Design of Learning Experience to Engage Learning in an Instructional Design and Technology
Graduate-Level Classes: Digital Game-Based Learning (DGBL) Cases

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Short Description

To effectively engage graduate-level students in Instructional Design and Technology (IDT) theories, methods, and applications, we incorporated a real-world project into the *Intro to Instructional Games and Simulations* and *Media in Instruction* courses. The 2019-2020 University of Tampa Research Innovation and Scholarly Excellence (RISE) Award/Dana Foundation Grant was awarded to deliver digital interactives to an orphanage in Haiti. Specifically these classes focused on creating Digital Game-Based Learning (DGBL) to teach English. Results of this pilot include 94% of students identifying positive impacts on learning.

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Abstract

The 2019-2020 University of Tampa Research Innovation and Scholarly Excellence (RISE) Award/Dana Foundation Grant was designed for university students to design and deliver digital interactives for children in Haiti. This paper offers strategies used in the *Introduction to Instructional Games and Simulations* course and *Media for Instruction* courses to introduce theories, methods, and practical applications to effectively engage the graduate-level students in the Instructional Design and Technology (IDT) learning experience. Specifically, this class designed educational games focused on instruction for an orphanage in Haiti. Two cases are also provided to demonstrate lessons learned involving game premise, game play, motivational strategies, assessment measures/winning, and how the project-based learning (PBL) impacted students. The overarching questions we sought to determine was:

What impact does a real-world project such as designing digital interactive games for English language learners (ELLs) in a developing country have on graduate students learning instructional design and technology concepts?

Over 94% of participants (*n*=7) attested to impactful learning using this real-world experience to prepare them with IDT concepts for the field.

Design and Development

Teaching the Value of Digital Game Based (DGBL) Learning

Myerson credits mathematicians John von Neumann and Oskar Morgenstern to have birthed Game Theory using mathematical equations to offer ongoing engagement and opportunities for problem solving (2013). This theory applies algorithms to digital devices to offer endless branches for players to make decisions which invites the possibilities of capturing players' attention in an environment which fosters critical thinking and problem solving. DGBL also provides a fail-safe environment to test new and different suppositions (Gee, 2008; Justice & Ritzhaupt, 2015). Using DGBL to offer competitive and collaborative opportunities in a digital game stimulates player motivation and performance (Burguillo, 2010).

Incorporating games into curricula is simply a natural fit for learners to acquire, apply, and retain new skills. Educating with games may seem like a win/win in theory for students and teachers but if we don't begin by grounding the gameplay on sound educational pedagogy and instructional design models we can plan on stamping the games developed under the *Entertainment* genre. To stress the importance of this concept, the graduate-level students were challenged to complete a quest to explore and examine if games tagged as "educational" were actually aligned to sound educational principles and theories. To complete this task, the RETAIN model (Gunter et al., 2008) rubric was used to measure the educational value of games designed to immerse players in learning. The RETAIN model according to Gunter et al, (2008) was "developed to aid in the evaluation of how well academic content is endogenously [part of the story vs. an addendum to the curricula] immersed and embedded within the game's fantasy and story context, promotes transfer of knowledge, and encourages repetitive usage so that content becomes available for use in an automatic way" (p. 511). The graduate-level students were charged with experiencing educational games by playing them and then rating them as per the RETAIN model.

Elaboration Theory

The first course of the IDT program covers basic instructional design (ID) theories. Consecutive *Media for Instruction* and *Introduction to Instructional Games and Simulations* courses provided them a project with which they would experience ID theories come alive. For example, the Elaboration Theory (Reigeluth, 1999, 2018) suggests that to build learning, we must begin with the simple and move to the complex. This theory uses sequencing and chunking elements to provide learners with room to consume and build upon each section rather than trying to provide them with all the content at once. For example, games the students designed began with friendly visual images and sometimes translations whereby offering the instruction in the learners' own native language to begin unfolding the cause and effect of symbol to word and sound; or, elaborating upon this knowledge by adding sounds, vocabulary words, and the pronunciation of words.

Educational pedagogy compliments the concept of chunking instruction with scaffolding methods that essentially offer a safety net structure for learners to grasp the learning as the instructor steps back (Erben et al., 2008; Alber, 2011). The IDT students were charged with building turn-key strategies (for students with or without a teacher) to scaffold the ELL instruction through digital games. Strategies selected included video recordings that modeled player interactions and sounded out letters and words.

Systematic Collaborative Process to Create a Comprehensive Sustainable Infrastructure

To improve usefulness and sustainability, service-learning projects need community involvement. A rapport with the communities who are familiar with the needs of the target audience strengthens the potential for them to take on a sense of ownership, potentially enhancing design decisions to improve effectiveness. For example, while travelling in Haiti, the professor delivering these courses observed that prior relief efforts from outside countries provided a valley of colorful homes for the impoverished but a glance into the mountains displayed barren hills with no foliage. Without transportation to work, food, water, or relief from the heat, not one home was used. By working with efforts already in place, the professor formed harmonious connections and selected CARHA as the non-profit organization who would continue to foster a symbiotic relationship by communicating their needs and using the education.

Building the persona and story for the ELL

CARHA provided our IDT students with names, ages, and genders of the learners (from this point forward called players) for whom they were charged with designing beginner ELL. Next, they would need to consider the premise on which their game would be built. What was the story they would tell?

Case 1. Emmanual and Hunter by Eggers

Gameplay. Emmanuel's & Hunter's Animal Farm Quest was developed as a single-player game designed to teach basic English vocabulary with cartoon caricatures using Articulate Storyline.

Narrative. The game follows the story of Emmanuel, the farmer, and his dog Hunter. The characters ask the players to help find the animals who have playfully decided to hide from Emmanuel & Hunter. Emmanuel and Hunter do not realize the animals are hiding behind the fence. The player is asked to find the animal based on the sound the animal makes. The animals jump up and down from behind the fence to add to the playful game of "hide and seek." Once the correct animal is selected, the animal sits on top of a bale of hay. This process is repeated until each animal is correctly selected.

Figure 1.

Farmquest Homepage

Motivation. The main characters selected were chosen based on animals that are indigenous to Haiti and easily identifiable by the pictures and the sounds. Emmanuel's character was created to be culturally relatable. The name Emmanuel was chosen using a list of common Hatian boys' names. Hunter's character was created from a real canine who rescued 100s of trapped victims after the devastating earthquakes and was the first non-human to win *Firefighter of the Year Award*. (National Disaster Search Dog Foundation: **https://searchdogfoundation.org/haiti-earthquake/**). Finally, IDT students used the RETAIN model (Gunter et al., 2008) to crosswalk educational theories like the ARCS model (Keller, 2009) to motivate learners with sound game design. The instrument was developed by adapting Charsky and Ressler (2011), using John Keller's Instructional Materials Motivation Scale (IMMS) (Keller, 1987) to a 1.4 readability level with translations added in the children's native language.

Figure 2.

IMMS Adapted to Measure ARCS for Haitian English Language Learner 1.4 Readability

Do you want to play it again? (Ou vle jwe li ankò?)

Yes!   No.

Is the game easy to use? (Èske jwèt la fasil yo sèvi ak?)

Yes!   No.

Did you do well? (Èske ou te fè byen?)

Yes!   No.

Did you learn something? (Eske ou te aprann yon bagay?)

Yes!   No.

What did you learn? (Kisa ou te aprann?)

Do you want more games? (Ou vle plis jwèt?)

Yes!   No.

Note. Students were guided to incorporate the ARCS model (Keller's 2009) into a post-assessment instrument designed to measure attention, relevance, confidence, and satisfaction to engage learners, adding the emoji visuals to support learner recognition.

Cultural and language literacy. To construct the instruction, the IDT students immersed themselves in researching their target audience and their location. They soon learned they had to rethink everything they knew to contextualize the instruction based on the cultural context with which they needed to design their instruction. For example the first design that emerged was a game based on farm animals which the designer thought would be appropriate for children. The imagery she used of a farm and barnhouse was familiar to children she knew but once diving deeper into analyzing her target audience realized this was far from their reality. The redesign contextualized the instruction with imagery and a story to provide meaning to which the Haitian children could relate.

Methods and Results

In this pilot study of IDT students applying the theories they learned about to real-world instruction, video observations and surveys were collected to analyze user reactions of the games to assess motivation and gather formative evaluation to improve game design. Testers included an IDT inquiry and measurement graduate-level class (*n=19*) and the Haitian children (*n=7*) that offered feedback for improvement and reactions clearly demonstrating motivation. A survey was

then also offered to the seven IDT student participants to gather responses to answer the overarching question: *What impact does a real-world project such as designing digital interactive games for English language learners (ELLs) in a developing country have on graduate students learning instructional design and technology concepts?*

Survey Results

The game's written narrative in the native Haitian language of French Creole appeared to be a minor distraction to the players. However, the students from the IDT class are not the intended target audience for the game. The issue of the text should not be an issue for the intended user of the game. No required changes needed in this area.

The game's most significant challenge for all the players was the difficulty and the frustration in finding the correct place to click on the targeted animal.

The audio had great feedback, as well as the players like the positive reinforcement of the clapping and cheering audio provided.

Characters had positive feedback in appearance and relatability.

Feedback on the possibility of learning transfer was positive as long as it was properly reinforced.

Observations

The players made videos of their face while playing the game. The facial expression of the players, for the most part, had minimal changes in facial expressions. The lack of expressions can be attributed to the initial intent of why the student participant was playing the game. The intent of playing the game was to critique the game for evaluation rather than playing the game for fun. This would position the participants viewing the game through a more critical lens and focus less on the fun and more on the educational nuances. However, it was observed at specific times in the videos (which likely corresponds with the task of trying to click on the correct animal response) facial expressions of the participants indicated possible frustration. The possibility of frustration in playing the game was a significant finding in the feedback process, which required significant changes in the gameplay triggers before releasing the final version of the game.

Revisions Made Post-Feedback

The game background comparison from the original version to the final version is reflected in Figure 3.

Figure 3.

Original Version (base slide) Final Version (first slide)

Other changes made to the original version included **feedback revealing the difficulty in locating the correct place to click to choose the correct targeted animal. Revisions from the original include:**

1. Two slides which contain visual cues (scaffolding) and text box directions (contextualization) on how to choose the correct answer.
2. Clearly outlined trigger buttons that mark the area where the player needs to click on to reveal the correct answer.
3. Additions made to the Original Version:
4. Additions made to enhance the game include a downloadable badge. The player will be able to collect game badges as new games are created to support motivation.
5. Too many words for beginner English language even with translations for a post-survey so it was simplified.

Final Beta-Testing Results

      Final beta-testing was performed by subject matter experts from CARHA organization and educators to measure the quality of the design, content, and contextualization of games.

Figure 4.

Data Result of Quality Assurance Checklist for Formative Evaluation of Farm Quest Game Content (c) and Design (d)

	Farm Quest Game	Min	Max.	Mean	Std Dev.	Variance
1	A. Recognition of the Symbol: Colors and letters are clearly recognizable.	3.00	3.00	3.00	0.00	0.00
2	B. Identification of Symbol Meaning: Letters or colors are clearly connected to form meaning	2.00	3.00	2.67	0.47	0.22
3	C. Pronunciation of Symbol: Audio offers clear pronunciation for letters or colors.	2.00	3.00	2.67	0.47	0.22
1	Design Build and Quality: All interactivity, functions, links, buttons, states, and menus work.	2.00	2.00	2.00	0.00	0.00
2	Grammar & Writing: All content is grammatically correct and in a legible format.	3.00	3.00	3.00	0.00	0.00
3	Engagement: Content includes interactive elements	3.00	3.00	3.00	0.00	0.00
4	Cultural Contextualization: Content is designed with context and images that the audience is familiar with.	3.00	3.00	3.00	0.00	0.00
5	Accessibility: Multimedia available (audio narration, images, text)	2.00	3.00	2.67	0.47	0.22

Note. This checklist was measured on a three-point scale (1) unsatisfactory to (2) satisfactory to (3) excellent in both design and content with all games scoring satisfactory to excellent in all categories.

Figure 5:

Facial Expression Results from Target Audience Testers Demonstrating ARCS Model

Discussion

The results of the observations overwhelmingly displayed students' success in applying theories learned to real-world applications as players demonstrated all aspects of the ARCS model from leaning into the screen with concentration, exhibiting Attention and Relevance. They sound out the letters, repeat the process, and joyfully exude Confidence in their body language with clapping and cheering when they identify and recognize the meanings. We suggest the final image displays confidence as the player air-types on the keyboard proud of his accomplishments.

Conclusion and Future Studies

The goal for this project to pair The UT students with real-world class projects to serve the needs of the Haitian children has successfully completed this charge to date. The role of applying technology, specifically gamification of educational material, is to engage and motivate gameplay while learners acquire knowledge, build upon that knowledge to deepen and retain it as they apply it. The use of having the graduate-level students create instructional games has found an essential role in engaging learners by encouraging a hands-on approach to learning. It is critical to understand why you are designing a game in the first place. It is also vital to know who the project is being created for and how it can be assessed. The task of designing a game to teach basic vocabulary words to Haitian children was an undertaking. Nevertheless, this undertaking has been a worthy enterprise. Not only has this project created the opportunity to reach a population that has limited availability to the digital game world but has given these graduate-level students a better appreciation of the dedication and effort that goes into designing and creating instructional games.

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