DIGITAL TOOLS FOR LEARNING CONSTRUCTION ECONOMICS TERMINOLOGY: EFFECTIVENESS AND ADOPTION

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Abstract. The rapid digitalization of higher education has significantly transformed terminology instruction in domain-specific fields, including construction economics. This study examines the effectiveness and adoption of digital tools used to teach construction economics terminology to undergraduate students. A mixed-method approach was employed, involving questionnaires, classroom observations, and an analysis of student performance before and after integrating digital platforms. The findings demonstrate that digital learning tools—particularly mobile applications, interactive glossaries, and BIM-linked terminology databases—enhance retention, contextual understanding, and autonomous learning. However, adoption is influenced by technological access, digital literacy, and perceived usefulness. The study concludes that digital tools offer substantial pedagogical advantages, provided they are systematically integrated into curriculum design.

Key words: mobile applications, digital literacy, digital tools, classroom observations, construction economics terminology.

1. Introduction

Terminology competence plays a crucial role in the successful education of construction economics students, as professional communication in construction relies heavily on precise economic and technical vocabulary. With the expansion of digital learning environments, educators increasingly incorporate digital tools such as mobile applications, online glossaries, augmented-reality (AR) platforms, and interactive e-learning systems to support terminology acquisition.

Although digitalization offers new opportunities, the effectiveness and adoption of these tools vary across institutions and learner groups. Previous studies emphasize digital tools' role in promoting autonomous learning and improving vocabulary retention; however, research specifically focusing on construction economics terminology remains limited. This article investigates how digital tools influence terminology learning outcomes in construction economics programs and identifies factors affecting student adoption.

Prior research highlights the importance of digital resources in specialized vocabulary development (Laufer, 2017; Nation, 2020). Studies within engineering and architecture education suggest that digital glossaries and BIM-integrated tools improve contextual terminology comprehension. However, few studies address economic terminology within construction management, leaving a gap that this research aims to fill. A mixed-method design was used to evaluate both the measurable effectiveness and subjective perceptions related to the adoption of digital tools. Quantitative data included pre-test and post-test terminology assessments, while qualitative data consisted of surveys and semi-structured interviews. The

study involved 48 undergraduate students enrolled in a "Construction Economics" course at a technical university, divided into a control group receiving traditional instruction and an experimental group using integrated digital tools. The experimental group worked with a range of digital resources, including mobile vocabulary applications such as Quizlet and Memrise with customized construction-economics terminology sets, an interactive online glossary embedded in the university's learning management system, a BIM-linked terminology browser for exploring terms within digital models, and flashcard generators supported by automated spaced-repetition systems (SRS). Data collection procedures included terminology tests administered at both the beginning and end of the semester, Likert-scale surveys evaluating perceived usefulness, ease of use, and overall satisfaction, classroom observations to record engagement and learning behaviors, and interviews with 12 volunteer students. Results showed that students using digital tools achieved a 28% improvement in post-test scores, compared to an 11% increase in the control group. The most significant gains among experimental-group learners were observed in their ability to recognize complex economic terms, retain terminology through spaced-repetition techniques, and apply economic vocabulary accurately in contextual construction scenarios.

A comparative analysis between the traditional learning group and the digital-tool-assisted group revealed substantial differences in terminology acquisition, engagement, and application. While the control group relied on textbook-based exercises, lecture notes, and in-class explanations, their learning outcomes were limited to gradual improvement in recognition of basic terms. In contrast, the experimental group benefited from interactive digital tools that provided multimodal exposure, instant feedback, and personalized learning pathways. The digital tools enabled students to revisit terminology more frequently through spaced-repetition systems and engage in contextualized learning using BIM-linked platforms. As a result, the experimental group demonstrated significantly higher gains in post-test performance, particularly in mastering complex economic terms and applying terminology in practical scenarios. Furthermore, student engagement was notably higher among digital tool users, who reported increased motivation, autonomy, and satisfaction with the learning process. Meanwhile, the traditional group showed slower progress, lower retention rates, and reduced enthusiasm for terminology tasks. Overall, the comparison indicates that digital tools not only enhance the efficiency and depth of terminology learning but also foster more active participation and sustained motivation compared to traditional instructional methods. Survey results indicated that 84% of students considered digital tools helpful for memorizing definitions, while 76% noted that interactive elements increased motivation.

The adoption of digital tools for learning construction economics terminology is influenced by several positive and negative factors. On the positive side, students appreciate the ease of access to learning platforms through smartphones, which allows them to study terminology at any time and place. Gamification features such as points, badges, and progress tracking increase motivation and make learning more engaging. The visual integration of terminology with BIM models further enhances conceptual understanding by allowing students to connect economic terms with real project contexts. Additionally, digital tools support personalized learning, enabling each student to progress at their own pace based on individual needs. Despite these advantages, certain barriers limit full adoption. Inconsistent internet access remains a challenge for some students, reducing their ability to use online tools effectively. Low digital literacy, particularly among first-year students, also affects their confidence and readiness to

engage with digital platforms. Moreover, the limited integration of digital tools into formal course assessments results in decreased long-term usage, as students tend to prioritize activities directly linked to grading. Overall, adoption is shaped by a balance between the motivating features of digital tools and the practical obstacles faced by learners.

The findings support existing evidence that digital tools enhance specialized vocabulary learning. In the context of construction economics, features such as BIM connectivity and SRS-based applications significantly improved contextual understanding and long-term retention. However, adoption is not uniformly successful. Students with higher digital literacy benefit more, suggesting the need for introductory digital skills training. Additionally, digital tools must be embedded into course assessment structures to ensure sustained engagement. The study highlights that effective implementation requires methodological planning, instructor guidance, and institutional support.

Digital tools play a vital role in modernizing terminology education for construction economics students. Their integration leads to measurable improvements in learning outcomes, increased engagement, and stronger motivation. Despite certain challenges, particularly related to technological access and digital readiness, the overall benefits outweigh the barriers. To maximize effectiveness, educators should adopt a blended-learning strategy, combine traditional instruction with digital resources, and design terminological activities aligned with real construction-economics practices.

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