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**Serious Games: Design Decisions, Efficacy, Usability, and Encouraging Widespread Adoption**

Serious games, also known as “gamified” education or game-based learning, is a growing field centering around using video games as an educational tool. This discipline is still in its infancy, and therefore is constantly being supported and molded by new research with the aim of increasing the adoption of these games as a supplemental tool for educational institutions and training programs for large groups like corporations or the military. My literature review will dive into the ever-growing body of research pertaining to serious games to find frameworks, methods, and design decisions that help to increase efficacy and usability while lowering costs of production, thus bringing this fledgling field of education into the modern educational zeitgeist.

My research question is as follow: “What are the reasons that companies and educational institutions are hesitant to implement serious games as an educational tool and what can game designers do to encourage the adoption of gamified education?”To this end, I have attempted to ascertain the reasons that serious games are not widely used in these fields yet and have been able to infer through my research that the reason is two-fold. The first of these reasons is the relative novelty of this toolset leading to lack of awareness by educators and professionals who would most benefit from their implementation. The second is that many of those who are aware of the toolset are not being shown their efficacy and usability. While none of my research has directly stated these reasons as the cause of slow adoption rates, it has become overwhelmingly clear by what the research seeks to change that these are the two main obstacles in attempting to get educational games into primary schools, universities, and training programs for large groups.

The next goal in my research process is to find sources that demonstrate what goals need to be accomplished for serious games to become a widely accepted educational tool. Much of my research has shown that the primary goal is to achieve demonstrable efficacy and usability. One of my sources chooses to focus on a proposed framework that will reduce production time and cost (Westera). These changes would help lead to wider adoption because serious games are a product that must be sold. It follows, therefore, that lower production costs lead to lower sales prices and increased implementation.

Another of my sources specifically focuses on increasing learning efficacy and usability across different demographics within a target audience. The authors provide a framework for analysis of a serious game through playtesting and annotating observations of user experience both during the design phase and after development has concluded (Moreno-Ger). By implementing this framework, developers can reduce the amount of time that would otherwise be necessary to re-design entire systems by fixing any issues as soon as they arise during the production process. Finally, I have found a source that shows the importance of influencing the perceptions of potential buyers of a serious game. In this case, the authors focus on a study involving a professional development course for teachers that aims to influence their perceptions, attitudes, and behavioral intentions regarding the use of serious games that resulted in every teacher involved indicating that they had a favorable view of the use of serious games as an educational tool in the classroom after the course (An).

The purpose of this literature review is to find the methods and principles of serious game design that are working and attempt to influence designers to implement these methods and frameworks into their design process. In doing so, they can reduce costs of production, increase efficacy of the learning experience and the usability across different demographics, and inherently spread awareness of this incredibly powerful educational toolset. I also intend to analyze what makes adoption rates increase much like the study about the teacher-focused personal development course (An). The target audience for my research is serious games designers, developers, and researchers.

**References (APA)**

Westera, W., Nadolski, R. J., Hummel, H. G. K., & Wopereis, I. G. J. H. (2008). Serious games

for higher education: a framework for reducing design complexity. Journal of Computer Assisted Learning, 24(5), 420–432. <https://doi.org/10.1111/j.1365-2729.2008.00279.x>

In this peer-reviewed article, the authors propose a framework to create serious games more effectively and affordably. It finds that the current literature on proposed frameworks does not do enough to reduce complexity of serious educational game design, and thusly results in an overwhelming range of options that must be coordinated between designer and educational professionals. This results in greater development time which increases the cost of development. To reduce this complexity, the paper proposes a series of concepts and limitations for their new framework which can limit the options for development yet have been proven to be effective methods of conveying educational material.

Because a game is essentially a series of states (visible/invisible, position, rotation, color, win/lose, score, etc.) that change based on player action, the designer can set a framework that will track these states and tightly control the complexity of the logic tree associated with them. These logic trees represent a series of decisions that mirror real world application and often each decision will lead to at least two new options for the player. The authors propose *widening*this "logic tree" instead of *lengthening*it. This means that the player's first decision may include four outcomes instead of two, which inherently reduces the overall complexity of the design process by reducing the associated "links" between each player action without removing essential outcomes from the experience. The author’s purpose is to reduce the level of complexity in serious games so that they can be designed more quickly and effectively, thereby reducing their production time and cost. This is directly relevant to my research as cost and development time are huge barriers that prevent widespread adoption of serious games by educational institutions and corporations.

Moreno-Ger, P., Torrente, J., Hsieh, Y. G., & Lester, W. T. (2012). Usability Testing for Serious

Games: Making Informed Design Decisions with User Data. *Advances in Human-Computer Interaction*, *2012*, 1–13. <https://doi.org/10.1155/2012/369637>

This peer-reviewed article discusses a framework for testing the efficacy and usability of a serious game with a focus on testing during the development process. By testing during development, designers can ensure that they do not have to go through expensive re-design processes towards the end or after the development cycle is complete. The authors’ purpose is to analyze their new framework and its efficacy in comparison to existing frameworks in an attempt to better streamline the analysis of serious games, their usability, and their efficacy.

The general approach to the testing methods being suggested here rely on analyzing a user’s play experience and logging “events,” defined here as any moment that a player has a visible reaction to an action within the game. These events are usually negative, helping designers find areas that need to be improved to increase usability for a wider userbase. To identify events, the researchers propose recording user playtesting and having at least two Prototype Session Evaluators review the footage and annotate any events they witness. While having multiple Prototype Session Evaluators is more expensive, it ensures that events that one person may not notice are still logged and analyzed. This can, again, prevent much more costly re-design cycles and helps to reduce cost of production and increase efficacy and usability for the target audience. This article relates to my research as it furthers the understanding of serious games analysis by proposing ways to test and document usability or efficacy design problems that can be re-worked during early stages of development. By fixing these errors early, the development team can cut costs, save time, and deliver a more effective product at launch. With more effective products, the perception of serious games in corporate and educational applications becomes more positive, leading to wider adoption.

Martin, S.M., Casey, J. R., & Kane, S. (2021). *Serious Games in Personalized Learning: New*

*Models for Design and Performance*. Taylor & Francis Group.

In this book, written by professors at George Mason University and members of the Virginia Serious Games institute, the authors investigate game-based teaching and learning at large. They analyze contemporary research, frameworks and models concerning development and analysis of serious games.

The authors have done a very deep dive into the analysis of not only the effectiveness of serious games, but also their ability to impact the acquisition of information and knowledge by its users. Two things that I have found that will greatly contribute to my research is the analysis of data-collection methods and the specific focus on how to provide a widespread adoption of game-based learning via demonstrating proven learning outcomes as opposed to selling the product by demonstrating simple questionnaires of users and the company’s track record of sales. While not necessarily pertinent to my research, I find it worth noting that I am currently taking courses with Dr. Martin and Professor Casey and happened to stumble onto this book during my research. I may consider asking to conduct an interview with one of these Professors soon.

An, Y. (2018). The effects of an online professional development course on teachers’

perceptions, attitudes, self-efficacy, and behavioral intentions regarding digital game-based learning. *Educational Technology Research and Development*, *66*(6), 1505–1527. <https://doi.org/10.1007/s11423-018-9620-z>

This peer-reviewed article is about a study concerning a professional development course on teacher’s perceptions, attitudes, and behavioral intentions regarding the implementation of serious games in their curriculum. The study asked teachers about their perceptions and attitude regarding serious games before and after the course, and this research is detailed in the paper. One interesting take away from this study is that, in the end, *every* teacher believed that serious games were a helpful tool for teaching students.

The purpose of this article was to demonstrate the importance of exposure in increasing the adoption of serious games by educators. This is an incredibly important piece of information for my research, as it shows that with more education and exposure, educators become interested in using serious games as a supplemental tool in their classrooms.