Critical Review of Research 1

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1. Identify the clarity with which this article states a specific problem to be explored.

Erhel and Jamet (2013) performed two experiments which they reported in their article “Digital game-based learning: Impact of instructions and feedback on motivation and learning effectiveness.” The problem they intended to explore, according to their introduction, was the need to better understand what impact digital game-based learning had on students’ understanding and retention of materials addressed in the learning environment. Their first experiment was created to determine if the type of instructions given to students prior to using a digital game-based learning environment would affect student motivation and student learning outcomes. The second experiment sought to understand whether the addition of regular feedback offered by the simulation would have any impact on the same measures.

The authors clearly stated the purposes of their research in the introductory paragraphs of each of the two experiments described in this article. The use of the terms “the aim of this study” and “we set out to determine” provided indicators that the research purpose was to follow. Both statements of purpose were one sentence long and were written in easy to understand terms. The authors followed the statements with their predictions of the impending results along with support for those theories from research that was done before them providing additional clarity to the purposes for each experiment. The goals of these experiments allow the authors to describe the effect that framing a student’s mindset before entering a digital game-based learning environment had on their motivations and learning outcomes.

2. Comment on the need for this study and its educational significance as it relates to this problem.

In the introduction of Erhel and Jamet's article, they explain that the ever growing number of individuals playing digital games has spawned the interest of researchers to look at the educational benefits of the medium. They continue to describe different research approaches and the results of those approaches. The authors describe one approach that researchers have often used, the comparison of using a digital game-based learning environment versus traditional teaching methods, and explain that this approach allows for too many independent variables which can corrupt the outcome of a study. To avoid this, Erhel and Jamet opt to explore the effect that different instructions given at the beginning of the same game-based learning experience has on the motivation and learning outcomes. According to the authors, this study can help deepen the understanding of how different approaches to game-based learning can affect the way a student interacts with the medium and ultimately how much he or she retains after that interaction.

This study hits on a few different elements of learning using games. The first is the idea that framing a student’s mindset prior to using a game for instructional purposes has an implication on his or her behavior, motivation, and retention of the materials being taught. The second is the impact feedback within the game setting has on those same elements of student learning. This study provides a different way to look at game-based environments and its effects on learning. The problem that was stated in the beginning of the article focused on the impact game-based learning had on motivation and learning. This study supports the idea that digital game-based learning environments do support learning outcomes when they are framed appropriately in the introduction of the lesson and if feedback is provided throughout the lesson. Because it focuses on the impact introductions to the environment and feedback throughout the environment have on students, this research can provide educators with insight on the importance of the attitude presented when introducing a game based environment and the importance of feedback throughout these types of learning activities.

3. Comment on whether the problem is “researchable”? That is, can it be investigated through the collections and analysis of data?

Understanding the impact digital game-based learning has on instruction is a researchable problem. While Erhel and Jamet (2013) found flaws in the way researchers often compares this method against other traditional methods of learning; that research and other research in this area have been able to provide data that demonstrates the impact game-based environments have had on learning outcomes and motivation. The easier of the two elements that data can prove is the motivation piece. In their article, Erhel and Jamet (2013) point out that researchers have found strong evidence that demonstrates the ability that games have to promote motivation in students.

4. Critique the author’s conceptual framework.

The conceptual framework of Erhel and Jamet’s (2013) research starts with the understanding that game-based learning is gaining popularity in both educational settings and educational research settings. Two components of game-based learning which are researched in this article’s literature review are the depth of learning that can be achieved through the structure and the effect motivation has on mastery and performance in the educational setting. Using the research about these, the authors set up a conceptual framework for their own study which was setup to determine the effect instructions had on the outcomes of a game-based lesson.

Erhel and Jamet’s (2013) research is set up so that every individual is using the same program, in the same setting, at the same time. All participants were provided a pretest to ensure they did not already possess knowledge of the material that would be taught in the game. Their independent variable is the way in which the instructions for the game-based learning experience were delivered. Half of the group received instructions that made it clear the game was meant for learning purposes, while the other half of the group was given instructions that made it seem like the game was only being played for fun. The dependent variable would be the scores participants were able to achieve on the two questionnaires.

The framework used provided a sound structure for the two experiments conducted by these authors. The pre-test provided the check needed to ensure background knowledge did not play a role in the final scores of the participants. Because the participants were in the same game-based learning environment at the same time, they did not run the risk of exposing participants to different physical conditions. The instructions were the only controllable variable that was changed for each group. This should lead to results that are as reliable as possible when dealing with different individuals from different backgrounds and different learning or motivational styles.

5. How effectively does the author tie the study to relevant theory and prior research? Are all cited references relevant to the problem under investigation?

Erhel and Jamet broke their literature review up into four separate sections. They begin by providing definitions of digital game based learning from two different studies in the first section. One definition was completed by Mayer and Johnson (2010) and the other by Prensky (2001). The authors describe Mayer and Johnson’s definition as a way to define any type of game while Prensky’s definition focuses on the effects the game has on the players (Erhel and Jamet, 2013). While starting with research that defines digital game-based learning is an effective method to begin the discussion of the studies presented, more elaboration on what game-based learning is would have made it easier for the reader to understand the nature of this type of learning environment.

The next section describes the motivational benefits of digital game-based learning. This short section is a flurry of definitions on goal orientation, internal motivation, interest, self-efficacy, mastery goals, performance goals, and flow theory. This section on motivation feeds off of the prior section which simply defined what digital game-based learning is, but it could have been incorporated into the section which follows it that compares the benefits of digital game based learning with conventional media. In fact, in the third section of the literature review the authors discuss research that addresses the idea that digital game-based learning and its effect on the students’ motivation to learn. The research and definitions found in the second section could have been incorporated with the information presented in the third section instead of creating separate sections. The listing of definitions in section two creates confusion as to how the research is applicable to the other information discussed in the literature review. The latter part of section three primarily focuses on the “media comparison approach” of studying digital game-based learning environment. Erhel and Jamet criticize this approach because there are too many factors that could change the results. They do describe the conflicting research that has been a result of this type of approach.

The final section of the literature review describes research that discusses how the presentation of instructions affect learning. The authors point out that this type of research has not been done for digital game-based learning environments before. They continue to describe how general versus specific instructions change the way learners interact with text while they are reading. The authors draw a line from how instructions affect learning from reading to their research question of how do instructions affect learning from digital game-based learning environments. Section four continues with a discussion about how the cognitive processes used during learning are an important factor in determining what is learned only at the surface level and what is learned deeply. Because instructions play a role in which cognitive processes are used during a learning task, it is important to understand the differences between surface and deep learning and what can lead a learner to only obtain surface learning or what can push them into deeper learning.

The four different sections of the literature review are relevant to the to the problem being investigated by Erhel and Jamet. It is important that the reader understands how digital game-based learning is designed, how motivation plays a role in learning through this type of environment, what the research says about digital game-based learning and how it compares to traditional learning environments, the flaws that make the different research studies contradict each other, and how instructions affect the depth of understanding in other learning environments.

After experiment one is concluded, the authors add additional supporting research to the article which discusses the effects of feedback on learning outcomes. They describe how feedback can positively affect the learning outcomes within game-based environments. The authors then explore the different types of feedback that have been used within these environments in prior studies. The authors believed that the reason why experiment one failed to yield positive effects on student content knowledge when given the entertainment instructions could be contributed to the fact that participants were not given effective feedback from which they could learn the materials. This research, while it is outside of the official literature review, does have bearing on the second study completed by these authors.

6. Does the literature review conclude with a brief summary of the literature and its implications for the problem investigated?

Erhel and Jamet (2013) do not have a formal conclusion of the literature, but they do give a brief summary of the literature as they begin to explain the first experiment. In this summary, the authors only go so far as to review the prior research methods and question the approach used to determine if digital game-based learning adds value to learning. The claim stated is that there were too many other variables in those studies that could have contributed to or detracted from the learning that was happening in that setting.

As the authors begin to discuss their second experiment, they return to the research again but they add new research about providing feedback during digital game-based learning. This research led Erhel and Jamet to create this second experiment where they followed the same procedure as the first experiment, but added feedback into the game environment.As the second experiment is introduced, the authors do explain that they are looking to see if the introduction of feedback with the entertainment instructions will allow the participants to maintain the playful motivation while providing a mechanism for the participants to engage in deeper learning.

7. Evaluate the clarity and appropriateness of the research questions or hypotheses.

The research question for experiment one asked if the instructions that are given prior to using a digital game-based learning environment would impact the students’ learning. The authors hypothesized that the participants who received the entertainment instructions would score higher in their motivations to complete the game-based learning, while those who were given the learning instructions would have higher scores in the content they were learning. This hypothesis presented for this study followed the reasoning that was presented in the literature review. They are also clear as to what is expected to be seen and why those outcomes are expected.

Experiment two explores the idea of feedback within a game-based learning environment. The hypothesis is that regardless of which type of instructions a participant was given, if feedback is provided, their content learning would rise since the feedback would guide participants’ learning which would lead them to a better understanding of the content. This question and the hypothesis are appropriate to the research that was presented in the literature review and the research that was presented outside of the literature review after the first experiment and the study that is being conducted. It provides a clear explanation of what is being studied and what the authors think their results will yeild.

8. Critique the appropriateness and adequacy of the study’s design in relation to the research questions or hypotheses.

The study is designed to compare the effect that instructions have on learning through digital game-based learning. In experiment one, Erhel and Jamet (2013) explain that they chose to design the study so that the only difference between the two groups of participants was the type of instructions given prior to their participation in the game-based environment. In the second study, the authors chose to complete the study again adding feedback to both participant groups. The way the study is designed does allow the researchers to focus on the research questions for each of the two experiments.

9. Critique the adequacy of the study’s sampling methods and their implications for generalizability.

The participants for experiment one includes 46 students from various universities. 22 men and 24 women were split into two groups. One group, the participants who were given the learning instructions, was made up of nine men and fifteen women. The group who was given the entertainment instructions was made up of fifteen women and nine men. There is no explanation as to how these participants were selected for each group or why the genders were not evened out better.

In experiment two, 44 participants, also undergraduate university students, were a part of the study. 16 women and 28 men were again split into two groups which included one where learning instructions were delivered and one where entertainment instructions were delivered. There was no description given as to how the participants were split for this experiment.

The age range for both experiments was rather narrow. While this study could be repeated with different age groups, an argument could be made that the results may not be generalizable by age. There is also little to no information about demographics of the participants beyond their age. Finally, the fact that all of the participants in this study were university students could pose an issue with the generalizability of the results because college students currently live and work in an environment where they are trying to learn on a daily basis. This study could have very different outcomes if the participants were k-12 students, working adults, or any other demographic.

10. Critique the adequacy of the study’s procedures and materials.

Experiment one started by randomizing the participants into either the instructional or entertainment group. Participants filled out a survey to determine if their prior knowledge was too great to be a viable candidate for the study. The participants entered the ASTRA learning environment where they were given the instructions and four simulations. After the simulations were complete, the participants were asked to fill out a survey that measured their engagement with the learning environment. Experiment two was conducted the same way as experiment one except the simulations provided feedback when an answer given by the participant was entered.

The game provided for participants in this study was the ASTRA multimedia learning environment. The description of this program sounds like a training video with a reactive simulation and follow up quiz. The game-based aspect of the environment was the ability to earn points for quiz answers, which were only reported as correct or incorrect to the individuals who participated in experiment two. The definition provided by Erhel and Jamet (2013) describes digital game-based learning as, … “a competitive activity in which students are set educational goals intended to promote knowledge acquisition.” The description of the ASTRA learning environment does not mention any competitive aspects. While it does say there are points given to participants for the quiz, it does not mention if those points are awarded in a way that would make the user feel like they are competing in the environment.

According to the description of the procedure, participants were randomized prior to taking the pretest. This pretest was administered to determine which individuals had too much prior knowledge to be viable candidates for the study. The likelihood of a more equal distribution could have been ensured, even though the results of the pretest scores were reported as significantly similar, by randomizing the participants into groups after the pretests were evaluated. The remainder of the procedure for the study itself does seem to be an adequate set up for answering the research questions in each experiment. All participants played through the same simulations with the instructions being the only differentiated variable.

11. Critique the appropriateness and quality of the measures used.

The study measures for the two experiments included the pretest, quiz questions within the digital game-based learning environment, and the survey provided to participants at the end of the program. Erhel and Jamet (2013) explain that the pre-test was created to test general knowledge that is similar, but not the same as the information that was presented and tested on within the simulation. While this tactic was put into place to prevent participants from gaining information inadvertently through the pretest, it could also be that it did not adequately assess whether or not the participants held prior knowledge about the subject. For example, while a participant may not know a great deal of medical knowledge, he or she could have been exposed to a family member or friend with one of the illnesses being taught through the simulation. This could cause them to fail the pretest, but still hold prior knowledge of the subject which could skew the validity of the study.

The quiz questions within the game-based learning environment were only described as recall questions. Using recall questions during the learning simulation is an appropriate tactic to assess student comprehension as they are participating in the environment. If these questions were missed it could be assumed that the student was either not engaged with the activity or did not understand it.

The motivational survey questions were administered after the simulations were completed. This was broken into different categories of questions with each category (mastery goal approach, mastery goal avoidance approach, performance goals approach, and performance goal avoidance) containing three items. This format allows for enough questions to ensure there is consistency in answers while not overwhelming the participants with too many questions.

The final set of questions participants were asked to answer were knowledge questions which included four knowledge and four inference questions. These questions allowed the researchers to determine if the material learned was retained well enough to apply the knowledge. These questions might have been more beneficial to understanding true learning of the material if they were administered after some time had passed. These could have been given a day, a week, or even a month later to learn if participants retained the knowledge they learned. While this tactic would have also left open the possibility that participants would somehow acquire more knowledge on the material in that time frame, one or two simple survey questions added to these knowledge questions could have provided answers as to whether the material was somehow studied or encountered again between the initial digital game-based learning simulation and the last set of questions were answered.

13. Critique the author’s discussion of the methodological and/or conceptual limitations of the results.

Erhel and Jamet (2013) describe three limitations in their study. The first is the limitations of the ASTRA simulation. They admit that the simulation did not provide much interactivity for the user. This statement seems to be accurate as the description of the ASTRA learning environment sounds more like a digital version of a classroom lecture with a quiz at the end than a game-based environment. It could be argued that the lack of interactivity and the lack of competition would not classify this simulation as a game at all.

The authors also describe a limitation with the quizzes within the ASTRA environment. In the description of these questions which were provided in the methodology of the study said they were recall questions. Erhel and Jamet (2013) point out that the questions were answered correctly at a relatively high rate. They seem to think that these questions were not hard enough to truly gage the effect feedback would have on learning in experiment two. A better example of the role feedback plays in this type of environment could be seen if the number of questions participants got wrong was higher because growth or a lack of growth could be measured by comparing the embedded questions with those that were given at the end.

The researchers also point out that they could have collected digital data which would have provided further understanding of participant engagement and activity. Information like how long participants spent reading instructions, watching the simulations, and answering questions could have provided another lens for looking at the data. For example, if participants only scanned the instructions this could account for why there was very little difference in the outcomes of the two groups.

14. How consistent and comprehensive are the author’s conclusions with the reported results?

After each experiment is explained, the authors describe their interpretation of the results. After the first experiment failed to show a strong difference between the two groups Erhel and Jamet (2013) created a second study that added feedback to the digital game-based learning environment. Their description of the results for the first and second experiments were consistent with the results reported. The general discussion at the end of the article provided a more thorough description of the author’s conclusions which described the results and the rationale as to why the authors thought the results came out as they did.

15. How well did the author relate the results to the study’s theoretical base?

Erhel and Jamet (2013) refer back to their hypotheses throughout their discussion of the results both after each experiment and at the end of the article as a whole. They describe how the results found in each of the two experiments were contradictory to their assumptions. They continued by relating their results back to the research which had lead them to their original theories and explained how some flaws in their study could have been to blame for some of the inconsistencies found between the assumptions they had made from their analysis of the literature and their findings from the research study.

16. In your view, what is the significance of the study, and what are the primary implications for theory, future research, and practice?

This study provides another way of looking at the implementation of digital game-based learning. It does not take a comparison of game-based learning and another instructional strategy; instead it provides insight into how differences in game-based learning standards could impact learning. While this study did not seem to find significant correlation between the type of instructions given and what was learned by the participants, the theory is sound. The study itself had flaws which could have led to the lack of significant differences found between the two researched groups. This study could provide a guide for further studies.

Future research could be done to continue studying the effect that different approaches to teaching students through digital game-based environments has on the overall learning outcomes. This type of research could help instructors who utilize or would like to utilize digital game-based learning to use methods which will allow students to gain the most out of their experience with these types of environments.

References

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