

Integrating Low-Tech Gamification in MATATAG TLE 8: A Systematic Review of its Impact on 21st-Century Skills in Resource-Constrained Contexts

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Abstract: This systematic review examines the role of gamification, particularly low-tech approaches, in enhancing 21st-century skills within the context of Technology and Livelihood Education (TLE) under the Philippine MATATAG Curriculum. The review aims to synthesize existing literature on how gamified strategies influence critical thinking, creativity, collaboration, communication, and ICT literacy in secondary education, especially in resource-constrained environments such as Geographically Isolated and Disadvantaged Areas (GIDA). Drawing from peer-reviewed studies, meta-analyses, and policy documents published between 2010 and 2024, the review identifies consistent evidence that gamification significantly improves learner motivation, engagement, and cognitive outcomes. While most studies focus on digital gamification platforms, emerging findings reveal that low-tech approaches—such as physical badges, quest boards, and point systems—can achieve comparable results when properly designed. However, there remains a lack of empirical research addressing low-tech gamification within TLE, particularly under the MATATAG curriculum and the newly adopted trimestral system. This review highlights these gaps and emphasizes the need for context-sensitive and scalable strategies to ensure equitable access to innovative pedagogy in underserved educational settings.

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I. INTRODUCTION

Education systems across the globe are undergoing a significant transformation toward competency-based learning frameworks aimed at preparing learners for the demands of the 21st century. Skills such as critical thinking, creativity, collaboration, communication, and digital literacy are increasingly recognized as essential competencies for success in both academic and professional contexts. In the Philippines, this shift is institutionalized through the MATATAG Curriculum, which prioritizes the integration of these skills across all subject areas, including Technology and Livelihood Education (TLE). Despite this policy direction, evidence indicates that Filipino learners continue to perform below international benchmarks in areas such as problem-solving and creative thinking, suggesting persistent gaps in implementation and instructional practice.

The challenge is more pronounced in Geographically Isolated and Disadvantaged Areas (GIDA), where limited access to technological infrastructure and educational resources constrains effective teaching and learning. Although reforms such as the adoption of the trimestral system aim to improve instructional delivery, traditional teacher-centered approaches remain prevalent, often resulting in low student engagement and underdeveloped skills. Against this backdrop, gamification has emerged as a promising pedagogical strategy capable of transforming

classroom experiences into interactive and learner-centered environments.

This review focuses specifically on the application of gamification in secondary education, with emphasis on its impact on 21st-century skills development, its relevance to TLE and other skill-based subjects, and its applicability in low-resource contexts. It excludes purely entertainment-based gaming and technologically intensive systems that are impractical in rural settings. The central objective of this review is to determine whether low-tech gamification can effectively support the development of 21st-century skills in TLE within resource-constrained educational environments under the MATATAG curriculum.

II. METHODOLOGY

This study adopts a systematic review approach to examine relevant literature on gamification and 21st-century skills. Sources were drawn from peer-reviewed journals, international and local research studies, and official government and Department of Education policy documents. Databases commonly associated with educational research, including journal repositories and indexed publications, were consulted using targeted keywords such as “gamification in education,” “low-tech gamification,” “21st century skills,” “TLE gamification Philippines,” and “GIDA education strategies.”

The inclusion criteria required that studies be published between 2010 and 2024, be empirical or systematic in nature, and focus on secondary or vocational education contexts. Studies that were purely theoretical or unrelated to skill development were excluded. The selection process involved screening studies based on relevance to the topic, applicability to resource-constrained contexts, and methodological rigor. Greater emphasis was placed on meta-analyses and experimental studies that provided measurable evidence of learning outcomes. Through this process, only studies that demonstrated credible and contextually relevant findings were included in the final synthesis.

III. MAIN BODY

Gamification has been widely recognized as an effective pedagogical strategy that enhances learner engagement by incorporating game design elements such as points, badges, leaderboards, and quests into non-game contexts. These elements create interactive learning environments that motivate students to actively participate in learning activities. Grounded in Self-Determination Theory, gamification satisfies learners' psychological needs for autonomy, competence, and relatedness, thereby fostering intrinsic motivation. Empirical evidence, including meta-analyses, consistently demonstrates that gamified learning environments significantly improve both academic performance and learner engagement.

Beyond motivation, gamification also plays a crucial role in the development of 21st-century skills. Gamified learning environments encourage critical thinking through problem-solving challenges, creativity through open-ended tasks, collaboration through team-based activities, and communication through presentations and peer interactions. ICT literacy is likewise enhanced through the integration of digital or hybrid tools in gamified tasks. However, while existing studies highlight increased engagement and participation, many focus primarily on behavioral outcomes rather than the comprehensive measurement of skill mastery, indicating a need for more robust assessment frameworks.

A significant distinction in the literature lies between digital and low-tech gamification. Digital platforms such as Quizizz and Kahoot have been widely adopted due to their accessibility and interactive features, yet their effectiveness is often limited in resource-constrained settings. In GIDA schools, challenges such as limited device availability, unstable internet connectivity, and insufficient ICT infrastructure hinder the implementation of digital gamification. In contrast, low-tech gamification employs simple, cost-effective tools such as physical badges, printed quest cards, and classroom-based leaderboards. Emerging studies suggest that these approaches can achieve similar levels of engagement and motivation, particularly when feedback is immediate and visible to learners.

In the context of TLE and other skill-based subjects, gamification is particularly effective due to its alignment with experiential and hands-on learning processes. TLE requires learners to apply practical skills in real-world contexts,

making it well-suited for gamified approaches that structure learning as quests or challenges. Evidence from intervention studies indicates that gamification improves technical skill application, problem-solving abilities, and overall learner engagement. Notably, an eight-week gamified program demonstrated significant improvements in ICT literacy and academic performance among technical-vocational learners, reinforcing the value of sustained gamified interventions.

Despite these promising findings, the literature reveals several critical gaps. Most existing studies focus on digital gamification, with limited attention to low-tech approaches suitable for GIDA schools. There is also a scarcity of research specifically addressing gamification in TLE under the MATATAG curriculum. Furthermore, few studies comprehensively measure all components of 21st-century skills, particularly the integration of ICT literacy alongside the 4Cs. The recent implementation of the trimestral system further complicates the landscape, as little research has explored how gamification can be adapted to this new instructional structure.

IV. CONCLUSION AND RECOMMENDATIONS

The literature consistently demonstrates that gamification is an effective strategy for enhancing learner engagement, motivation, and academic outcomes. It supports the development of 21st-century skills and provides a dynamic alternative to traditional teaching methods. Importantly, low-tech gamification offers a viable and inclusive solution for resource-constrained environments, enabling schools with limited technological resources to implement innovative pedagogies aligned with the MATATAG curriculum.

The significance of this review lies in its synthesis of evidence advocating for low-tech gamification as a scalable and context-sensitive approach to education reform, particularly in underserved areas. By bridging the gap between theory and practice, this review contributes to the growing body of knowledge on inclusive and equitable teaching strategies.

Future research should focus on conducting empirical studies that examine the effectiveness of low-tech gamification in TLE, particularly within GIDA contexts. Longitudinal studies are needed to assess the sustainability and long-term impact of gamified learning on skill development. Comparative research between digital and low-tech approaches could provide deeper insights into their relative effectiveness. Additionally, the development of standardized tools for measuring 21st-century skills would enhance the validity and reliability of future studies. Finally, further exploration of gamification within the trimestral system is necessary to ensure alignment with current educational reforms.

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