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A Comparative Study of Self-Regulated Learning in Non-Gamified and Gamified Teaching Methods

ORIGINAL ARTICLE

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Abstract

This study compared the effect of gamified and non-gamified teaching methods on self-regulated learning among 90 Class IX students. The experimental group received gamified instruction in Mathematics for two months, while the control group received traditional instruction. At the completion of the treatment, both groups were assessed by administering Self-regulated Learning scale. Post-test analysis revealed that the gamified approach (mean score: 186.27) was more effective than the non-gamified approach (mean score: 149.87) in enhancing self-regulated learning. Additionally, the study found that gender did not influence the effectiveness of either approach.

Key Words

Gamification, Teaching Methods, Self-regulated Learning, 21st Century Learners.

Introduction

The 21st-century educational landscape is undergoing a significant shift due to rapid technological advancements and the AI revolution. This presents opportunities and challenges for educators catering to Generation Alpha, digital natives born between 2010 and 2025. There's a growing emphasis on creating engaging, interactive educational experiences tailored to post-modern learners.

In this context, self-regulation is emerging as a vital learning skill, enabling learners to direct their own learning process. Gamification has been identified as a potential strategy for enhancing students' self-regulation. Research suggests that gamification can be an effective tool for developing self-regulation skills, leading to improved educational outcomes. However, there's limited empirical research on gamified pedagogical approaches in the Indian context. This study aims to fill this knowledge gap by comparing the effectiveness of gamified and non-gamified instructional methods in promoting self-regulated learning.

Theoretical Background

Gamification

Deterding et al. (2011) defined gamification as "the use of game design elements in non-game contexts" to encourage desired behaviors. This approach uses game features like points, badges, and leaderboards to

boost motivation and engagement. In this study, Khan Academy, a gamified learning platform, was used to teach Class IX students mathematical concepts. The intervention included video lessons, interactive exercises, quizzes, and unit tests, allowing students to earn mastery points, badges, and rewards. The Personalized Learning Dashboard tracked progress, provided real-time feedback, and facilitated active engagement with learning materials. Students earned virtual rewards and badges upon completing math lessons or demonstrating mastery over specific concepts.

Role of Gamification in Fostering Self-regulated Learning

In today's fast-paced world, self-regulated learners excel by taking charge of their education, becoming more resilient and adaptable. Gamification boosts self-regulation by increasing motivation, providing a structured learning environment, enhancing engagement, and offering immediate feedback. According to Self-Determination Theory (SDT), gamification satisfies core psychological needs - competence, autonomy, and relatedness - making it a potent tool for boosting self-regulated learning outcomes.

Theoretical Foundation for Self-regulation in Gamification

Self-regulation of learning involves students actively managing their educational activities to achieve academic goals. According to Winne (2016), it involves goal setting, strategy employment, progress monitoring, and outcome reflection. Pintrich (2000) defines self-regulated learning as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features of their environment".

Social Cognitive Theory of Bandura

The Social Cognitive Theory (SCT) by Albert Bandura emphasizes self-regulatory mechanisms like self-observation and self-evaluation in learning. Key components include self-efficacy, self-regulation, observational learning, and reinforcement, which facilitate learning and behavior change through the interplay of personal, behavioral, and environmental factors.

Review of Related Literature

Recent studies explored gamification's impact on self-regulated learning (SRL). Alhalafawy & Zaki (2022) found Digital Platform-Based Gamification (DPBG) significantly enhanced SRL skills among tenth-grade students. Capuno (2023) showed Quizizz, a gamified formative assessment tool, positively impacted test scores via improved SRL. Chang et al. (2023) found Kahoot enhanced self-regulation in learning. Najmi (2023) discovered gamification-based flipped classrooms significantly enhanced SRL skills and educational resilience. Zhao et al. (2023) revealed a self-regulated gamified VR learning system improved performance, engagement, and self-regulation. Opri' et al. (2024) found gamification boosted motivation but decreased some self-regulated processes.

While studies suggest gamified instructional approaches develop SRL skills, there's a scarcity of empirical research systematically evaluating gamification's impact on self-regulation, especially in India. This study aims to investigate the potential benefits of gamified teaching methods in promoting SRL skills compared to non-gamified approaches.

Rationale of the Study

The 21st-century learning landscape requires individualized and self-directed learning experiences. Understanding self-regulation's impact on learning is crucial for tailored educational experiences. While gamified pedagogical approaches show potential, empirical research supporting their effectiveness in promoting self-regulated learning is limited, especially in Indian educational settings. This study aimed to bridge this knowledge gap by exploring the effect of gamified and non-gamified teaching methods on self-regulated learning, providing insights into designing effective pedagogical strategies.

Statement of Problem

A Comparative Study of Self-Regulated Learning in Non-Gamified and Gamified Teaching Methods.

Research Questions

1. Does gamified teaching method lead to improved Self-regulated learning compared to non-gamified teaching method?
2. Do demographic characteristics, specifically gender moderate the relationship between non-gamified teaching method and Self-regulated Learning?
3. Do demographic characteristics, specifically gender moderate the relationship between gamified teaching method and Self-regulated Learning?

Objectives

1. To examine the difference in Self-regulated learning between non-gamified and gamified teaching methods.
2. To explore whether Self-regulated learning varies over demographic groups – gender in response to non-gamified approach.
3. To examine whether Self-regulated learning varies over demographic groups – gender in response to gamified approach.

Hypotheses

H_{01}: There is no significant difference between the mean of Self-regulated learning scores of non-gamified and gamified teaching methods.

H_{02}: There is no significant difference between the mean of Self-regulated learning scores of female and male students taught through non-gamified teaching method.

H_{03}: There is no significant difference between the mean of Self-regulated learning scores of female and male students taught through gamified teaching method.

Operational Definition of Key Terms

To ensure clarity and precision, the investigators provided operational definitions of key terms used in the study as follows:

Gamified Teaching Method

Gamified Teaching Method (GTM) is defined as the systematic integration of gamification elements – namely, point systems, multiple attempt options, personalized suggestions, virtual rewards, and immediate feedback – into instructional methods for teaching mathematical concepts aligned with the NCERT Curriculum for Class IX. In this study, the investigators employed the Khan Academy gamified platform as the primary tool for implementing GTM during the experimental phase.

Non-Gamified Teaching Method

The Non-Gamified Teaching Method (NGTM) refers to traditional instructional methods used for teaching mathematics, characterized by chalk-and-talk methodology, textbook-based learning, and teacher-led discussions. This approach emphasizes structured content delivery and direct knowledge transfer, without the incorporation of gamification features.

Self-Regulated Learning

As per Gupta and Mehtani (2017), this study defines Self-Regulated Learning as a multidimensional construct encompassing six key dimensions: self-awareness, planning and goal-setting, self-monitoring, self-control, self-evaluation, and self-modification.

Methodology

Population and Sampling

This study focused on 4000 secondary school students across 12 CBSE-affiliated schools in Raigarh, India. A two-stage sampling strategy was used: St. Teresa's Convent School was purposively selected, and then 2 intact classes of 45 students each (Class IX, aged 14-16) were randomly assigned to experimental or control groups, totaling 90 participants.

Rationale for Sampling Strategy and Sample size

A single school was purposively selected for a 2-month gamified intervention with Class IX students. Two intact classes (45 students each, total n=90) were randomly chosen. In Social Science research, experimental investigations frequently involve the selection of intact groups from naturalistic settings, given that random allocation of participants to treatment conditions may not be practicable (Sansanwal, 2020). Despite being relatively small, the sample size is considered adequate for experimental research objectives (Cohen et al., 2007).

Variables

This paper investigated the association between pedagogical approaches and Self-regulated learning, taking into account the demographic variable of gender. The variables utilized in this investigation were:

Independent Variable: Pedagogical approach, which comprised two levels: Gamified Teaching Method and Non-Gamified Teaching Method.

Dependent Variable: Self-Regulated Learning, a multidimensional construct comprises of six dimensions: self-awareness, planning and goal-setting, self-monitoring, self-control, self-evaluation and self-modification (Gupta & Mehtani, 2017).

Demographic Variable: Gender, classified into two categories: Male and Female.

Research Design

The research utilized a quasi-experimental design incorporating a posttest-only control group design. The experimental group underwent a gamified instructional intervention, whereas the control group received conventional instruction. A comparison was conducted at a singular post-intervention evaluation point, facilitating a direct assessment of the intervention's impact while reducing potential biases and confounding variables.

Tools

The Self-Regulated Learning Scale (SRLS-GMMD), developed by Gupta and Mehtani (2017), was used to measure Self-Regulated Learning. The scale demonstrated high reliability (á = .982) and validity. This self-report measure utilized a five-point Likert Scale, comprising 48 items distributed across six dimensions: self-awareness, planning and goal-setting, self-monitoring, self-control, self-evaluation and self-modification. Respondents rated their agreement with each statement on a five-point continuum: Strongly Disagree, Disagree, Undecided, Agree or Strongly Agree. This scale provided a comprehensive understanding of Self-regulated Learning.

Experimental Intervention

The experimental group (n = 45) underwent a two-month gamified pedagogical intervention in Mathematics utilizing Khan Academy, a web-based and mobile platform. Khan Academy enabled self-paced learning through video lessons, practice exercises, and quizzes, incorporating gamification elements such as rewards, badges, points, immediate feedback, and progress tracking. This interactive approach motivated students to persist in practicing and refining their skills, concurrently enhancing their overall learning experience. Conversely, the control group (n = 45) received traditional instruction on identical subject matter and topics for the same duration. Following the two-month intervention, both groups were assessed to evaluate Self-regulated learning using the Self-regulated Learning Scale, and resultant data were gathered for subsequent analysis.

Procedure of Data Collection

The researchers chose a co-educational CBSE school in Raigarh city, secured requisite permissions, and assured the authority that all ethical considerations would be addressed during the two-month experimental investigation and data collection. Two intact classes were randomly chosen and allocated to either the Control Group or the Experimental Group. The Experimental Group received a gamified intervention utilizing Khan Academy, wherein mathematical concepts aligned with the Class IX NCERT curriculum were taught. In contrast, the Control Group received conventional instruction on the same mathematical concepts employing the chalk-and-talk method and textbook-based learning. Subsequent to the two-month intervention, both groups underwent a posttest utilizing the Self-regulated Learning Scale (SRLS-GMMD). The post-test scores were compiled and analyzed using IBM SPSS Statistics 21.

Results and Discussion

Comparison of mean of Self-regulated learning scores of non-gamified and gamified teaching methods.

In the first objective, the mean of Self-regulated learning scores of non-gamified and gamified teaching methods were compared. There were two levels of teaching method, namely, non-gamified and gamified. A t-test was employed to statistically analyze the data, and Table 1 presents the findings.

Table 1: Teaching Method -wise N, Mean, SD, and t-values of Self-regulated learning

Category	Teaching Method	N	Mean	SD	Df	t-value	Remark
Control Group	Non-gamified Approach	45	149.87	39.59	88	5.58	$p < 0.01$
Experimental Group	Gamified Approach	45	186.27	18.70			

Table 1 makes it clear that the resulting t-value is 5.58, which, with df = 88, is statistically significant at the $p < 0.01$ level. Self-regulated learning of gamified and non-gamified teaching methods has considerably different mean scores, as demonstrated by this. Therefore, the null hypothesis stating that there is no significant difference in the mean scores of Self-Regulated Learning between gamified and non-gamified teaching methods is rejected. Additionally, the average score for Self-regulated learning of the gamified teaching method is 186.27, which is substantially higher than the average for the non-gamified teaching methods, which is 149.87. Therefore, compared to the non-gamified pedagogical approach, the gamified pedagogical approach is more successful at guaranteeing the Self-regulated learning.

Comparison of mean of Self-regulated learning scores of female and male students taught through non-gamified teaching method

In the second objective, the average Self-Regulated Learning scores of female versus male students taught through gamified pedagogical approach were compared. There were two levels of gender, namely, female and male. The data underwent t-test analysis to determine statistically significant differences, and Table 2 presents the findings.

Table 2: Gender-wise N, Mean, SD, and t-values of Self-regulated learning of Non-Gamified Teaching Method

Gender	N	Mean	SD	Df	t-value	Remark
Female	24	146.62	41.25	43	0.583	Not significant
Male	21	153.57	38.27			

Table 2 shows that the calculated t-value of 0.583 is not statistically significant. Thus, female and male students taught using a non-gamified pedagogical technique showed no significant difference in their mean Self-Regulated Learning scores. Therefore, the null hypothesis stating no significant difference in mean Self-Regulated Learning scores between female and male students taught using a non-gamified method is not

disproved. Thus, female and male students taught using a non-gamified method exhibited similar levels of Self-Regulated Learning.

Comparison of mean of Self-regulated learning scores of female and male students taught through Gamified teaching method.

In the third objective, the average of Self-regulated learning scores of female and male students taught through Gamified teaching method were compared. There were two levels of gender, namely, female and male. A t-test was employed to statistically analyze the data, and Table 3 presents the findings.

Table 3: Gender-wise N, Mean, SD, and t-values of Self-regulated learning of Gamified Teaching Method

Gender	N	Mean	SD	Df	t-value	Remark
Female	23	185.00	18.66	43	0.461	Not significant
Male	22	187.59	19.07			

Table 3 shows that the calculated t-value of 0.461 is not statistically significant. It indicates that female and male students taught using a Gamified pedagogical approach had similar mean Self-Regulated Learning scores. Therefore, it is not necessary to reject the null hypothesis, which states that there is no discernible difference between the mean Self-Regulated Learning scores of female and male pupils taught using a Gamified teaching method. Therefore, it can be claimed that both female and male students who were taught using a Gamified pedagogical technique exhibit same level of Self-regulated learning.

Conclusion

The study's findings derived from the statistical analysis of posttest data, revealed that gamified pedagogical methods substantially enhance Self-regulated learning in comparison to non-gamified pedagogical methods, with a mean score of 186.27 versus 149.87. The outcomes emphasize the influence of gamification in transforming learning experiences by fostering self-regulated learning. This outcome is consonant with extant research emphasizing gamification's potential to render learning experiences more personalized and self-directed. Significantly, the study also ascertained that Self-regulated learning was not moderated by gender, with both male and female learners exhibiting comparable responses to gamified and non-gamified approaches.

The study's outcomes possess substantial educational implications, underscoring the significance of pedagogical innovation, educator training, and policy restructuring. Given the digital nativeness of contemporary students, gamified educational experiences can serve as a potent instructional tool for the 21st century, augmenting reasoning capabilities, digital literacy, and adaptability skills. By harnessing gamification, educators can more effectively engage and motivate students, thereby preparing them for the modern workforce. This investigation adds to the growing body of research substantiating the benefits of technology-enhanced learning and gamification in education, furnishing valuable perspectives for educators and policymakers.

Limitations and Future Research

Despite the fact that the current experimental research supported the beneficial effects of gamified teaching methods in improving Self-regulated learning, there are certain limitations which need to be dealt with in future research. The study's intervention period lasted only two months, which is not long enough to evaluate the impact. Both, the method's novelty and its brief use may have contributed to the favourable outcome. The researchers can evaluate the treatment's effects in all respects if the duration is extended. The present study solely took into account the intervention's posttest results and used a posttest only control group design. The use of a pretest-posttest control group design, extended duration, and evaluation of pretest scores could all be advantageous for future studies. To broaden the applicability of these results, further studies could explore the effectiveness of gamified pedagogical tools in promoting Self-regulated learning across diverse educational contexts, subjects, and age groups.

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