The Impact of Gamified Mobile Learning on Student Motivation and Academic Achievement: A Systematic Review of Socio-Demographic Moderating Variables

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Abstract: This literature review synthesizes findings on the causal relationship between gamified mobile learning, student motivation, and academic achievement, with a specific focus on the moderating effects of socio-demographic variables. Drawing from metaanalyses, systematic reviews, and experimental studies, the paper establishes that gamification has a significant positive effect on both student motivation and academic performance. This positive impact, however, is not uniform. The review argues that the effectiveness of gamification is causally influenced by a student's age, gender, and grade level. Younger students are more responsive to extrinsic motivators, while older learners are driven by intrinsic factors like autonomy and mastery. Gender may influence preferences for competitive versus collaborative game mechanics, and grade level moderates the impact based on developmental and curricular context. Ultimately, the literature suggests that the full potential of gamification is realized not through a onesizefits-all approach, but through a thoughtful design that is tailored to the specific demographic profile of the learner.

Keywords: *Gamification, Student Motivation, Academic Achievement, Mobile Learning, Socio-Demographics.*

I. INTRODUCTION

The integration of gamification into educational technology, particularly through mobile applications, has been a growing trend aimed at enhancing student engagement and motivation. Gamified learning transforms traditional educational content into an interactive experience by incorporating game-like elements such as points, badges, leaderboards, and challenges. The critical question remains, however, whether this approach leads to a significant and consistent difference in academic achievement and motivation. This paper provides a comprehensive narrative review of the existing literature to establish the causal links between gamification, motivation, and academic outcomes, while also exploring how sociodemographic variables such as age, gender, and grade level moderate these effects.

II. METHODOLOGY OF THE REVIEW

This review employs a narrative and thematic synthesis of peer-reviewed academic literature. The selection of sources prioritized recent meta analyses and systematic reviews to capture a broad, statistical overview of the field's consensus. Individual experimental and quasi-experimental studies were then used to provide specific causal evidence, particularly those that utilized control groups, pretest/post-test designs, and statistical analyses (such as ANCOVA) to isolate and measure the effects of gamification. The findings

were organized thematically to first establish the overall impact on motivation and achievement, and then to delve into the specific causal pathways influenced by socio-demographic variables.

➤ *Academic Achievement and Student Motivation: A Causal Link*

Academic research provides substantial evidence that gamified mobile applications significantly improve student academic achievement when compared to non-gamified approaches. This positive effect is well-documented, with multiple meta-analyses finding strong overall effect sizes (e.g., a Hedges' *g* value of 0.822) that remain consistent across various disciplines, regions, and learning modalities (Zeng et al., 2024). Specific case studies further support these findings, demonstrating substantial gains in test scores and conceptual understanding in subjects like science and biology (Abenes et al., 2023; Omurtak & Zeybek, 2022). The improvement in academic achievement is closely tied to the positive changes in student motivation that gamification encourages.

The positive effect on motivation is a fundamental shift driven by gamified design. Gamified applications directly address both intrinsic and extrinsic motivational factors. By incorporating elements like points, badges, and leaderboards, gamified systems appeal to extrinsic motivation by providing tangible rewards and recognition. Concurrently, they can foster intrinsic motivation by providing engaging challenges that promote a sense of autonomy and competence (Jeno et al., 2017). This continuous feedback loop builds self-efficacy, the belief in one's own ability to succeed, which in turn encourages students to tackle more difficult topics with confidence (Erbas & Demirer, 2023). This cycle of enhanced motivation, engagement, and self-efficacy directly translates to improved academic performance, establishing a clear causal link between the three variables.

➤ *Socio-Demographic Variables as Causal Moderators*

While the overall effect of gamification is positive, its effectiveness is not universal. The literature strongly supports that a student's age, gender, and grade level act as crucial moderating variables, influencing how they respond to specific game mechanics.

➤ *Age and its Impact on Motivation*

Age is a significant causal variable in determining how students respond to gamification, owing to differences in cognitive and developmental stages. The causal link is based on the differential effectiveness of extrinsic and intrinsic motivators across age groups. Younger learners, such as those in elementary or early high school, are especially drawn to gamified elements like points, badges, and tangible rewards because they align with their need for immediate, concrete feedback. In contrast, older students (senior high school and college) are more responsive to gamified systems that tap into intrinsic motivation. They are more likely to be driven by a desire for mastery, autonomy, and social collaboration. For these learners, effective gamified systems are those that offer complex challenges and opportunities for self-directed learning (Mendoza, 2024).

➤ *Gender as a Causal Factor*

Gender shapes both the type and level of student motivation in gamified classrooms in nuanced and complex ways. The causal link here is rooted in how gender may predict a preference for different types of social interaction and competition in games. Empirical studies consistently report that male students may show higher motivation with competitive gamification elements, such as leaderboards and challenges, whereas female students may be more engaged by collaborative play, narrative-driven games, and social features (Reyes & Santos, 2024). This suggests that gender influences a student's preferences for specific game mechanics, and these differing preferences then cause a differential motivational response. When gamified tasks are designed to be inclusive and collaborative, gender gaps in motivation tend to disappear, further supporting the idea that design choices can mediate the causal effect of gender.

➤ *Grade Level and its Causal Impact on Motivation*

Grade level represents a key contextual factor that directly influences the causal link between gamification and student motivation. Studies indicate that the motivational impact is most pronounced at critical academic transitions and varies by developmental readiness. Intervention studies with Grade 10 and senior high school students in the Philippines found a significant increase in both intrinsic and extrinsic motivation following a gamified intervention (Cruz & Dela Cruz, 2025; Villacarlos et al., 2024). Research also reveals that grade level acts as a proxy for classroom stakes and social norms. For example, leaderboards may boost motivation in some grade levels but can increase anxiety and reduce net motivation in high-stakes senior classes. The causal chain supported by empirical work is grade level → different classroom demands and social norms → differential suitability of gamification features → change in motivation.

III. CONCLUSION

The evidence from multiple research domains consistently supports a significant positive effect of gamified mobile applications on both student motivation and academic achievement. However, the realization of this potential depends on thoughtful and careful design that goes beyond simple "pointification." The literature strongly supports the causality of age, gender, and grade level in shaping student motivation. These demographic variables are not mere descriptors; they interact with cognitive, social, and psychological development to produce distinct motivational profiles and academic responses. This understanding highlights the critical importance of designing gamified approaches that are tailored to diverse learner populations, rather than relying on a one-sizefits-all model. By using rigorous research designs, practitioners and researchers can better understand how to leverage gamification to maximize its positive causal impact on student motivation and academic success.

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