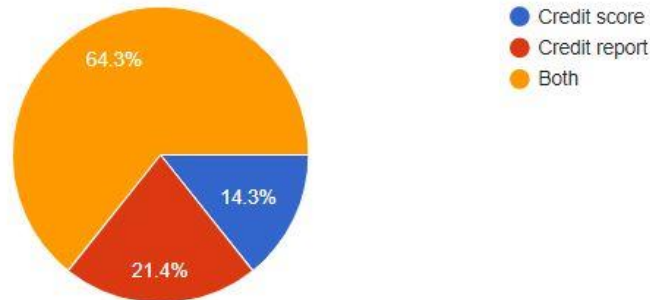


Figure 3. Pre-Test Answer for Question 5

Which of these shows your credit history?

14 responses

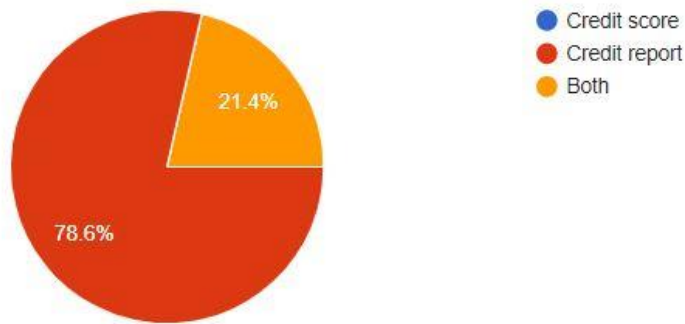


Figure 18. Post Test Answer for Question 5

For Question 7, regarding investment vehicle, there was also a change in answers between pre and post-test. In the pre-test, 7 players selected the correct answer “Any method by which an individual can grow their money”, while on the post-test, 13 players selected it as the correct answer.

What is an investment vehicle?

13 responses

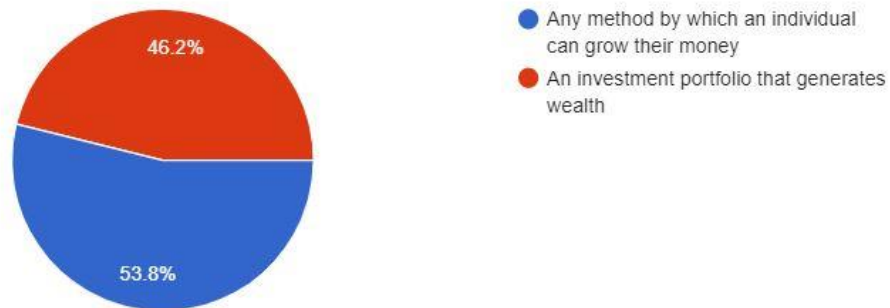


Figure 49. Pre-Test Answer for Question 7

What is an investment vehicle?

14 responses

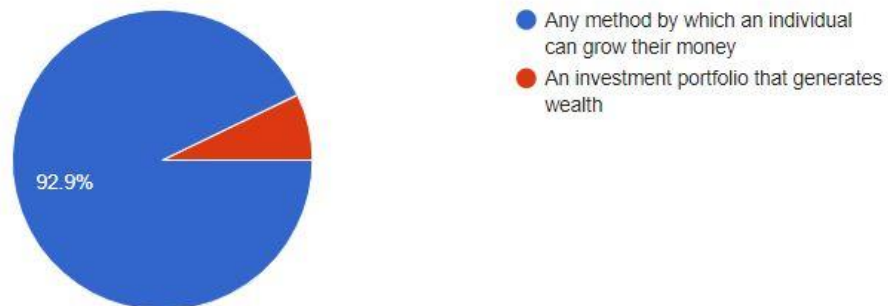


Figure 50. Post-Test Answer for Question 7

For Questions 11 and 12 on the post test, players were asked questions regarding their experience of playing the game. Question 11 asked players to provide written feedback on whether they felt they learned more about money management after playing the game. Feedback comprised of mostly positive responses, with one negative response.

In general, players felt that the game was educational, but the overall design of the game could be improved to be more entertaining and fun.

Overall, do you feel that this game taught you more about money management than before you played it?

14 responses

Yes
yes
Yes.
Definitely!
Yes. Discussion about cards led me to learn information about credit scores. The game was interesting to read.
I did learn a few more topics. It does make for some interesting conversations about why something is the answer.
It's definitely taught me more due to the repetitions of facts. I'd recommend it if there were some more aspects of entertainment involved instead of just teaching me about wealth management.
Not really. It was more about matching questions and answers than answering the questions.
YES

Figure 21. Post Test Answers to Question 11

Question 12 asks players if they would recommend this game to their family or friends. The response to this was split evenly, with half of the players saying “Maybe” and the other half saying “Yes.”

Would you recommend this game to your friends or family?



14 responses

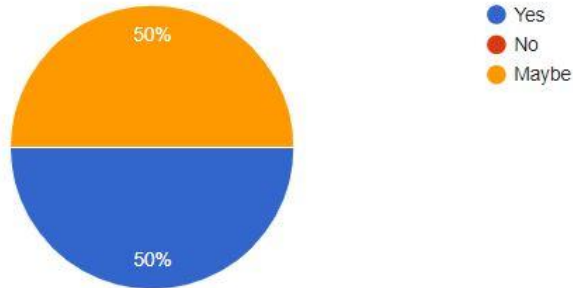


Figure 22. Post Test Answers to Question 12

A histogram chart was also created to depict aggregate data for both pre-test and post-test scores. For the pre-test scores, the histogram is skewed towards the left, with the majority of scores ranging from 0.20 to 0.44. For the post-test score, the histogram is skewed towards the right with the majority of scores falling in between 0.6 and 0.9.

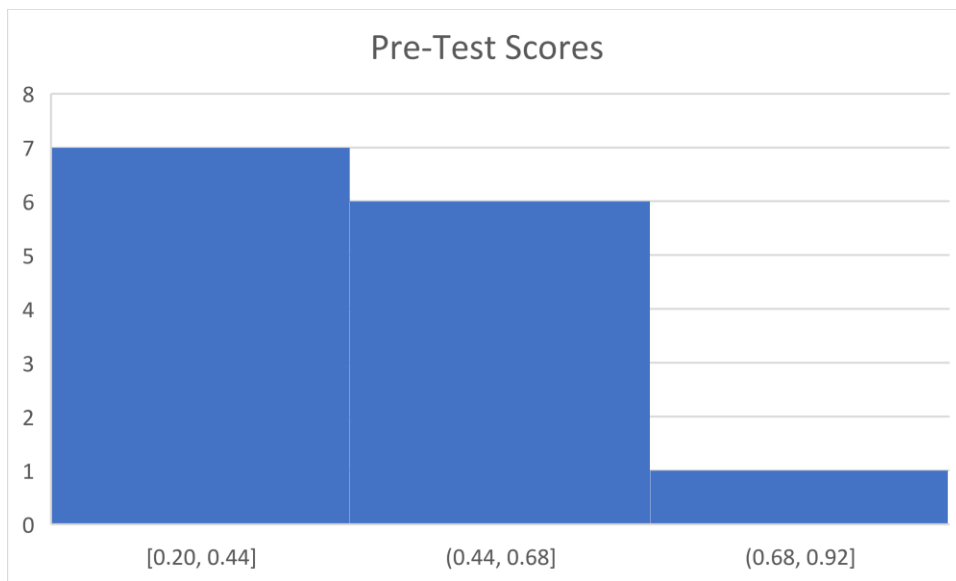


Figure 63. Histogram for Pre-Test Scores

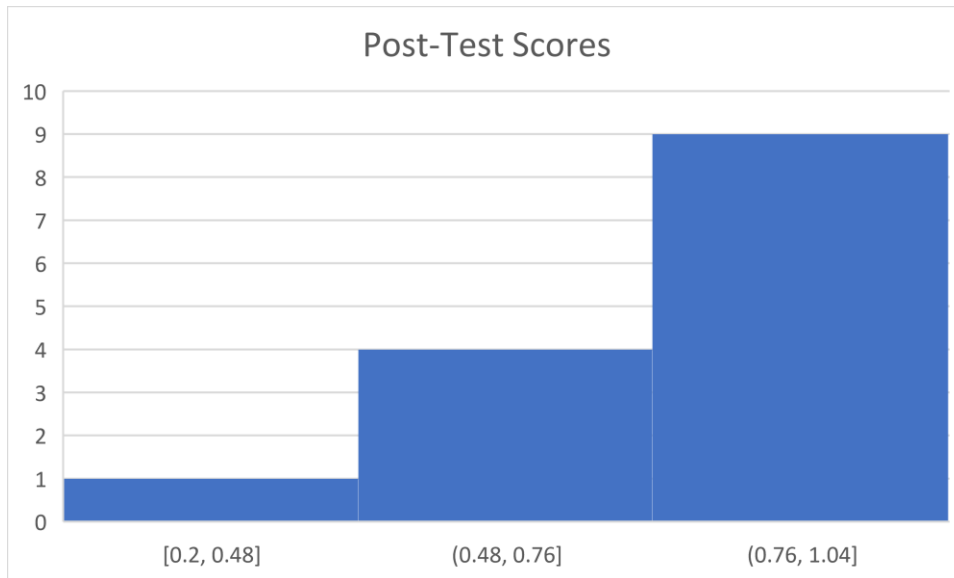


Figure 74. Histogram for Post Test Scores

A paired t-test was then performed on the pre-test and post-test scores to see if there was a statistically significant mean difference in scores before and after playing the game. By comparing the p-value (0.0002) to the significance level ($\alpha=0.05$), we see that the p-value is less than alpha. We can conclude from here that the difference between the population means is statistically significant.

6.3 Problems in Evaluation

There are flaws in the evaluation plan that could have affected the above results. First, since 6 of the evaluation questions were taken from the cards themselves, players would have seen the questions on the cards 3 times. This could have created a learning effect since players were repeatedly being exposed to the same questions. This would have led to players memorizing the answers, and then selecting the correct answers on the post test. Second, since the majority of questions were multiple choice, players had the opportunity to guess. By guessing correctly, they would have the opportunity to

receive credit for a question that they wouldn't have known. Third, there was no control group used in the evaluation to compare the results against. This perhaps could have been fixed by having a group of testers read some pages from a financial literacy book, that included answers to the questions mentioned in the quiz. In addition, since the post-test survey was administered immediately after the game, players would have been able to retain most of the information that they had learned since they had just played the game. The survey could have been emailed out to the players after a few days had passed, to see if they were still able to retain what they had learned.

7. Post Mortem

Throughout the process of creating the game, there were certain elements that were smooth in implementation while others that caused setbacks.

7.1 What Went Wrong

One of the biggest challenges that I encountered while making the game was scope. There were a wide variety of topics that I could have covered, ranging from budgeting to taxes to retirement planning. However, it was not possible for me to cover all this material in a game, as the scale of the project would've become too large and it would've taken me too long to create the game. Therefore, I had to narrow down my scope and only focus on a select few topics. I ended up choosing to focus my cards on the topics of housing, insurance, credit, and investing. The second challenge I faced was figuring out how to translate so many different money management principles into the game's mechanics while also making it a fun and cohesive game that educated players.

My first attempt at this was to create a life-simulation board game with different event cards, where players would draw cards at random and have different events happen to them. However, there were a few problems with the game, namely that it was taking too long to play, there were too many things to keep track of, and not all the cards addressed money management topics. It was also challenge figuring out how to incorporate money management lessons into some of the cards. In addition, there was the problem of randomization that was caused by having players roll the dice to determine which card they would pick. This meant that not all the players would see the same cards. The third challenge that I faced was that I was the sole developer for the game. This meant that I faced a significant amount of work while creating the game. As an analog game, this meant that every time I made a change to the cards, I would have to reprint and cut the cards out again. I feel that it would have been helpful if I had another designer on this project to bounce off design decisions with as well as help with the workload involved in creating the game. Some of the design decisions that were problematic in the first iteration of the game were only caught during playtesting down the road, which could've been resolved much earlier.

7.2 What Went Right

Despite the problems that I encountered while making the game, there were still many successes along the way. As a developer, this was the first game that I had developed all by myself. I was responsible for the content that was created along every step of the way, from doing research on money management principles and translating them to the cards, to designing the board

and artwork in the first iteration of the game, to getting the board and cards cut and printed. Having had no game development experience prior to coming to WPI for grad school, figuring out how to build a game from scratch was a significant challenge for me. Since I was the solo developer of the game, I learned many things since I had to do everything myself. This included figuring out the overall design and mechanics of the game, the layout and artwork for the cards, and printing and cutting the cards. As an analog game, having to create each piece of the game by hand was a time-intensive yet rewarding process. It was rewarding to design each of the game pieces individually, from the cards to the tracking sheets to the tokens and watching them all to come together to form a game. The materiality of the game pieces also made it enjoyable to touch and physically interact with them. Since all the elements in the game are physical pieces, I had to think about many elements of production ahead of time when it came to designing and printing the game, such as the layout and size of the cards, the size of the tokens, and what color and type of paper I would use to print. By having to think about these design choices early on, I was able to figure out what would and wouldn't work well in the game.

My second iteration of the game was an improvement over the first game. As a card game, my game played out much faster and easier than the previous version, which was a board game. The rules were easy to understand and follow, there were less items to keep track of, and the time it took to play the game was much shorter. In addition, this version of the game was more aligned with teaching players different money management principles than the previous

iteration, where some cards were related to money management while others were not. Making it a 2-player game also made it easier for testing, as it ended up being easier to coordinate playtesting sessions for 2 players at a time instead of 4 players. Overall, reducing the game's complexity helped to improve it by making it clearer and more straightforward to play. While the game could have been more entertaining, I felt that it was better aligned for teaching players money management concepts. It is certainly a challenge to figure out how to make a game both entertaining and educational, and this is something I would like to continue to improve on for future iterations of this game.

8. Conclusion

Balancing Act was an attempt at creating an educational game that would teach players the fundamentals of money management. Throughout the course of development, from the initial idea to the end result, the game took on many different forms. It started off as an idea for a poverty game, turned into a money management board game, and then became a card game. Testing with users seems to indicate that the players did learn more about money management, even though the game itself could have been designed to be more fun and entertaining. In terms of personal development, this project was very rewarding to me, as I gained more experience in designing games on my own. The process of creating this game taught me many things as a game developer, from how to improve a game's design to managing the workload and scope of the project.

For future directions, I would like to create a digital version of this game to achieve my initial goal of creating a life simulation game that incorporates money management lessons. This could be done using the Unity or Unreal engine. If designed well, I believe that this type of game would be very promising and have a lot of potential for success in the future. As an educational game, it could be used both by schools and financial companies to help people gain a better understanding of financial literacy. Educational games like these can become the new standard by which financial literacy is taught, due to how enjoyable they are.

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Appendix A: Production Schedule

Here is a timetable for the development of the game:

Date	Goal
11/4	Work on thesis proposal
11/11	Continue working on thesis proposal
11/19	Come up with game mechanics and overall flow for the game.
11/26	Come up with preliminary sketches for game board
12/3	Begin working on a prototype of the game
12/10	Create and design game cards
12/17	Continue working on game board and cards. Design and print play money.
12/24	Print game cards and game board. Design and print tokens.
12/31	Finish game prototype
1/7	Meet with advisor to playtest game
1/14	Write outline of thesis paper
1/21	Meet with advisor to playtest game

	Write intro to thesis paper
1/28	Work on modifying card and game board design
2/4	Continue work on modifying card and game board design
2/11	Finish modifying card and game board design. Develop pre and post-test survey for evaluation.
2/25	Update and revise thesis proposal
3/4	Work on second iteration of the game.
3/11	Work on second iteration of the game.
3/18	Conduct playtesting sessions. Thesis paper work
3/28-3/31	PAX East
4/8	Conduct playtesting sessions. Thesis paper work
4/15	Hand in thesis paper draft.
4/19	Presentations
4/25	Submit thesis paper

Appendix B: List of Cards

Housing

1. The light circuit in your apartment's kitchen has stopped working. Who is responsible for fixing this?
A) Tenant
B) Landlord

Answer: B) In an apartment, the landlord is usually responsible for the majority of repairs. You can avoid worrying about fixing up the property.

2. You would like to completely redesign the bathroom in your apartment. Do you:
A) Try remodeling
B) Leave it alone.

Answer: B) You are not able to update or personalize your living space in an apartment.

3. What is a tax benefit of home ownership?
A) Deducting mortgage interest from your taxable income.
B) Deducting mortgage payments from taxable income.

Answer: A) Homeowners can deduct mortgage interest and property tax payments from their taxable income.

4. You have accepted a job in a new city but are not sure how long you will stay there. Which option will give you more mobility?
A) Renting
B) Owning

Answer: A) Renting gives you more mobility if you think you might move cities or change jobs in the near future.

5. How does owning a home help increase personal wealth?
A) Builds equity
B) Lowers mortgage payments

Answer: A) You can build equity when owning a home (the market value of the home minus what you owe on it).

6. While you were out, a fire broke out in your apartment. Which option will help you protect your personal belongings?
A) Renters insurance
B) Homeowners insurance

Answer: A) Renters insurance is used to cover property damage in the event of an emergency such as a house fire or theft.

7. During a high windstorm, a tree toppled over and damaged the roof of your home. Which option will help cover the damage?
- A) Renters insurance
 - B) Homeowners insurance

Answer: B) Homeowner's insurance helps cover losses and damage to property, such as damage from a windstorm or a falling object.

8. While you were out, a thief broke into your apartment and stole your laptop. Which option will help cover the loss of the laptop?
- A) Renters insurance
 - B) Homeowners insurance

Answer: A) Renters insurance is used to cover property damage in the event of an emergency such as a house fire or theft.

9. You hit a mailbox while backing out of your own garage and get a minor dent on your car. Do you:
- A) File an insurance claim
 - B) Pay for auto repairs out of your own pocket.

Answer: B) If the cost of repairs is near or less than the amount of your deductible, there is generally no reason to file a claim.

10. You chip your front tooth while eating dinner and need to go to the dentist. Which insurance policy will help cover this?
- A) Health insurance
 - B) Dental insurance

Answer: B) Dental insurance helps cover the costs of preventative care associated with dental treatment.

Credit

1. You receive a special offer from a credit card company to apply for a new credit card. Do you:
- A) Fill out the application. The more credit cards, the better!
 - B) Say no and stick to one credit card

Answer: B) It's easy to run up debt when you use multiple cards. Try to avoid opening new credit cards as a solution to financial problems.

2. Which of these shows your credit history?
- A) Credit score
 - B) Credit report
 - C) Both

Answer: B) Your credit report shows your credit history. Your credit score is just a number.

3. Your phone bill is due today! Do you:
- A) Pay the minimum amount
 - B) Pay the whole bill

Answer: B) Make payments in full. Carrying a credit card balance means you'll be in debt longer and accumulate massive amounts of interest.

4. What is a credit card APR?
- A) The interest rate you pay for borrowing money
 - B) The interest rate you pay for making credit card purchases

Answer: A) APR is the annualized representation of your credit card's interest rate

5. It is important to have healthy credit. Which of the following does not affect your credit score?
- A) Salary
 - B) Payment history
 - C) Length of credit history
 - D) Credit inquiry

Answer: B, C, D) The factors that determine your credit score include your payment history, the amount you owe, length of credit history, types of credit, and credit inquiries.

6. You went on a shopping splurge over spring break and maxed out on your credit card. Which of the following is a consequence of this?
- A) Improved APR rates
 - B) Drop in credit score
 - C) Being hit with a penalty rate

Answer: B, C) It is advisable to keep credit card utilization below 30% on each card. Anything above 30% will hurt your credit score.

7. Your friend has a Platinum level credit card, which piques your interest into getting one. Do you:
- A) Stay with the credit card you have
 - B) Inquire about getting another card

Answer: A) Frequently applying for new credit cards can hurt your credit score. Multiple inquiries lead lenders to believe that you are taking on too much debt and are at a risk of nonpayment.

8. What is the leading credit score in the industry?

- A) FICO
- B) Equifax
- C) Experian

Answer: A) FICO is the leading credit score in the industry, with scores ranging from 300 to 850.

9. You are just starting out financially and don't have a credit score yet. Which of the following methods will allow you to build a credit score?
- A) Opening a checking/savings account
 - B) Getting added to someone's credit card as an authorized user
 - C) Opening a brokerage account
 - D) Having someone with good credit cosign a loan with you

Answer: A, B, D) To obtain a credit score without credit, you can open a checking/savings account, be added as an authorized user to someone's credit card and have someone with good credit cosign a loan with you.

10. After seeing your credit report, you would like to boost your credit score. What actions can you take to do this?
- A) Pay your bills on time
 - B) Pay down debt
 - C) Open a new credit-card account

Answer: A, B) Your credit score can be improved by paying your bills on time, paying down debt, and applying for credit sparingly.

Investing

1. You are interested in investing in the stock market. How will you allocate your investments?
- A) Put all your money into your favorite tech company's stock
 - B) Put your money in multiple investments

Answer: B) Diversifying your investments lessens your investment risk. Don't put all your eggs in one basket.

2. You have a hunch that a certain healthcare company's stock will do well. Do you:
- A) Buy the stock
 - B) Research the company to decide whether you should invest in it.

Answer: B) Don't rely on hunches. Always research the company and understand the risk/opportunity associated with the investment before investing.

3. Which of the following are good ways to build long-term wealth?
- A) Stocks
 - B) Bonds
 - C) Real Estate

D) Small Business

Answer: A, C, D) Investing in stocks, real estate, and small-term business investments are the best ways to build long term wealth

4. If you are interested in investing in mutual funds, you should look into buying a
- A) No-load mutual fund
 - B) Load mutual fund

Answer: A) All mutual funds have fees, however not all charge sales fees. A no-load mutual fund does not charge sales fees and performs just as effectively as a load fund.

5. What is an easy, low cost way to invest in the stock market?
- A) Index Funds
 - B) Bonds
 - C) Certificate of Deposit

Answer: A) Index funds track the performance of a stock market index, have low funds, and are easy to manage

6. What is an advantage of investing in a 401k plan?
- A) Allowing your money to grow tax-free
 - B) Having your employer match a portion of your contribution
 - C) Not having to pay taxes once with withdraw from the account

Answer: A, B) You don't have to pay taxes on money you put into your 401k account, and companies often match anywhere from 1-5% of your gross salary.

7. Which of the following accounts helps build retirement savings?
- A) IRA
 - B) 401K account
 - C) Checking account

Answer: A, B) An IRA and 401k are both designed to help you save for retirement.

8. What is an investment vehicle?
- A) Any method by which an individual can grow their money
 - B) An investment portfolio that generates wealth

Answer: A) An investment vehicle is any method by which an individual can grow their savings

9. What is the most common ownership investment vehicle?
- A) Real estate
 - B) Bonds
 - C) Stocks

Answer: C) Stocks represent shares of ownership in a company and are the most common ownership investment vehicle.

10. How does a stockholder acquire their share of the company's profits?

- A) Receiving dividends
- B) Higher stock prices
- C) Certificate of Deposit

Answer: A) A shareholder receives their share of profits through dividend payouts (quarterly cash payments to shareholders from the company).

Appendix C: Survey Questions

1. What are the benefits of owning a home? (Check all that apply)
 - Personalizing your living space
 - Less costly repairs
 - Deducting mortgage interest from taxable income
 - Mobility
 - Building wealth
2. What are the benefits of renting a home? (Check all that apply)
 - Personalizing your living space
 - Less costly repairs
 - Deducting mortgage interest from taxable income
 - Mobility
 - Building wealth
3. If you want to personalize your living space, it is easier to do so when:
 - Renting
 - Owning
4. What is renters insurance?
 - Financial protection provided for your home in the event of an accident or disaster
 - Financial protection provided for your personal property in the event of an accident or disaster
 - Financial protection provided for your apartment in the event of an accident or disaster
5. Which of these shows your credit history?
 - Credit score
 - Credit report
 - Both
6. What is a credit card APR?
 - The interest rate you pay for borrowing money.
 - The interest rate you pay for making credit card purchases.

7. Which of the following factors determines your credit score? (Check all that apply)
- Payment history
 - Salary
 - Types of credit
 - Credit inquiries
8. What is an investment vehicle?
- Any method by which an individual can grow their money
 - An investment portfolio that generates wealth
9. What is the most common ownership investment vehicle?
- Real estate
 - Bonds
 - Stocks
10. What is an advantage of investing in a 401k plan? (Check all that apply)
- Allowing your money to grow tax free
 - Having your employer match a portion of your contribution
 - Not having to pay taxes once you withdraw from the account'
11. Overall, do you feel that this game taught you more about money management than before you played it? (Post-Test only)
12. Would you recommend this game to your friends or family? (Post-Test only)
- Yes
 - No
 - Maybe

Appendix D: IRB Approval Form

WORCESTER POLYTECHNIC INSTITUTE

100 INSTITUTE ROAD, WORCESTER MA 01609 USA

Institutional Review Board

FWA #00015024 - HHS #00007374

Notification of IRB Approval

Date: 01-Mar-2019
PI: Sheldon, Charles L
Protocol Number: IRB-19-0507
Protocol Title: Balancing Act
Approved Study Personnel: Yang, Yrenia ~Sheldon, Charles L~

Effective Date: 01-Mar-2019

Exemption Category: 3

Sponsor*:

The WPI Institutional Review Board (IRB) has reviewed the materials submitted with regard to the above-mentioned protocol. We have determined that this research is exempt from further IRB review under 45 CFR § 46.104 (d) (2.) For a detailed description of the categories of exempt research, please refer to the [IRB website](#).

The study is approved indefinitely unless terminated sooner (in writing) by yourself or the WPI IRB. Amendments or changes to the research that might alter this specific approval must be submitted to the WPI IRB for review and may require a full IRB application in order for the research to continue. You are also required to report any adverse events with regard to your study subjects or their data.

Changes to the research which might affect its exempt status must be submitted to the WPI IRB for review and approval before such changes are put into practice. A full IRB application may be required in order for the research to continue.

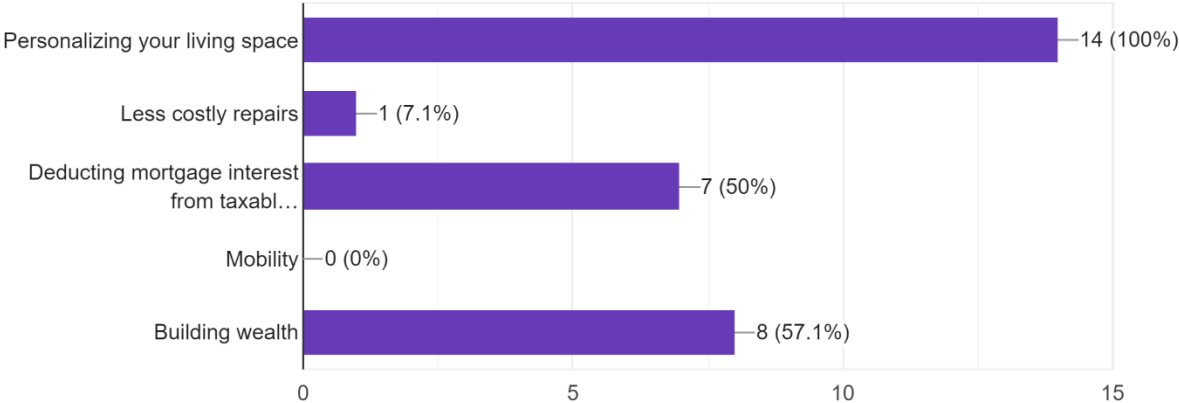
Please contact the IRB at irb@wpi.edu if you have any questions.

*if blank, the IRB has not reviewed any funding proposal for this protocol

Appendix E: Pre-Test Survey Data

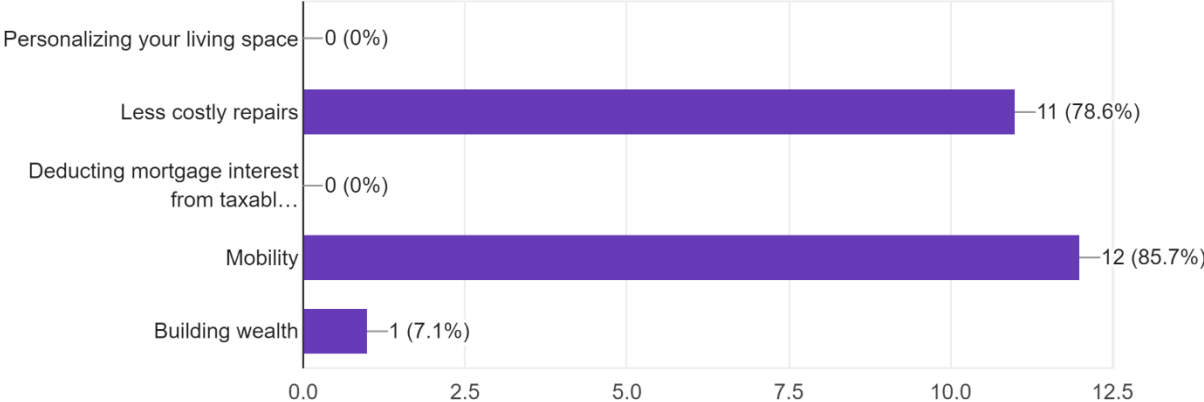
What are the benefits of owning a home? (Check all that apply)

14 responses



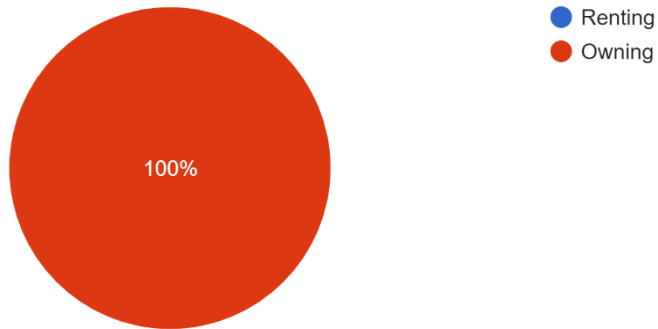
What are the benefits of renting a home? (Check all that apply)

14 responses



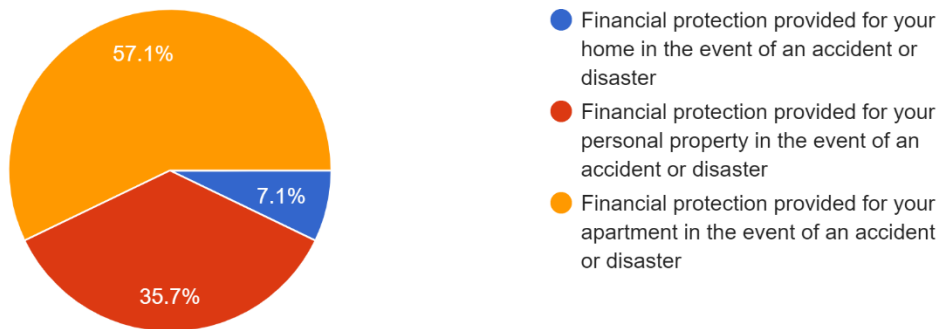
If you want to personalize your living space, it is easier to do so when:

14 responses



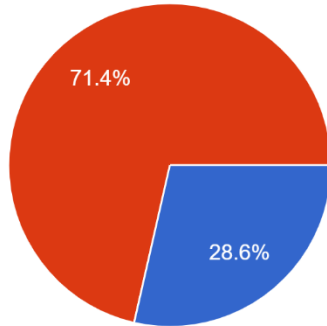
What is renters insurance?

14 responses



What is a credit card APR?

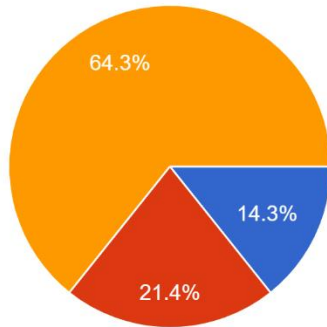
14 responses



- The interest rate you pay for borrowing money.
- The interest rate you pay for making credit card purchases.

Which of these shows your credit history?

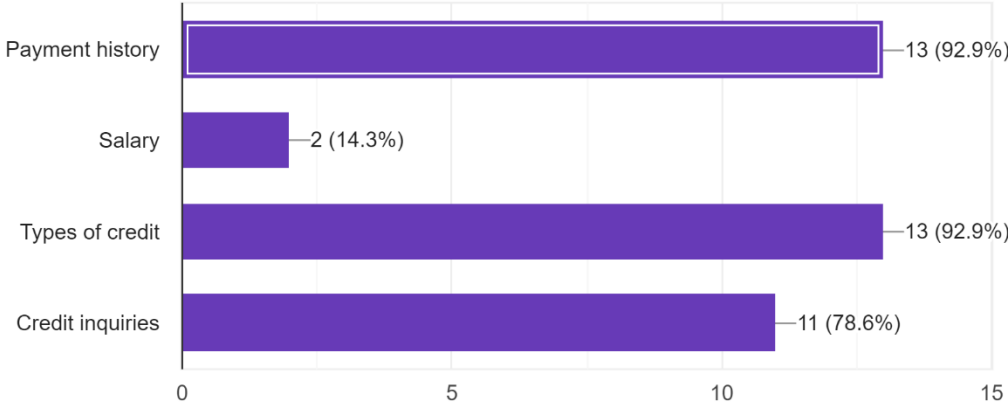
14 responses



- Credit score
- Credit report
- Both

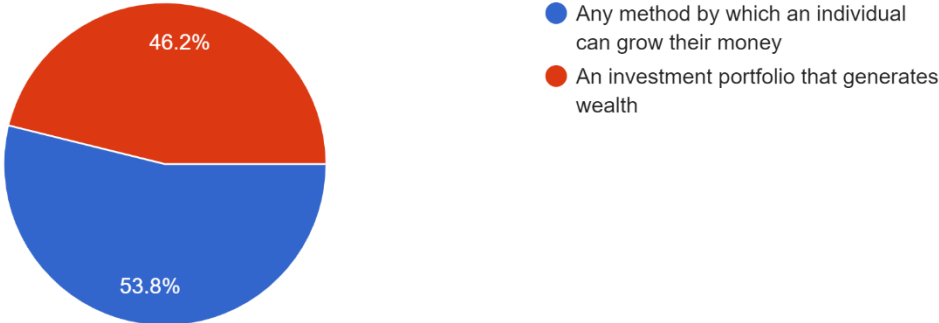
Which of the following factors determines your credit score? (Check all that apply)

14 responses



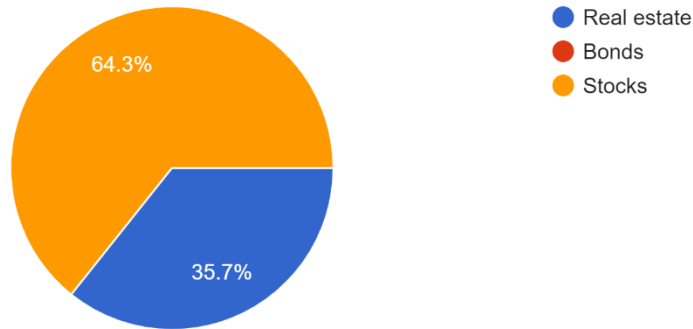
What is an investment vehicle?

13 responses



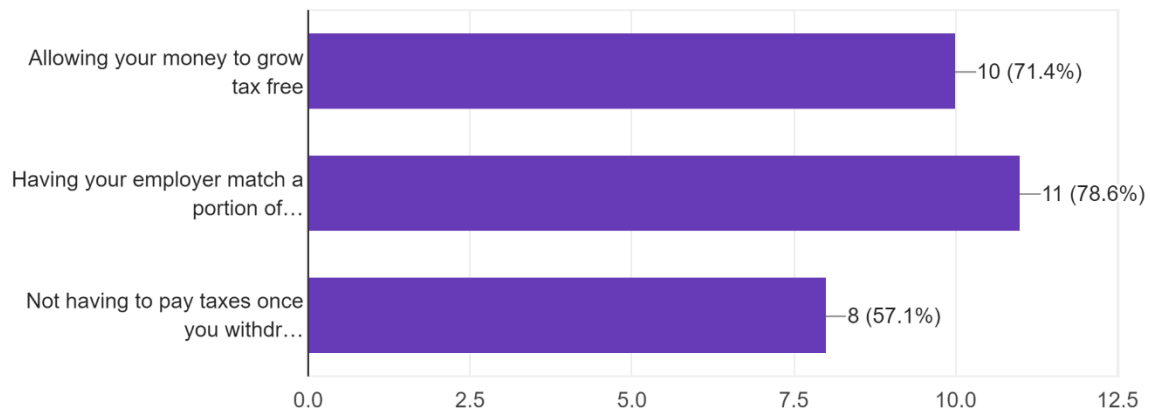
What is the most common ownership investment vehicle?

14 responses



What is an advantage of investing in a 401k plan? (Check all that apply)

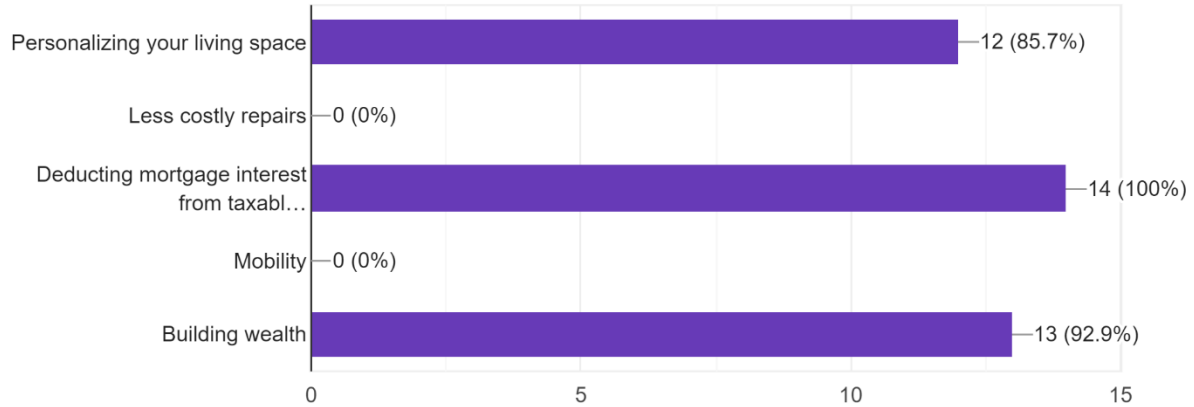
14 responses



Appendix F: Post-Test Survey Data

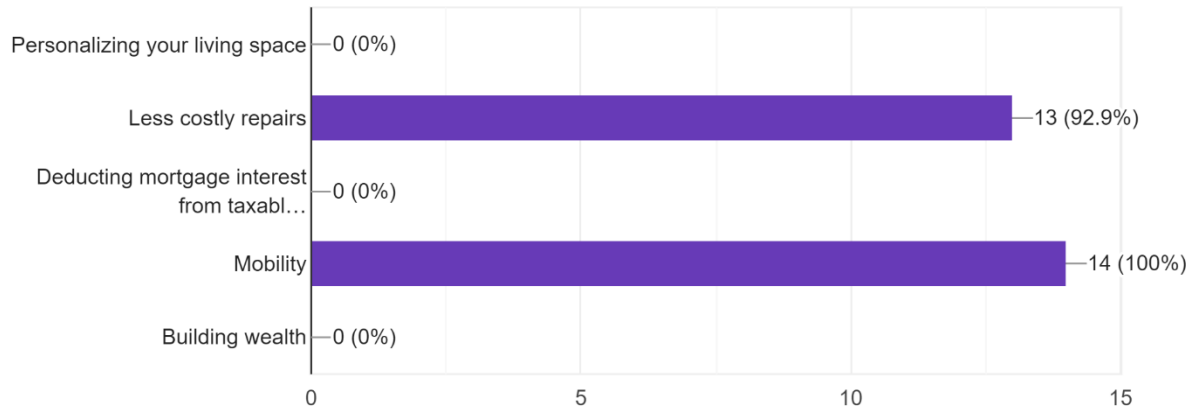
What are the benefits of owning a home? (Check all that apply)

14 responses



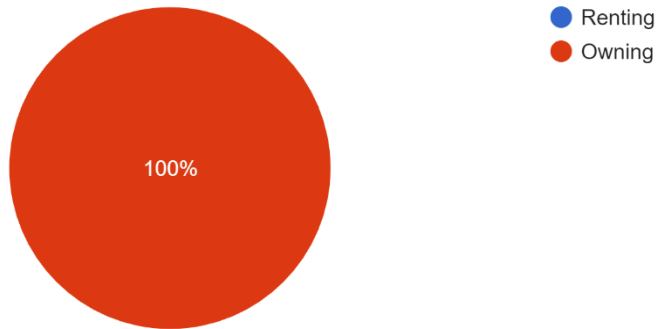
What are the benefits of renting a home? (Check all that apply)

14 responses



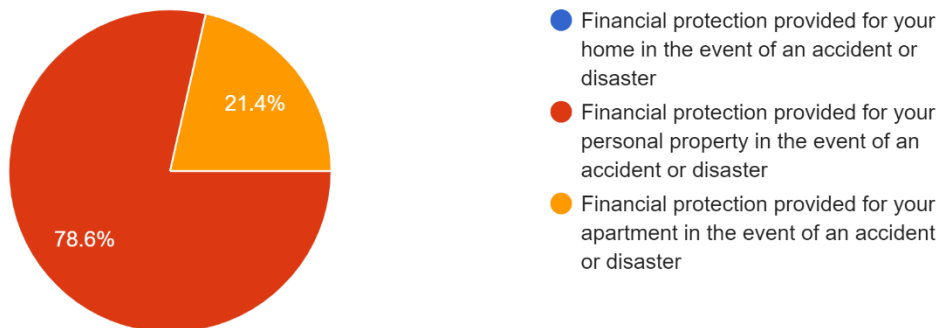
If you want to personalize your living space, it is easier to do so when:

14 responses



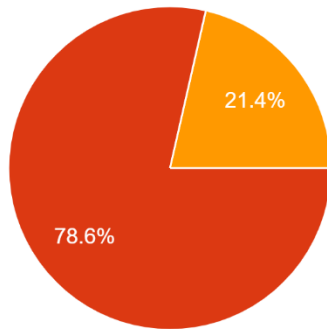
What is renters insurance?

14 responses



Which of these shows your credit history?

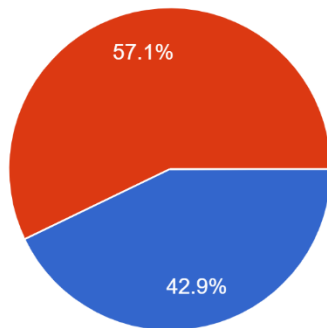
14 responses



- Credit score
- Credit report
- Both

What is a credit card APR?

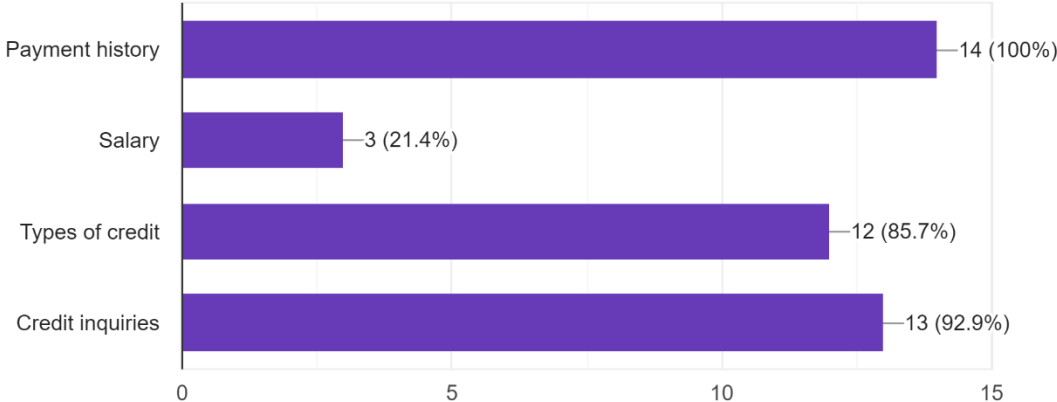
14 responses



- The interest rate you pay for borrowing money.
- The interest rate you pay for making credit card purchases.

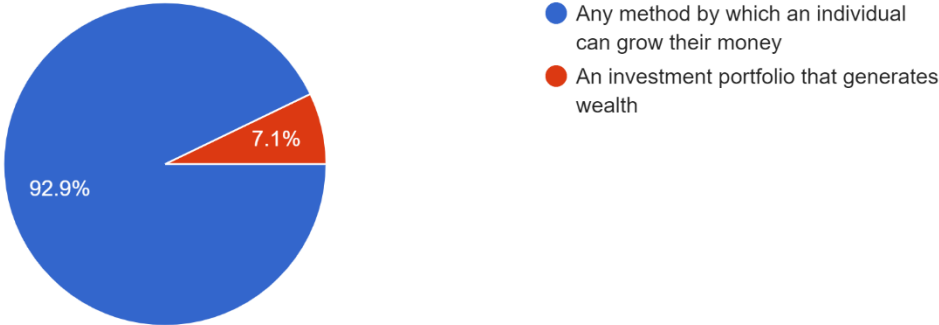
Which of the following factors determines your credit score? (Check all that apply)

14 responses



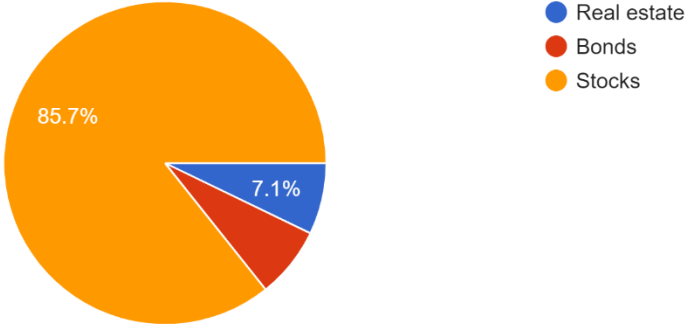
What is an investment vehicle?

14 responses



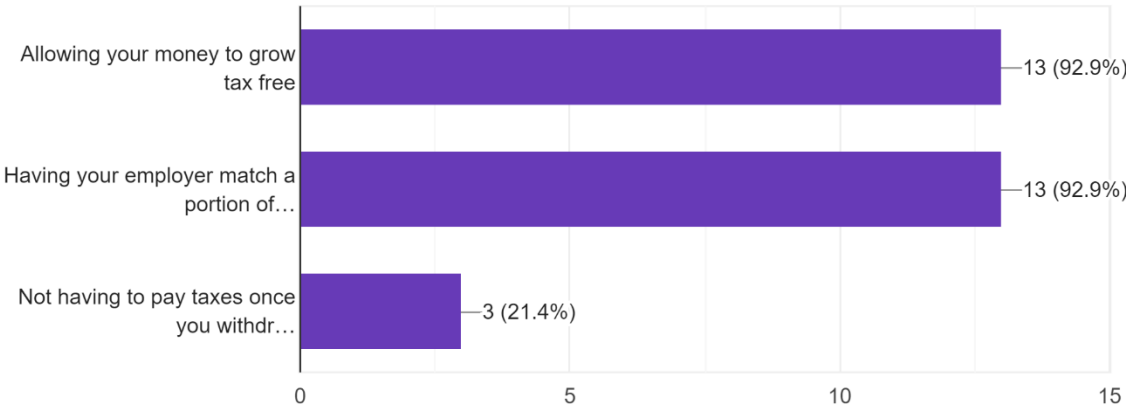
What is the most common ownership investment vehicle?

14 responses



What is an advantage of investing in a 401k plan? (Check all that apply)

14 responses



Overall, do you feel that this game taught you more about money management than before you played it?

14 responses

Yes
yes
Yes.
Definitely!
Yes. Discussion about cards led me to learn information about credit scores. The game was interesting to read.
I did learn a few more topics. It does make for some interesting conversations about why something is the answer.
It's definitely taught me more due to the repetitions of facts. I'd recommend it if there were some more aspects of entertainment involved instead of just teaching me about wealth management.
Not really. It was more about matching questions and answers than answering the questions.
YES

Would you recommend this game to your friends or family?

14 responses

