COGNITIVE SCIENCES AND HUMAN DEVELOPMENT

Comparing the Impact of Asynchronous Online Quizzes on Student Learning Outcomes in a Computer Communication and Networking Course

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ABSTRACT

This study investigates the effectiveness of asynchronous online quizzes in improving student learning outcomes in higher education. Specifically, we compare the impact of two teaching methods - Synchronous Lecture and Asynchronous Tutorial pair (SLAT) versus Asynchronous Lecture and Synchronous Tutorial pair (ALST) - in delivering weekly quizzes to 70 undergraduate computer science students. Our results show that the SLAT outperformed the ALST method in enhancing students' academic performance after each learning unit. The findings highlight the potential of asynchronous quizzes as a valuable learning tool, particularly when combined with live lecture classes and asynchronous tutorials. These results have implications for educators looking to implement blended learning models that prioritize student engagement and academic achievement.

Keywords: undergraduate studies, synchronous learning, asynchronous learning, quiz, self-directed learning

1   INTRODUCTION

Encouraging meaningful interaction among learners in fully online courses is a complex and multifaceted issue that has been extensively investigated in tertiary education. One of the fundamental dimensions of online learning environments is the timing and location of learning activities, which can be broadly classified into two categories: synchronous and asynchronous. Asynchronous settings are characterized by higher learner autonomy and reduced dependence on instructor guidance. Consequently, such settings require more self-directed learning, motivation, and digital literacy skills to navigate the course content and achieve learning goals effectively. On the other hand, Synchronous online learning provides a more "live" learning experience, enabling real-time social interaction and feedback among learners and instructors. The benefits of synchronous online learning, including increased engagement and motivation, have been documented by several scholars. Nonetheless, this modality also presents significant challenges, such as the need for robust technical infrastructure to ensure a seamless learning experience. These issues have been explored in prior research (Bullock et al., 2008; Bernard et al., 2004; Xie et al., 2018; Harnett, 2015; Kim et al., 2019; Blau et al., 2017; Hrastinski, 2008) and must be carefully considered in designing effective online learning environments that foster optimal learning outcomes.

Research outcomes regarding the influence of synchronous and asynchronous methods on student performance are not without a doubt. Based on the study conducted by Nieuwoudt (2020), the results showed that there is not much difference in the students' accomplishments whether they attended synchronous online classes or watched the previously recorded video of the lecture classes. However, the amount of time the students contributed to online learning activities greatly affected their academic growth. Both synchronous and asynchronous online learning settings whereby the students participate actively have led to better engagement and higher academic success. According to King (2004), in a study of student perception of online learning, videos and screencasts can increase the instructors' visibility and ability to communicate the course content effectively.

Similarly, engagement with the students required relevance between the materials, tasks, and activities, including the available technological tools such as video (Bailey et al., 2014). Thus, to facilitate communication in these two educational settings, synchronous and asynchronous, researchers felt that there is a need to distinguish between several types of activities and interactions on how students can be engaged in their learning (Nieuwoudt, 2020; Rapanta et al., 2020; Zhu, 2006). Most studies propose that using students' online discussion forums is a valuable learning exposure in various disciplines (Jin, 2005). Other techniques, such as quizzes, can improve understanding of the assigned course materials (Narloch et al., 2006). It is known that quizzes have become one of the popular online learning tools on the online platform eLeap. Using quizzes can help the students be more focused than before, and it could identify gaps in their knowledge, build self-confidence and help them retain knowledge.

However, there is an argument about how quizzes influence student academic performance. Grimstad and Grabe (2004) observed that students who completed learning unit quizzes significantly improved their academic performances. Brothen and Wambach (2001) mentioned