Evaluation Report for an Educational Game

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Abstract

This paper will discuss the learning theories and instructional design models that inspired the creation of *Life: to Save or Spend*, an educational game designed for 18-30-year-olds struggling to make the right personal finance decisions. Six participants partook in my usability testing. The proposal was presented in my evaluation plan. I will present the information I collected and provide recommendations from the data received to enhance *Life: to Save or Spend* to make it a valuable educational tool. I will also reflect on my experience conducting an evaluation and some of the lessons I learned during my time in the Instructional Design and Technology program at the University of Cincinnati.

Keywords: learning theories, instructional design models, educational games, personal finance

Evaluation Report for an Educational Game

Game-based learning can significantly enhance the learning experience (Pho and Dinscore, 2015). Game-based learning combines gaming principles, real-life situations, and educational theories to involve the learner and create a fun and dynamic tool (Pho and Dinscore, 2015). "What makes games interesting in educational contexts is that they are a very efficient way of presenting problems" (Kalmpourtzis, p. 80). *Life: to Save or Spend* came into existence from the need to find a way to teach learners new to personal finance how to make better money-making decisions. In *Cases on Digital Game-Based Learning* (2013) by Baek and Whitton, research surrounding game-based learning has presented many successful cases in which digital games create active and engaging situations that motivate the student to support learning.

As stated in my evaluation plan, I choose to evaluate my educational game *Life: to Save or Spend* because games can present learning information in a relatively new light making the learning process more enjoyable. My evaluation plan revealed the process and procedures of testing my educational game through usability testing. Usability testing can reveal issues and problems from the perspective of the user and learner. The results of the findings will help me decide what recommendations and solutions should be implemented. That way my game can be displayed in an online setting to provide for future reference to other creators and technologists in education.

The primary need for usability testing was to determine if the game is playable in a different software program from the original. Initially, the game was created using Adobe Animate; after the announcement of removing flash from web browsers such as Google Chrome, the game was reconstructed using Articulate Storyline. The exportation from Storyline uses HTML5 that will be viewable and playable in the future. I will discuss my finding and how they

were used to influence which recommendations need to be implemented. I will also provide a

rationale for the instructional models and learning theories that influenced the game's

development and ideas. Finally, I will reflect upon my experience conducting my research and

provide insight into what I have learned throughout this process.

<div align="center">**Instructional Design Model**</div>

Deciding on an appropriate instructional design model to use as a framework for

creating *Life: to Save or Spend* came down to needing one that was iterative, easy to use, and

offered quick and flexible results. The ADDIE model is a standard and easy to use framework to

work with and build off of. It also works well given the constraints of creating an educational

game within a specific timeframe and conducting an evaluation and feedback implementation.

ADDIE is an acronym that stands for analyze, design, develop, implement, and evaluate (Branch,

2009). ADDIE is a widely used and useful framework that aids in creating high-quality

instructional learning products (Branch, 2009). I will further breakdown each step used and how

it was used to impact the creation of *Life: to Save or Spend*.

Analyze

During the ADDIE model analysis phase, designers will determine instructional goals,

analyze learners, and come up with a project management plan (Branch, 2009). The analysis was

incorporated into the creation of my game by identifying the target audience and coming up with

an idea on how to create learning objectives and goals that will help sustain knowledge

progression. The target audience for *Life: to Save or Spend* are young adults ranging in age from

18-30 years old. *Life: to Save or Spend* is a finance game created to educate learners on the

importance of saving by giving them real-world scenario financial choices improving their

decision-making process. Knowing and understanding the intended audience will help guide the

design and development decisions when creating an educational artifact (Branch, 2009). It is

important to understand the audience's experience level, prior knowledge, and attitudes. That

way, an instructional resource will have a lasting impression and aid in learning rather than not

providing any influence. "Educators need to incorporate a learner's interest into the requirements

of the task or concept they want to teach" (Kalmpourtzis, 2018, p. 88). Without knowing the

audience and their needs *Life: to Save or Spend* would not have been supported or needed by

learners.

Design

The next phase of the ADDIE model is the design element. During this phase, objectives

are written, the structure and exercises are outlined, and storyboards are created (Branch, 2009).

This is where the blueprint for the artifact is composed (Branch, 2009). A lot of the initial design

phase was done during the educational game design course. This was a group process. As a

group, we designed a lot of game scenarios and initial ideas. We also researched and tested

different gaming platforms. Storyboards of the game were created in a Microsoft Word

document. During storyboarding, we aligned scenarios to have a foundation in educational

strategies. Authenticity was an important attribute to take into account. The constructivist

epistemology of learning relies heavily on creating authentic environments that bring past

experiences into the forefront to help learners interpret new meanings and better understand new

information (Splitter, 2008).

It was important to make sure that we were creating ideas that were fun and engaging but

also educational and informative. This phase again proved problematic when we began testing

different platforms. We discovered that some platforms would prove too difficult for our end

goals. This provided us with a lot of frustration and worry because we were not sure the best route to go down. We eventually figured out a solution and thus began the development process.

Develop

During the development phase, instructional products and content are assembled and created (Branch, 2020). The initial development of the artifact was done in Adobe Animate. We added graphics, text, and sound to bring our game to life. During the game design course, we presented *Life: to Save or Spend* to our class for feedback. Changes were made based on recommendations from peers. After the course the game was redeveloped in Articulate Storyline, thus going through another iteration of implementation and evaluation.

Implement

This phase is when instructional tools are presented to end-users (Branch, 2009). The first implementation process was not as formal or robust as a typical implement phase. The game has been a prototype, and that is what was shown and has been shown during the other iterative stages. During the first implementation of *Life: to Save or Spend*, the game was played by our peers. We received feedback on specific scenarios to enhance the experience. During my second time implementing *Life: to Save or Spend*, I tested the game on several different operating systems to ensure the most current evaluation process would go smoothly.

Evaluation

The last phase of the ADDIE model is evaluation. This phase is about evaluating the goals and objectives set prior to creating the learning object (Branch, 2009). The first evaluation process was an informal focus group styled peer review. My current evaluation has been a lot more detailed and involved. I was able to gather qualitative data from the target audience during

recorded playtesting sessions. I will reveal my findings from my most recent evaluation

procedure later on in this paper. Arshavskiy (2013) stated the following:

> Even though it may seem like each phase of the ADDIE model is independent, in reality,
>
> the model is not always linear, and each stage may look different depending on your
>
> requirements, your project, and the way you manage it. (p. 27)

This process has been primarily focused on the evaluation and making sure my artifact will get

the appropriate support and feedback it warrants to make it a valuable eLearning tool that I can

display in my online portfolio for years to come. ADDIE was the instructional design model used

during this project because it is a quick and sufficient framework for educational game

development. Each step works together to build off of and make continual and sustainable

improvements. Using ADDIE also helped me ground my design in a case-based reasoning

learning theory.

Learning Theories

"In constructivism people are considered as creators of knowledge in their own unique

way based on their experiences. In constructivist environments learners are active participants in

the teaching process" (Kalmpourtzis, 2018, p. 96). In a constructivist approach to learning, the

student plays an active role (Splitter, 2008). Knowledge is constructed by using past experiences

to help guide new understanding (Splitter, 2008). *Life: to Save or Spend* design is a role-playing

choose your own adventure style. The learner simulates real-world scenarios and builds upon

their knowledge of past and future experiences by using cases that give them instant feedback.

Case-Based Reasoning (CBR) is a learning theory linked to a constructivist approach to

education. This theory focuses on learning as it relates to building more memorable and

accessible knowledge by creating 'authentic experiences' for the learner (Kolodner, Cox, &

González-Calero, 2005). Authentic learning provides a deeper understanding of complicated

learning contexts, allowing for learners to store, remember, and draw on for future reference.

For instance, in *Life: to Save or Spend,* a character is exploring the world as a working adult that

faces real-world decisions like buying food, paying rent, and deciding to repair their vehicle.

This authentic environment can help the learner make sense of their own experience by building

knowledge based on a familiar gaming simulation. *Life: to Save or Spend* was influenced

primarily by Goal-Based Scenarios (GBS), an instructional strategy that emerged from CBR.

"Goal-Based Scenarios have learners achieve missions in simulated worlds" (Kolodner, Cox, &

González-Calero, 2005, p. 2).

The design behind GBS is that the learning environment should be built around the

pursuit of a goal; that way, the learner engages and takes an interest in the activity, all while

accomplishing the goal (Schank, Fano, Bell and Jona, 1994). *Life: to Save or Spend* was

constructed around many of the instructional principles from GBR. The game characters have a

specific goal and mission to save money. Having users decide on what scenario-based choice to

make will heighten their understanding of making future decisions by drawing on their past

knowledge. Educational games work well with a design grounded in CBR and GBS because they

can simulate real-world scenarios that help learners build off previous memories and situations,

allowing learners to refer to them and enhance their cognitive abilities.

Data Analysis and Results

As stated in my evaluation plan, my usability test consisted of two components:

observational notes via playtesting and the SUS survey results. The playtesting data was a lot

harder to come up with the right way to make sense of the feedback. But I was able to find a

solution using the information presented in *Quantifying the User Experience* (2016) by Sauro

and Lewis. I will give the findings from the System Usability Scale (SUS) first, followed by the

feedback from playtesting. But before I delve into those components, I will provide a bit of

background on general data from the participants. I conducted a usability session with a total of

six participants. All six sessions were done remotely. Figure 1 shows the age, knowledge level,

and experience given by each participant.

Figure 1

General Data Collected
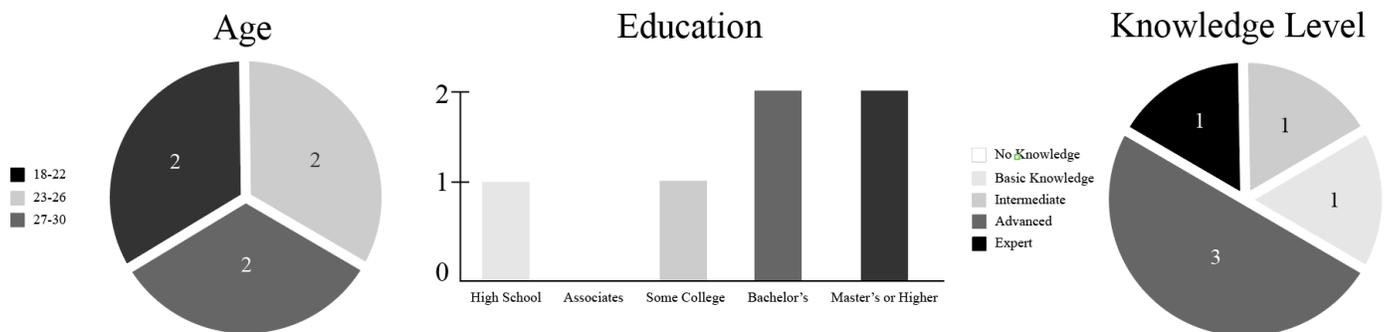
Out of the six participants, three were between 18-22, three were 23-26, and three were 27-30. I

wanted to select a range of participants to see if the different age groups or educational

background would affect the usability results. It turned out that the background and age did not

provide any significant hindrances in usability. Regarding education, one was a high school

graduate, one had taken some college courses, two had bachelor's degrees, and two had a

master's or higher. Finally, regarding knowledge level related to personal finance, one rated their

knowledge as basic, one rated themselves as intermediate, one as an expert, and three as

advanced.

SUS

As stated in my evaluation plan, the SUS was used to get a quick overview of my game's usability regarding ease of use and user satisfaction. The results of the SUS are located below in Table 1.

Table 1

SUS Results

Participant ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Raw Score	SUS Final Score
1	3	2	5	1	3	2	5	1	5	1	34	85
2	4	1	5	1	5	1	5	1	5	1	39	97.5
3	4	1	5	1	4	2	5	1	5	1	37	92.5
4	3	1	5	1	5	1	5	1	5	1	38	95
5	3	1	5	1	3	1	5	1	5	1	36	90
6	4	1	5	1	4	4	4	1	4	2	32	80

Using the formula in *Quantifying the User Experience*, the SUS's final scores were all above 80 (Sauro and Lewis, 2016). Using the grading scale interpretation, a score of 80 and above is equivalent to an A- and is considered an acceptable rating for a user-tested artifact as seen in Table 2.

Table 2

Grading Scale Interpretation

Grade	SUS	Range	Adjective
A+	84.1-100	96-100	Best Imaginable
A	80.8-84.0	90-95	Excellent
A-	78.9-80.7	85-89	

The average of all scores was 90, and the median was 91.25. Given the total results, participants viewed the ease of use portion of the usability of the game favorably. Still, I also wanted to find

out other factors such as the learnability and flexibility of the educational content of *Life: to Save or Spend.*

Playtesting Feedback

The second part of my data collection process was turning the qualitative notes I took during playtesting sessions into codable and easy to interpret information that will aid in the recommendation procedure. I drew inspiration from the Rosemberg (2017) article as well as the book, *Quantifying the User Experience.* Detailed in my evaluation plan, I coded and sorted verbal and nonverbal feedback into a table that will rank the severity of the issues presented. Table 3 displays my interpreted data from all six playtesting sessions.

Table 3

Coded Data from Playtesting

ID	Game Play Issues	Task Critically	Where	Description	Impact	P1	P2	P3	P4	P5	P6	Frequency	Severity
1	How to Play button	5	Home page	Many playtesters avoided selecting the 'How to Play' button. 'How to Play' has information that effect game play.	5	1	1	1	1		1	83%	20.8
2	Accessibility of colors	5	Home page, breakdown page	Dark green and light green text may be hard to read.	5	1	1				1	50%	12.5
3	Welcome text	2	Home page	Welcome to' and 'life to save or spend' are on separate lines	5	1	1	1	1		1	83%	8.3
4	Button text	2	All pages	Button text is off center	2	1						17%	0.7
5	Button size	2	All pages	Button sizes and color were inconsistent.	2	1						17%	0.7
6	Transition issue	2	Income breakdown, to first scenario	Transition does not feel as smooth	3	1						17%	1.0
7	Happiness Meter	4	Home page	Button sizes and color were inconsistent.	5	1	1	1		1	1	83%	16.7

ID	Game Play Issues	Task Critically	Where	Description	Impact	P1	P2	P3	P4	P5	P6	Frequency	Severity
8	Story and Decision inconsistency	5	Story pages	Users felt that some choices were not realistic and that the	5	1	1	1	1	1		83%	20.8
9	Lose all money	5	Robbed page	Users felt this choice was too severe and did not fit in with the	5	1	1	1	1	1	1	100%	25.0
10	Undeveloped character	3	Character page	User did not like that one character was not developed.	4			1				17%	2.0

Notes:

Task criticality: Impact on the game or the user if the task is not accomplished. Rated from 1-5: 1 being less severe, 5 being most severe.

Issue frequency: Amount of times the issue occurred between participants.

Issue impact: How much it impacted the player trying to accomplish the task. Rated from 1-5: 1 being less severe, 5 being most severe.

The most severe issues from this data were the how to play button, robbed scenario, and story inconsistency. Since these were coded as highly severe, recommendations will be made to correct these issues. Severity ratings were the result of multiplying impact and task critical score. I would also like to fix some other less severe issues like color and accessibility problems. Even though they were not as severe as the others, it is still important to create a more accessible version that can be played by a number of viewers.

Recommendations

Based on the feedback from the SUS and playtesting sessions the specific changes and enhancements of *Life: to Save or Spend* will be presented in the following paragraphs. Most of the playtesters avoided selecting the 'How to Play' button and immediately started the game. Even though the gameplay is straightforward enough to figure out how to play, the 'How to Play' page contains information about the mood meter. Missing this information caused a lot of the players to be confused by this. To avoid this issue, the home page will just have the start button, and the directions and information will be integrated onto the next page; that way, users will understand the rules and critical information upfront instead of on another page.

The next most severe issue was the 'Got Robbed' scenario. Players felt this did not fit with the game and felt this scenario was unfair. To fix this, I will remove this scenario and continue the same strategy implemented throughout. Players will get another decision-making scenario instead of a situation where they lose all of their money and have to replay the game. Fixing this will enhance gameplay and user satisfaction.

Story inconsistency was another problem that was brought up during playtesting. Some users felt a particular selection would result in a different outcome. I agree that the inconsistency in decisions could lower engagement and leave players feeling frustrated. To fix this, I will make

some choices not take an abrupt hit to their savings. For example, obvious cheaper options would result in the loss of more money due to an accident or injury. Instead of adding unexpectedness to choices, they will be more aligned with realistic decisions.

Lastly, I will make changes to improve the accessibility of the game. Most importantly, I will change some font colors to make the text stand out more instead of blend into the background. Even though this issue was coded as less severe, an accessibility issue should be improved to meet basic standards and be suitable for all learners.

Reflections

Overall, this process has been a great learning experience. I was able to draw on past experiences from other classes to build on previous knowledge while building new cognitive skills that will help me improve in my career as an instructional technologist. The biggest struggle was making sure all the components in my evaluation plan would aid in the right feedback during my usability testing sessions. Qualitative data can be challenging to collect and interpret. I learned a lot about qualitative research and how to best interpret and code data. This evaluation has dramatically impacted my artifact's design by allowing me to test it out with target learners. Obtaining information from them will allow me to enhance components to make it more valuable for a broader range of users. Even though this project focused heavily on the evaluation component in the instructional design process, I felt that I was able to obtain valuable experience on how to enhance and create a highly useful learning tool.

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