

Evaluation Report for Kingston's Review Adventure

Mitchell B. Camfield

School of Education, University of Cincinnati

IDT8130: Master's Project

Dr. Janet Zydney & Dr. Gi Woong Choi

November 1, 2020

Evaluation Report for Kingston's Review Adventure

In education, video games are being used more often as a tool to bring excitement to learning by creating a fun and immersive environment. Hopping on that trend, I worked with a faculty member at the University of Cincinnati (UC) College of Nursing to devise a game that could give the students of the graduate-level clinical management course a fun way to supplement their studying as they prepared for their fourth major exam in the course. Ultimately, the faculty member and I devised a plan to create *Kingston's Review Adventure*, a game in which the students must aid an adorable corgi named Kingston and his courageous plight to run through an open field. We chose to make a review video game to improve the student's motivation by mitigating anxieties and distractions that would hamper their ability to continue studying (Seli & Dembo, 2019, p. 194). After an incredibly rushed production schedule, Kingston was shipped to the online course to assist the tired graduate students.

Unfortunately, a litany of problems were reported about the game to the instructor. Among other things, buttons would not function, the user interface had trouble adjusting to different screen sizes, and students were receiving the same review question repeatedly. This led to a quick retirement for Kingston after this disastrous debut. Through the use of a detailed evaluation plan, I devised a way to review constructive feedback from other instructional designers to revise *Kingston's Review Adventure* so that it could once again return to the spotlight and assist students with reviewing for their exams. The details of the evaluation plan can be found in the accompanying "Evaluation Plan" document. In this Evaluation Report, I will discuss the instructional design models and learning theories that served as the base for this artifact, the analysis of critical feedback, and reflect on the design of educational video games through the lens of *Kingston's Review Adventure*.

Instructional Design Models

Kingston's Review Adventure was intended to be a fun and entertaining way to supplement studying for a difficult exam. I was aiming to motivate students by giving them a break from the monotony of reviewing literature and parsing through lectures. With these goals in mind, I constructed this review game using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model to ensure a systematic analysis, design, and iterative development cycle based on evaluation (Molenda et al., 1996). After a needs analysis was conducted, it was reasonable to also incorporate the ARCS motivational model to guarantee that the artifact would increase student motivation. As the name suggests, according to the ARCS model, student motivation is contingent on four factors, which are Attention, Relevance, Confidence, and Satisfaction (ARCS) (Keller, 1987a).

Analysis

The first stage of the ADDIE model is to analyze the target population of learners, determine learning issues that need to be remediated, how to solve these learning issues, and how determine the cost-benefit of an instructional design intervention (Molenda et al., 1996). As mentioned previously, the target population of learners were the graduate students of the clinical management course. The anticipated learning issues, as observed when students prepared for previous exams, was that students would experience burn-out, which would hamper their ability to study effectively for exams in the course. I determined that the development of a video game for exam review would remediate this issue so long as the ARCS motivational model were incorporated in its design (Keller, 1987b; Seli & Dembo, 2019). A video game could also be easily distributed to students in the course learning management system and can be easily altered to fit similar needs for different exams and courses.

Design

In the next stage of ADDIE, the design stage, I considered two major design points when incorporating the ARCS motivational model; first, *Kingston's Review Adventure* needed to host all four factors of motivation from the the ARCS model and second, designing for usability is essential to ensure that these motivational factors were apparent to the user. If the usability of a videogame is not designed well, then it will be difficult to draw attention, create a relevant experience, instill confidence, and provide satisfaction in the user (Sears & Jacko, 2009) Additionally, I made sure to keep in mind the information gathered from the analysis phase, as well as relevant resources and other materials the students would need to successfully complete this review game.

To grab the user's attention, a somewhat bizarre situation is presented to them. A corgi, some fun theme music, and a call to action that the user must help it run through a field. To maintain this attention throughout the gameplay experience, users continue playing along with Kingston and are accompanied by exciting sound effects. For relevance, the intrinsic value of this review game, as a tool to study for a major course exam, makes it highly relevant to students and is an enticing option after reviewing textbooks and lectures for hours on end. Building confidence in students is accomplished by using the directions of the game to explain the purpose of its existence and the criteria for success to eliminate fear of the unknown. If students can understand how to achieve success, they will be more confident and less anxious (Keller, 1987b). Finally, users must also have a satisfying experience while playing the game. Instant positive feedback and the unexpected song-and-dance routine at the end of the game are satisfaction strategies inspired by Keller (1987a) to help users feel good about their accomplishments.

I chose to use the Unity 3D game engine software since I wanted to develop a game that was robust yet modular. The Unity game engine, distributed by Unity Software Inc., is an accessible software that can be used to create simple or robust video games using the C# programming language. The game engine is heavily supported by tutorials and courses for developers as well as a large, international community.

In *Kingston's Review Adventure*, students will have their knowledge assessed by answering a series of review questions in succession. If they answer the review questions correctly, Kingston advances down the game board; incorrectly, Kingston remains in place. The review questions were created by the instructor, so they are already designed to advance the students learning. The students win the game by answering all the review questions correctly.

Development, Implementation, and Evaluation

In the development phase, all necessary materials needed to finish the game are located within the game itself. Tutorials, additional options, and all review game materials were included within the game. Minor prototype testing was utilized at different stages of development to ensure that errors would be detected and remedied to prevent larger issues when continuing production (Molenda et al., 1996).

To implement the game into the online course, it was uploaded to a private server on Github.com so that a simple URL could be used. This ensures that students would not have to download any files or applications and could easily access the game online. Using Github made it easy to upload revised versions of *Kingston's Review Adventure*, as minor issues could be fixed in Unity and the latest version could be quickly uploaded to the private server. Finally, a

simple usability evaluation was placed in the course so that students could voice any issues or opinions that they had concerning the game.

Learning Theories

The design of *Kingston's Review Adventure* incorporated a couple of learning theories to ensure that students were learning information in a relevant way to be successful with their exam. A variety of factors influence a student's willingness to pursue learning, including their motives, expectations, skill level, consequences, and attributions toward their performance (Driscoll, 2005, pp. 332 - 333). In developing an educational video game to increase learning motivation in students, I took the humanist approach to its instructional design. The instructor and I recognized the danger to student success on exams if motivation waned from burn-out, so I created *Kingston's Review Adventure* with student motivational learning theories in mind to create more self-actualized individuals. Motivational learning theories reviewed by Schunk inspired the integration of elements of the ARCS model into the game. According to Schunk, designing instruction using the ARCS model fosters the student's self-worth and positive attributions, which increases student motivation in learning (2011, pp. 366 – 367). A couple of examples of this are attention grabbing, such as creating a fantastical situation of helping a corgi run through a field, and satisfaction (earning a happy yip! from Kingston when answering a review question correctly) (Schunk, 2011, p 386).

By the time students used *Kingston's Review Adventure*, they had already been participating in the course for 10 weeks and had taken 3 exams. These students had already developed their own definitions of self-worth and defined attributions while learning new content during lectures, structured activities, and by completing assignments in the course. This game would serve only to make slight adjustments to these factors of motivation through this short

review game. Incorporating factors of motivations from the ARCS model aids in affirming these changes to the student's factors of motivation, such as receiving positive validation when answering a review question correctly or by grabbing the student's full attention before beginning the game by incorporating fun in-game music and the unusual task of helping a corgi run through a field.

Data Analysis and Results

My evaluation plan was used to detail the steps necessary to improve *Kingston's Review Adventure*. This plan was customized to identify issues with usability that would impede the user's ability to have an enjoyable learning experience while playing this review game. As described in my evaluation plan, data was collected using the think aloud testing method from a small number of instructional designers. After this qualitative data was collected, each sample of data was then coded to identify themes in the user responses. These codes were developed by looking for keywords in the user data (eg "the **sounds** for the main menu are distracting" or "the **buttons** are too small on the **game board**") and are a useful method for creating meaningful groups for participant feedback (Mortensen, 2020). After coding was completed, the data was color-coded by user and organized into a table to identify if different users gave similar feedback (Lucero, 2015). Finally, solutions to problematic game items were created and prioritized based on a variety of factors.

The think aloud testing methods were conducted over 15-minute sessions with four instructional designers. The amount of constructive feedback varied by person, which is a common occurrence due to the unnatural nature of this testing method (Nielsen, 1993, p. 224). Any positive feedback was identified but not included in the coding process. Parsing through the samples of data collected, 10 themes were identified and coded: fonts, buttons, music,

scaffolding, website hosting, main menu design, game board design, game board usability, question board design, and question board usability. Of these themes, nearly all of them included feedback from more than one participant (7 of 10), and some included feedback from all participants (3 of 10). The complete breakdown of data samples and themes can be found in Table 1. The complete list of samples and their associated code can be found in Appendix A.

Table 1

Codes, Number of Affected Users, and Number of Instances

Code	No. of Users Affected	Total No. of Instance
Fonts	1	4
Buttons	3	2
Music	3	5
Scaffolding	3	8
Website Hosting	1	1
Main Menu Design	2	3
Game Board Design	4	9
Game Board Usability	1	1
Question Board Design	4	4
Question Board Usability	4	6

From the table, we can prioritize issues based on the number of users that were affected and the total number of instances of a code. We can surmise that issues concerning scaffolding, game board design, question board design, and question board usability require immediate attention since all test users were affected and have a high number of instances relative to the other codes. The issues with lowest priority are those concerning website hosting and game board usability, since only one user was affected and only had a single comment for these issues. To prioritize further, I decided to assign a score to issues based on their code prevalence, severity, and estimated time it will take to fix the issue (Uddin et al., 2016). The priority score is

generated so that I know which issues to focus on fixing before presenting this artifact to my peers. Since there is only a short amount of time to try and fix feedback on *Kingston's Review Adventure*, I will be triaging feedback and bugs to know which issues to address during this short timeframe. The point amount dedicated to each of these is outlined in the Table 2 below.

Table 2

Priority Score According to Code, Severity, and Estimated Time to Complete

Code	Severity	Est. Time to Complete	Assigned Score to Each Criteria in Row
GB Design	Game breaking	≤ 1 hour	10
Scaffolding			9
QB Usability			8
QB Design	Major Issue	1 – 4 hours	7
Music			6
Buttons			5
MM Design	Minor Issue	4 – 8 hours	4
Fonts			3
Website Hosting			2
GB Usability	Not an issue	≥ 8 hours	1

Note. GB stands for *Game Board*, QB stands for *Question Board*, MM stands for *Main Menu*.

Recommendations

After coding the feedback provided from my evaluation participants and creating a scoring system to prioritize issues, the next step is to brainstorm solutions. First, I identified the items within *Kingston's Review Adventure* that most likely caused the feedback. Then, I brainstormed potential changes to these items to solve the issues brought up by the evaluation participants. After settling on an effective solution, I then calculated a priority score to determine the order in which I pursue tackling the issues.

As a method of triaging the feedback and bugs with *Kingston's Review Adventure*, an equation to calculate the priority of each issue was created. This equation is (rank in code priority) + (severity of issue) + (estimated time to fix issue) = Priority Score. Using this calculation, the list of each issues can be ranked as seen in Table 3 below. Issues that have the same priority score are further prioritized based on their severity and estimated time to complete.

Table 3

List of Issues, Their Solutions, and Priority Rank

Issue	Solution	Priority Score
UI does not scale when game is resized.	Choose "scale to screen size" with Canvas object in Unity3D.	30
When a mouse hovers over an answer, it is not highlighted nor selects correctly.	Convert answer choice game objects to UI elements.	25
Correctly selected questions repeat.	Program list to only return incorrectly answered questions to selection list.	24
Directions are not very detailed. User does not understand what the game will entail in terms of question amount, how to win, and if losing is possible.	Revise text directions to include this information.	23
There are not directions on how to play the game (what buttons do, controls).	Revise directions to explain buttons. Include pictures.	23
Music does not carry from the main menu to the game board. There is no background music when the user arrives at the game board.	Use the same music in main menu and game board. Add audio controller to game board to play this music.	23
Main menu music is a bit jarring and unpleasant.	Replace main menu music with a more neutral background sound.	23
There is not an easy way to restart the game.	Add a restart button.	21
Upon arrival to the game board, the button to grant a next question to the player is worded confusingly.	Have button say "New Question" instead of "Next Question".	21
Users are frustrated when continually getting review questions wrong.	Add a button that eliminates two of the incorrect answer choices.	20

Buttons and fonts are too small.	Make buttons and fonts bigger.	19
Users can easily miss reading the directions when before starting the game.	Have directions appear automatically when user starts the game. Add a button which allows users to look at the directions while in the middle of the game.	18
Large amounts of empty, bland space on game board.	Resize buttons, add more art, animations, and helpful UI to game board.	18
Player cannot review questions that they had already answered.	Add a button that instantiates a panel with the full list of questions and answers that the player has successfully completed.	18
The question board is very bland.	Utilize the artful backdrop used in the game board.	18
Simmer.io has a distracting layout for hosting the game.	Upload to GitHub server instead.	12

The purpose of assigning issues a priority score is so that I can efficiently mend *Kingston's Review Adventure*. I only have a short timeframe to fix this artifact from the time of this data analysis to the presentation of the revised artifact to my peers. So, it is wise to address the issues that are most severe and easiest to fix first. Issues with a priority score of over 20 will be fixed before presenting this game again. Issues with a priority score of below 20 will only be fixed if there is enough time remaining after fixing the high priority issues.

Reflections

My biggest takeaway from this evaluation is painfully obvious in hindsight. If an educational video game is rushed through production without any user testing and if game design is developed “on the fly”, a litany of problems will be encountered. *Kingston's Review Adventure* was designed and pushed in about a week – three days of which were spent coding during the night after I had finished work and class. Careful consideration was not used when designing the actual video game, which led to an inefficient development schedule and a very large amount of

usability issues, such as with the user interface malfunctions on the question board or the lack of helpful directions to complete the game. Although great care was taken when designing this game for education on paper, the ineffectual and hurried design of the game prevented it from reaching its full potential as a tool for learning.

It has been about a year since I developed this first iteration of *Kingston's Review Adventure*, and in that span of time I have learned much more about instructional and game design. Evaluating and analyzing this game at the end of my degree program is somewhat nostalgic; I can distinctly remember the long nights of coding and designing this game whenever I listen to the main menu soundtrack or Kingston's bark. I often look at parts of the game and wonder "Why would I ever design things this way?!". Nevertheless, we all must start somewhere, and I am glad I started my journey in game design with Kingston the Corgi and his plight to run through an open field.

References

- Driscoll, M. P. (2005) *Psychology for learning and instruction* (3rd ed.). Pearson.
- Keller, J. M. (1987a, September). Development and use of the ARCS model of instructional design. *Journal of Instructional Development*, 10(3).
<https://doi.org/10.1007/BF02905780>
- Keller, J. M. (1987b, October). Strategies for stimulating the motivation to learn. *Performance and Instruction Journal*, 1-7. <https://doi.org/10.1002/pfi.4160260802>
- Lucero, A. (2015) Using affinity diagrams to evaluate interactive prototypes. In J. Abascal, S. Barbosa, M. Fetter, T. Gross, P. Palanque, M. Winckler (Eds.), *Human-computer interaction – INTERACT 2015* (pp. 231-248). Springer, Cham.
https://doi.org/10.1007/978-3-319-22668-2_19
- Molenda, M., Pershing, J. A., Reigeluth, C. (1996). Designing instructional systems. *Training and Development Handbook*, 4, 266 – 293.
- Mortensen, D. H. (2020, June). *How to do a thematic analysis of user interviews*. Interaction design. <https://www.interaction-design.org/literature/article/how-to-do-a-thematic-analysis-of-user-interviews>
- Nielsen, J. (1993). *Usability engineering*. AP Professional.
- Schunk, D. H. (2011). *Learning theories: An educational perspective* (6th ed.). Pearson.
- Sears, A., Jacko, J. A. (Eds.). (2009). *Human-computer interaction: Designing for diverse users and domains*. CRC Press.

Seli, H., & Dembo, M. H. (2019). *Motivation and learning strategies for college success: A focus on self-regulated learning*. Taylor & Francis Group.

Uddin, J., Ghazali, R., Deris, M. M., Naseem, R., Shah, H. (2016). A survey on bug prioritization. *Artificial Intelligence Review*, 47(2). <https://doi.org/10.1007/s10462-016-9478-6>

Appendix A

Fonts

- “The fonts could be a little larger [on the main menu buttons].”
- “[The directions] look normal - just the font is small is all.”
- “It's really small too - the fonts are really small on [the game board and question board exit button].”
- “Just make sure that the fonts are larger for us old folks.”

Buttons

- “I have a hard time with all those small [buttons].”
- “Maybe this "next" button can be a lot bigger, maybe it can be centered.”
- *User skipped the credits button*

Music

- “I don't hear anything.” (transitioning from main menu to game board)
- “So if I mute it and then unmute it goes away and does not come back.” (gameboard speaker button during celebration)
- “I don't like that the audio starts right away.”
- “[The dog wail] is so sad I have to turn that off.”
- “Also, I'm not sure if there is sound that I am supposed to be hearing?” (main menu to game board transition)

Scaffolding

- “Oh dude, I just want to quit.” (frustrated), (in reference to getting 3 questions wrong in a row).
- “I've played your game before and I got through it. I do not know why I am blowing it this time.”
- “Is there a point where I win? Like, how many questions, type of thing or? You know, how do I win? I want to win.”
- “I want to say that since [the exit button] is on a question, that it would go back to a previous area.”
- “I would expect the objective to tell me more about the game. What am I going to learn about playing the game?”
- “I would expect the how to play to be here. There's no instructions on how to play the game.”

- “If I hit ‘Exit’, will it take me back to the home page and if I come back, do I start in the same spot or will I have to start over?”
- “If I keep getting these wrong can I keep going or is there a point in time where like the game says you're not good enough or something?”

Website Hosting

- “When I first clicked on [the game] I got a little confused and I thought [the games in the side menu] might have been [the game] at first.”

Main Menu Design

- “Should I look at the directions first or anything or is that part of it?”
- “I don't like that the audio starts right away.”
- “It does look like the Corgi's feet are a little covered up by the directions.”

Game Board Design

- “If it were me, there is a lot of white space a lot of dead space here.”
- “What you could do, Mitch is bring all the buttons up [to the sky] and bring all the buttons across the [hill].”
- “It just doesn't feel balanced, but I like the art.”
- “I can't relaunch [the game] from within its own GUI here.”
- “Keeping [the sky and grass] aesthetic or a light enough color where you still have the black text over it.”
- “I enjoy [the celebration]. I was confused if that was going to be the last question or if the star was going to be the last question.”
- “The first thing that popped into my head (about the gameboard) is there's a lot of empty space up here.”
- “‘Next’ implies that I have already had a question, so I would have that say ‘start here’ or something like that because to me it seems like I jumped into the middle of the game.”
- “I can't remember what I answered. Is there a way to go back?”

Game Board Usability

- “If I hit the ‘Exit’ button, am I just going to exit the whole game or am I just going to exit this question?”

Question Board Design

- “I feel like [the question board] is very bland. I don't know if it would be possible but I think just to have like a grass background similar to [the board].”

- “Is this the same question?”
- “I think I have gotten this question 3 times.”
- “I can’t remember what I answered. Is there a way to go back?”

Question Board Usability

- “Oh - whoa...” (perplexed), (in reference to the answer choice highlights not aligning to answer choice UI elements).
- “I think that’s part of my problem here dude, I’m clicking the wrong buttons.” (in reference to the answer choice highlights not aligning to answer choice UI elements)
- “I’m pretty sure I had this one earlier.” (in reference to a repeated question)
- “Okay your boxes is a little off.” (referencing the highlight answer UI)
- “If I hit the ‘Exit’ button, am I just going to exit the whole game or am I just going to exit this question?”
- “One of my comments is that it highlights all of these.” (highlight answer UI)
- “I think there might be a selection issue.” (answer highlight UI)

Revision Notes

Introduction, p. 2: Added scholarly source used to determine initial version of artifact.

Instructional Design Models, p. 3: Provided more information about the incorporation of the ADDIE model for constructing the artifact.

Instructional Design Models, pp. 3 – 5: Organized instructional design process into sub headers to organize information.

Instructional Design Models, pp. 3 – 5: Provided more information on the fusion of the ADDIE and ARCS model for the design of the artifact.

Instructional Design Models, p. 4: Removed unnecessary information concerning the ARCS model and the artifact.

Learning Theories, p. 6: Revised learning theory basis from schema theory to various motivational learning theories.

Data Analysis and Results, p. 7: Added scholarly article used for coding process.

Data Analysis and Results, p. 8: Revised Table 1 to adhere to APA format.

Data Analysis and Results, p. 8: Added scholarly article used for feedback triaging method.

Data Analysis and Results, p. 9: Revised Table 2 to adhere to APA format.

Data Analysis and Results, pp. 10 - 11: Revised Table 3 to adhere to APA format.

Data Analysis and Results, p. 12: Added information on how I will approach fixing feedback.