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A Meta-Analysis: Gamification in Education

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ABSTRACT

Background: The lack of motivation and engagement of students has posed a prevailing challenge in education, including in higher education and K-12 education (Legault et al., 2006; Meens et al., 2018). Given that gamification has gained increased attention and interest among educators (Nah et al., 2014) and yet, the literature does not provide consistent findings, we will conduct a meta-analysis on gamification in education.

Objectives: We will use the meta-analysis approach to examine the use of gamification design elements in education in improving three types of student learning outcomes: motivation, engagement, and academic achievement. We will examine game design elements as independent variables, including quests, points, badges, leaderboard, level, avatar, progress bar/progress graph, feedback, storytelling, and collaboration (Nah et al. 2014; Treiblmaier et al. 2018). We will also examine moderating factors such as course subject, educational level, instruction type (instructor-led or not), application platform (e.g., classroom management, learning assessment tool), and time duration.

Methodology: We will conduct a literature search in major databases that include Business Source Premier, Education Full Text, ERIC, Scopus, IEEE, and PsycInfo. Only experimental quantitative studies will be included in the final meta-analysis. Regarding the data analysis, Hedges' g is chosen to measure the effect size (Borenstein et al, 2009). Considering the heterogeneity among the samples, we apply random effects model for data analysis using R and RStudio. In addition, p value will be used to estimate the presence or absence of heterogeneity and I^2 to calculate the degree of inconsistency of the analysis. Finally, we will use the funnel plot to detect any publication bias.

Expected contribution: This study will contribute to the HCI field in two key aspects. First, drawing on existing theoretical foundations that can be applied to gamification (e.g., Treiblmaier et al. 2018), this study will aim to develop a nomological network to explain the effects of using different design elements in education through a bottom-up approach where the nomological network will be grounded in data. Second, while the problem of small sample sizes emerges in a significant number of research studies, the meta-analysis will combine multiple independent studies by extracting their statistical data, which will increase the sample size and obtain a more precise effect estimation.

Conclusion: The findings from this meta-analysis research will help educators assess the suitability of using specific gamification design elements to support their teaching. It will also facilitate theory building through development of a nomological network for gamification in education.

Keywords

Gamification, game design elements, education, motivation, engagement, learning achievement.

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