ANALYSING THE IMPACT OF STUDENT ENGAGEMENT ON LEARNING OUTCOMES IN E-LEARNING PLATFORMS: A SYSTEMATIC REVIEW OF LITERATURE

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Abstract

This paper explores the impact of student engagement on learning outcomes in E-learning platforms. It seeks to provide practical insights for educators and institutions as they navigate the digital education landscape. This systematic literature review adhered to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, utilising its methodology to identify and select the most relevant literature, resulting in the inclusion of 54 papers for review. Also, this analysis identified a notable gap in research related to the relationship between student engagement and learning outcomes in Sri Lanka. Prior studies, mostly conducted in European countries, might not be directly applicable to the Sri Lankan context due to differing infrastructure and unique student behaviours and learning expectations. The distinctiveness in Sri Lanka's infrastructure and students' learning attitudes makes the direct application of these findings from European studies challenging. Additionally, none of the existing studies in this area have utilised the Community of Inquiry (CoI) framework, which is a valuable tool for assessing student engagement in E-learning platforms. Also, as found in the literature, Information Technology (IT) students tend to possess higher technical expertise compared to students from other disciplines. Therefore, when conducting research in the context of Information Technology students, it is not a critical influencing factor to consider. This systematic review aims to bring together the existing literature and identify research gaps for context-specific investigations. By addressing these gaps and incorporating a Sri Lankan perspective, future researchers can further explore this context to make decisions in the field of digital education and contribute to the improvement of E-learning experiences in Sri Lanka.

Keywords: E-learning platforms, learning outcomes, student engagement

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Introduction

E-learning is defined as using information and communication technologies (ICTs) to revise and reshape educational practices, providing learners with digital platforms and resources to engage in remote and interactive learning experiences (Kigozi Kahiigi et al., n.d.) Over the past decade, the concept of e-learning has emerged as a transformative force in the field of education. Also, the COVID-19 pandemic has accelerated the development and adoption of e-learning platforms worldwide (Enache, 2021), including in Sri Lanka. This acceleration was significantly contributed by the closure of schools and higher education institutes in many countries, due to the pandemic. As a result, the availability of e-learning platforms and tools was greatly expanded to continue education. Numerous platforms, both locally developed and internationally recognised, have emerged and offered a wide range of educational content and interactive features. These platforms provide students with access to virtual classrooms, multimedia resources, and collaborative learning environments. According to a report by Research and Markets Group, the global e-learning market size is estimated to reach $374.3 billion by 2026 (Bataev, 2017). This indicates the increasing importance and adoption of e-learning in the future and proves the relevance and timeliness of studying e-learning platforms. Valuable insights can also be provided for students within this evolving educational landscape.

Student engagement is concerned with the interaction between the time, effort, and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and their performance (Trowler, 2010). When students are actively engaged in their learning, they are more likely to have acquired knowledge, developed critical skills, and achieved positive learning outcomes. Also, learner engagement is critical for learning outcomes in a non-formal online learning environment. (Wang et al., 2022)

Learning outcome is defined as the measure of the effectiveness of a learning platform (Zhang et al., 2017). In the context of e-learning platforms, it refers to the knowledge, skills, attitudes, and competencies that are gained by students as a result of their participation in online courses or programs. The impact of student engagement on learning outcomes in e-learning platforms can be examined through various lenses. Researchers often investigate how different elements of e-learning, such as interactive multimedia resources, collaborative activities, discussion forums, and virtual simulations, are promoted by student engagement and how they influence their academic achievements. They also explore how instructors' pedagogical strategies, feedback mechanisms, and the design of learning environments impact student engagement and subsequently affect learning outcomes.

Methodology

The primary objective of this study is to identify and evaluate the existing literature on the influence of student engagement on learning outcomes in e-learning platforms. Figure 1 shows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, which was employed to guide this analysis. Relevant papers were obtained from Google Scholar, JSTOR, Taylor and Francis Online, and Emerald Group Publications. The initial dataset consisted of 18,410 records. However, after careful consideration, 1,023 records were excluded due to their reliance on methods other than surveys or questionnaires for data collection. Also, an additional 500 records were eliminated due to the absence of quantitative or mixed research methodologies. After that, to maintain a manageable record quantity, the analysis was restricted to the first twenty pages of Google Scholar search results.

Figure 1. *PRISMA Flow Diagram*
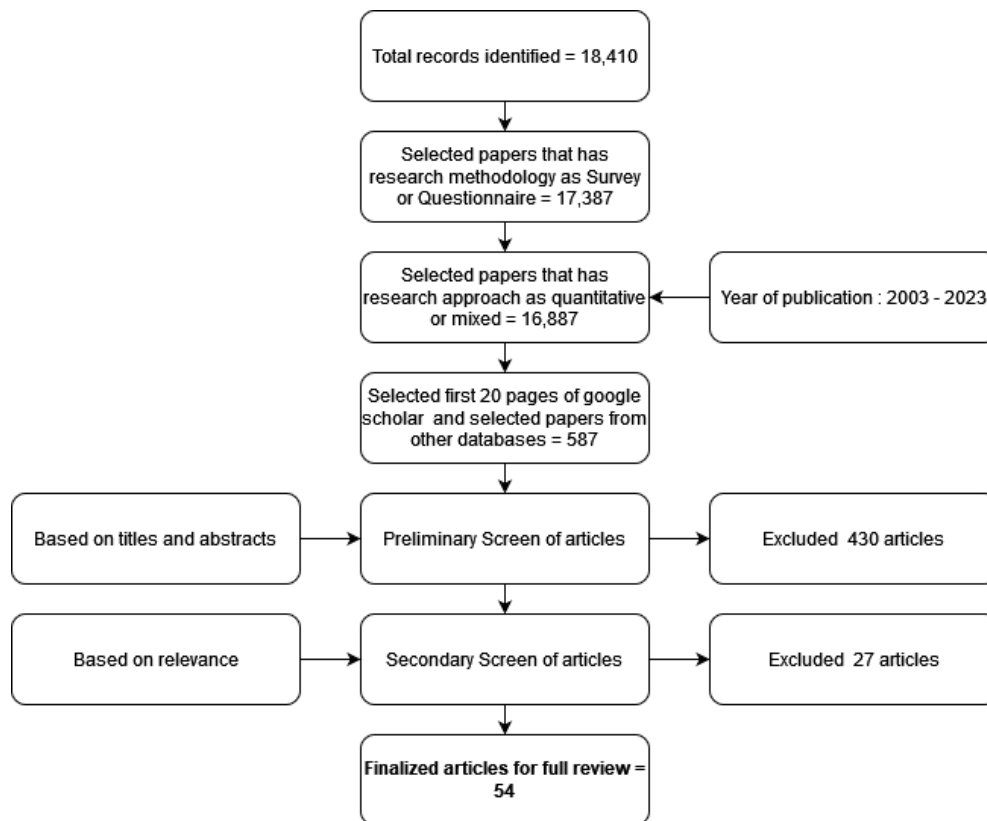
Papers that are focused on e-learning courses, e-learning platforms, student engagement in e-learning, student engagement in massive open online courses (MOOCs), student learning outcomes in e-learning, the connection between student engagement and learning outcomes, teaching and learning in online environments, and learning outcomes or performance of e-learning were included. Papers were excluded if they were not relevant to the research area, full papers were unavailable, or papers were not published in English. Furthermore, only full papers published between 2003 and 2023 were considered. Finally, fifty-four papers were selected for the final evaluation.

Challenges in online learning in Sri Lanka

E-learning platforms have become increasingly popular, but they are not without challenges. These challenges encompass a range of issues. One set of challenges involves social factors, such as the accessibility of online learning resources, and students often encounter challenges related to instructors, which can influence their overall experience and expectations when learning courses online (Denbel, 2023). Computer anxiety and lack of familiarity with e-learning technologies are identified as challenges in implementing e-learning (Adeshola & Agoyi, 2022). Technophobia and frustration towards technology can lead to reluctance and withdrawal from e-learning environments (Juutinen et al., 2011). The digital divide, consisting of barriers to accessing e-learning environments, is also highlighted as a challenge. However, studies suggest that Information Technology students may not have problems related to a lack of familiarity with e-learning technologies (Siregar, 2022). According to the World Bank report in 2021, effective teachers, suitable technology, and engaged learners are the critical components to being effective in remote learning (Muñoz-Najar et al., 2021). Access to the internet, limited bandwidth, distractions, power cuts, and lack of power backups are indeed challenges

in e-learning (Naidoo, 1 C.E.; Muresan & Gogu, 2013). These challenges can hinder the smooth progress of online learning activities. Limited or unreliable internet connectivity can make it difficult for students and teachers to access online resources and participate in virtual classes(Alsubhi et al., n.d.). Additionally, distractions in the home environment can affect students' focus and engagement in e-learning. Power cuts and the absence of power backups can disrupt online classes and lead to interruptions in learning (Karjo et al., 2021). These challenges highlight the importance of addressing infrastructure and technical issues to ensure a conducive e-learning environment.

The challenges faced by Sri Lankan students in learning through e-learning courses include the impact of the COVID-19 pandemic and the economic crisis in the country (Sirithunga et al., 2022). Factors such as limited access to technology and internet connectivity and the quality of the e-learning system/platform have affected Sri Lankan students' satisfaction and academic performance (Jayanetti & Jayalal, 2022). Additionally, the inability to participate in group activities and the absence of face-to-face interaction have hindered students' collaborative learning and leadership development.

Factors Affecting Student Engagement in E-learning

In the domain of e-learning, several factors play a crucial role in shaping students' experiences and outcomes. A key consideration is the active engagement of students. Research has suggested that encouraging their active participation can improve academic performance (Rodgers, 2008). Synchronous learning, which enables real-time interaction between students and instructors, is highlighted for its ability to encourage immediate (Adeshola & Agoyi, 2022). This real-time interaction appears to be a valuable aspect of the e-learning process.

Furthermore, learners' prior experience and knowledge related to e-learning environments have a notable impact on their engagement levels (Abuhassna et al., 2022). Understanding and accommodating these differences can be essential in facilitating effective online education. Notably, students' learning habits can significantly influence their level of engagement in online teaching and learning (Werang Brw et al., n.d.). This underscores the importance of cultivating effective study habits and strategies among students engaging in e-learning. In addition, it is crucial to acknowledge that learners may disengage from e-learning due to a variety of factors. Interestingly, attrition is often driven by students' own choices rather than a lack of support (Sinclair & Kalvala, 2016). To address this, it is important to provide learners with sufficient information to make informed decisions about their suitability for a program.

Also, the role of instructors in student engagement is an area of interest. Some studies mentioned the impact of different instructors on student engagement, but the significance of these differences varies. It is worth noting that the instructor effect is omitted in certain cases due to a lack of significant differences (Rodgers, 2008). This emphasises the importance of understanding how instructors contribute to or influence student engagement in e-learning settings. Assessing student engagement is often achieved through self-reporting, which provides valuable insights into students' experiences. This method is widely accepted and acknowledged in the field. Self-reporting serves as a foundation for understanding and improving the quality of online education.

Students learning behavior in E-learning courses.

Various factors significantly influence students' learning behavior in e-learning. These factors can provide insights into the effectiveness and challenges of online education. First and foremost, several key elements have been identified as positively impacting students' behavioral intentions and actual use of online courses. These include self-efficacy, attitude, system quality, and information quality (Werang Brw et al., n.d.) The presence of these factors contributes to a favorable learning environment,

enhancing students' engagement and performance in e-learning. Undergraduate students have displayed positive attitudes toward e-learning, viewing it as a tool that supports their independence in learning and interaction with technology (Rasjid et al., 2023). This attitudinal shift reflects the potential benefits of e-learning in modern education. Moreover, aspects like information literacy, technical characteristics, and facilitation conditions have been found to positively impact students' learning performance in e-learning environments. These factors further underscore the importance of creating conducive conditions for effective online learning.

Despite the extensive access to education that MOOCs offer, low completion rates remain a persistent concern. For instance, in a study of MOOCs, only 10.87% of participants completed the course, which included all activities and quizzes to receive a final grade. This highlights the challenge of retaining learners throughout the course duration and the need for strategies to address dropout rates in MOOCs. One pivotal factor in influencing dropout rates is the course length, with a positive correlation observed. Longer courses may present greater challenges in retaining student engagement. This highlights the importance of carefully considering the duration of e-learning programs to optimises student persistence. Additionally, course structure is significantly influenced by various factors (Abuhassna et al., 2022). Understanding how these factors impact course design and organization is essential for creating effective and engaging e-learning experiences.

The community of inquiry framework has been used in several studies to measure student engagement (Choo et al., 2020; Purwandari et al., 2022). These studies have explored the interdependent cognitive, social, and teaching presences within the framework and their impact on student learning experiences (Borup et al., 2020). The framework is effective in assessing student engagement in online and blended courses. The framework has also been used to investigate the relationship between student engagement and course satisfaction in online courses. Overall, the community of inquiry framework provides a structured approach to measuring and understanding student engagement in online and blended learning environments.

Students Learning Outcomes in E-learning Courses.
E-learning in higher education has proven to boost students' learning outcomes. It helps them do better in their studies and reach their educational goals. How students react to online classes depends on what they intend to achieve and other external factors, which also affect how satisfied they are with their courses (Ullah et al., 2023). When we compare academic achievements, we find that online learning usually results in slightly better grades than blended learning, which combines online and in-person classes (Sorokova et al., 2021). This suggests that e-learning can work well on its own. Using electronic tools like discussion forums and quizzes on platforms like Blackboard can help students with different learning abilities. To make e-learning effective, things like how the lessons are designed, how appealing they are, and how easy they are to use matter. Students also need to find the learning materials easy to use and feel like they are effective (El-Aasar & Farghali, 2022).

Certain signs are used to check how well students are doing in e-learning. These signs include how assignments are performed, how score reports are interacted with, what was known before, how prepared they are, how much participation is involved, and how the material is engaged with (Murad et al., 2019 ; Biškupić et al., 2022). These signs help us predict how well students will do at the end of the year and in exams (Thambusamy & Singh, 2021). It is also important to have a good amount of useful learning materials, well-designed lessons, and teachers who are good with technology to help students do well (Del Puerto et al., n.d.). When students learn from a distance, taking part in discussion forums plays a big role in how well they do. So, how much students talk and engage with their peers matters a

lot. We can also measure the impact of electronic tools on learning by looking at things like electronic quizzes and discussion forums.

Relationship between student engagement and learning outcomes

Student engagement in e-learning is a crucial determinant of learning outcomes. This review delves into the connection between student engagement and learning outcomes, considering various factors shaping this relationship and its implications for the efficacy of online education.

Student engagement in e-learning significantly influences learning outcomes. When students are motivated, have a positive attitude, find the learning experience useful, and derive pleasure from it, their engagement levels tend to be higher (Yousaf et al., 2023). This heightened engagement is associated with improved learning outcomes. A significant finding is that student engagement acts as a mediator in the link between e-learning system usability and learning outcomes. In essence, the extent to which students actively engage with online materials, discussions, and activities can substantially impact the achievement of positive learning outcomes (Abuhassna et al., 2022). The usability of the e-learning platform and student engagement are intertwined, jointly shaping the overall learning experience.

Previous research has identified a significant but weak positive correlation between student engagement and their performance, particularly when considering the final learning activity (Rajabalee et al., 2020). This suggests that while student engagement is important, its impact on performance can vary based on the specific learning activities involved. The importance of learner engagement in achieving positive learning outcomes is well-established in previous studies (Liu et al., 2022). Also, some studies have highlighted the positive relationship between learner engagement and key learning outcomes, emphasising its significance in the educational context (Navío-Marco & Solórzano-García, 2021; Zhang et al., 2022; Pinera, n.d.). Furthermore, digital learning platforms have shown promise in fostering higher levels of student engagement. This increased engagement has been linked to improved academic achievement, indicating that more engaged students tend to perform better academically. It is essential to recognise that the effects of e-learning on learning outcomes are diverse. Some studies report positive impacts, while others indicate mixed or even negative effects on learning effectiveness, attitudes, and emotions (Adeshola & Agoyi, 2022). This suggests that the relationship between student engagement and learning outcomes in e-learning is multifaceted and can be influenced by various contextual factors. Also, e-learning research faces challenges related to participant diversity. Studies can encompass participants from diverse backgrounds or focus on a specific context. For example, some studies involve participants from various countries, while others exclusively sample learners from specific platforms (Liu et al., 2022). These variations underscore the importance of considering the specific context when interpreting findings. Some studies have limitations in participant diversity, such as exclusively surveying undergraduate students at one university (Adeshola & Agoyi, 2022). Expanding research to include a broader range of participants, including undergraduates and graduates from different universities, could enhance the reliability and validity of findings.

Results and Discussion

In the process of understanding the relationship between student engagement and learning outcomes, this research is centred on Sri Lankan Information Technology undergraduates who have undertaken programming language courses within e-learning platforms. While similar studies have been conducted in various European countries and the findings of those studies also differ from one study to another, reflecting the absence of a universal framework in this domain. Furthermore, the specific context of Information Technology students' programming language learning has not been adequately addressed in previous research studies. Also, some literature utilised the CoI framework to assess student

engagement within online or blended learning environments (Choo et al., 2020; Purwandari et al., 2022). However, hard to find prior research that employed this framework to investigate the interplay between student engagement and learning outcomes in e-learning platforms, particularly concerning undergraduates.

Table 1.

Learning Outcomes Measurements

References	Learning Outcomes							Student Engagement							
	Completion rate	Grade	Quiz Score	Exam scores	Assessment completion rate	Project completion rate	Peer review scores	Taking assignments and quizzes	Engage in critical thinking and Problem-solving	Watching video materials	Contribution to discussions	Use of discussion forms	Clear instructions/language	Well organized course materials	Teacher-Student Interaction
(Gray & Diloreto, 2016)	X														
(Swan & Fang Shih, n.d.)	X			X	X										
(M. Zhang et al., 2017)		X													
(Rajabalee et al., 2020)				X				X							
(Kearsley, 2010)					X										
(Berge, 2013)						X									
(Moore & Kearsley, 1996)					X								X		
(Richardson & Swan, 2003)							X								
(Wang, 2022)									X	X	X				
(Liu et al, 2022)											X	X			
(Sinclair & Kalvala,2016)											X	X		X	X

Additionally, the research acknowledges the distinctive backdrop of Sri Lanka, a developing country where not everyone enjoys equal access to infrastructure. As highlighted in the existing literature, factors like Internet reliability, device accessibility, and power supply play crucial roles in shaping the

e-learning landscape (Group on School Connectivity, 2020; Naidoo, 1 C.E.; Muresan & Gogu, 2013). Moreover, a notable challenge faced by students, namely, their lack of familiarity with e-learning technologies, is mentioned in the literature (Chikurteva et al., n.d.; Maria POPA, n.d.; Adeshola & Agoyi, 2022). Nevertheless, it is worth emphasising that such challenges can be mitigated when conducting research specifically for Information Technology students.

To measure learning outcomes, research papers included in Table I, consider a range of measurements drawn from existing literature, including course completion rates, exam scores, and assessment or project completion rates. These indicators provide a robust foundation for evaluating the impact of student engagement on learning outcomes within the unique Sri Lankan context.

Conclusions and Recommendations
The conclusion of this systematic literature review highlights several key findings and implications drawn from the analysis of the relationship between student engagement and learning outcomes in e-learning platforms, with a focus on Information Technology undergraduates in Sri Lanka. The review reveals a complex interplay of factors that influence the effectiveness of e-learning, shedding light on the challenges, opportunities, and strategies in this educational context.

Firstly, the study emphasizes the transformative impact of e-learning, particularly considering its accelerated adoption during the COVID-19 pandemic. The global expansion of the e-learning market underscores the increasing importance of this mode of education, and the findings from this review resonate with the global trend. It acknowledges the relevance of studying e-learning platforms and their implications for education in the digital age. The review highlights the multifaceted nature of student engagement and its critical role in shaping learning outcomes. It underscores the importance of student motivation, attitude, and the usability of e-learning platforms in fostering engagement and, subsequently, enhancing learning outcomes. The correlation of these factors emphasizes the need for a holistic approach to e-learning design and implementation, where the student experience is a central consideration.

In the context of Sri Lanka, the study identifies unique challenges, such as issues related to Internet connectivity, device accessibility, and students' familiarity with e-learning technologies. These challenges underscore the importance of addressing infrastructure and technical issues to create a conducive e-learning environment. Moreover, the impact of the COVID-19 pandemic and economic crisis in Sri Lanka on students' e-learning experiences is highlighted, emphasizing the need for tailored support and solutions in such contexts. The review also emphasizes the importance of course design, duration, and instructor influence on student engagement and, subsequently, learning outcomes. It suggests that careful consideration of these factors can significantly impact the effectiveness of e-learning programs. Furthermore, the use of the CoI framework to gauge student engagement within online or blended learning environments is acknowledged as a common practice in previous studies. However, the unique application of this framework in investigating the interplay between student engagement and learning outcomes within the Sri Lankan context, particularly for Information Technology undergraduates, represents a novel contribution to the field.

The diverse findings regarding the"effe'ts of e-learning on learning outcomes underscore the need for contextual understanding when interpreting results. The review acknowledges the limitations of participant diversity in some studies and encourages future research to include a broader range of participants to enhance the reliability and validity of findings. It also recommends that future researchers analyze the impact of student engagement on learning outcomes in e-learning platforms.

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