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TECH IN THE CLASSROOM: HOW DIGITAL TOOLS AND DEVICES SHAPE MODERN LEARNING EXPERIENCES

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ABSTRACT

Platforms like Zoom, Google Meet, and Microsoft Teams were employed by several institutions as delivery tools to combat the pandemic. At the same time, gadgets like mobile phones, iPads/tablets, desktops, and laptops were used by students to enhance their learning experience. The objective of the current study was to determine the effect of technology differentiation and gadget on students' learning effectiveness. A scientifically structured questionnaire was provided to students to ascertain how effective the learning had been based on the technology platform employed and gadgets used. The learning effectiveness was measured on the basis of three dimensions namely, knowledge construction, student's interaction and instructor's presence. A sample comprising 300 university students from the State of Punjab was taken for the current study. Using ANOVA, the findings of this study have helped to analyse which technology platform and device used is giving the most effective learning outcome.

Keywords*:* Technology Platforms, Gadgets, Online Learning, Learning Effectiveness, ANOVA

INTRODUCTION

The COVID-19 pandemic compelled universities and other educational institutes to switch completely from face-to-face to online learning, resulting in an unprecedented learning environment for both teachers and students. They cannot imagine learning taking place without the aid of modern technologies. The proliferation of the internet and its impact on education has led to the adoption of many web-based applications, leading to the emergence of the e-learning trend in education.

In education industry, the use of technology and gadgets have grown exponentially over past few years (Bayanova, *et al*., 2019). E-learning platforms, unlike traditional face-to-face learning techniques, allow teachers to engage with students and discuss course content at any time and from any location. Such platforms became widely available for students and teachers at many educational institutes. Zoom, Google Meet, and Microsoft Team, to name a few, were employed by several institutions as a delivery tool (Serhan, 2020) during the imposed lockdown. These platforms have a cutting-edge technology that offer a number of unique features that can assist students in learning effectively (Rojabi, 2020). Over the years, these platforms have become widely available for students and teachers at many educational institutes. At the same time, the gadgets like mobile phone, iPad/tablet, desktop, and laptop are used by students to enhance their learning experience (Bayanova, *et al.,* 2019). They can use these devices to access online libraries, research materials, and educational applications

that provide interactive and engaging content (Mohzana *et al.,* 2025). Moreover, gadgets have made it easier for students to collaborate on projects and assignments, communicate with their peers and instructors, and receive feedback in real-time, regardless of their location making learning process more accessible and convenient for students (Serhan, 2020). A blend of traditional in-person instruction and online learning is replacing the traditional classroom arrangement in the rapidly changing global educational setting. Online learning platforms and resources were often viewed as supplementary tools to support traditional classroom instruction in schools and colleges prior to COVID-19. The pandemic forced an extraordinary change in which learning had to switch to an 'online-only' format. Without any prior strategic planning or worldwide preparation, educators were forced to provide lessons via a variety of online platforms.

LITERATURE REVIEW

Utilizing an online learning platform is logical as modern students are proficient in digital technology and are capable of effectively using it for educational purposes (Rahayu *et al,* 2024). Online learning platforms offer clear benefits for developing an environment which fosters conducive and immersive learning (Bakerson *et al.,* 2015). Through the use of a learning management system, virtual learning offers special features like assignment submission, chat discussions, comment sections, authoring tools, rubrics, and feedback methods. The quality of e-learning portal systems was evaluated by Sung *et al.* (2016) through an evaluation of the site's speed, design, extra features, navigation, content display, search capabilities, and ability to foster trust among users. Trentin (2009) discovered that a badly maintained and designed website can impede students' motivation and interest, which are critical for their participation in self-disciplined and self-motivated e-learning. For this reason, these evaluation criteria are imperative.

With their significant impact on so many facets of people's life, including education, gadgets have become an essential component of modern society. Gadgets are portable electronic equipment such as laptop, tablet/iPad, and mobile phone. These tools have significant potential for learning in both classroom and outdoor settings (Sung *et al.* 2016). Students commonly possess mobile phone, tablet and laptop. They exhibit a notable proficiency in multitasking with many electronic devices as revealed by Taleb & Sohrabi (2012). As Kukulska-Hulme *et al.* (2011) found, mobile learning allows people to develop, compile, and access useful information using smartphone, laptop, and the like. Additionally, it encourages innovative communication with a range of people and communities, enabling students to use their time no matter where they are. According to Rafiq *et al.*, (2024), students perceive a cell phone as an essential item rather than a luxury. Empirical research on deploying tablet and laptop in higher education revealed that this technology has a favourable impact on student engagement and participation (Koile & Singer, 2008), as well as creating flexibility and a more informal learning environment (Kenney & Newcombe, 2011). According to a study by Fleischer (2017), it was found that students held a favourable attitude towards laptop. They reported feeling more motivated and involved in their learning when using laptop. As mentioned by Chen & Huang (2010), and Beckmann (2010), learning management systems made especially for mobile devices let students finish courses, interact with classmates, and share knowledge while looking for or uploading materials from anywhere at any time. According to Ferreira *et al.* (2013), the use of mobile learning in HEIs ranged from basic applications that enhance traditional teaching methods to advanced systems specifically tailored for the mobile learning approach. Few of the researches that were carried out in United Kingdom (Green and Hannon, 2007), United States of America (Kvavik, 2005) and Australia (Kennedy *et al.,* 2006; Kennedy *et al.,* 2008) indicated students interact with digital

gadgets through formal and informal channels of communication, such as emails, blogging, and other means. Microsoft Teams is an incredibly successful online learning platform standing out for having an extensive feature set that include chat rooms, group conversations, video conferencing and sharing of content (Ilag, 2020 and Henderson *et al.,* 2020).

E-learning technology allows for new modes of engagement and encourages novel pedagogies (Kem, 2022). As per the study by Fortune *et al.* (2011), for students to meet their learning goals, access to materials, chances for interaction, and the general learning environment are essential. In another study by Gray and DiLoreto (2016), the organisation and structure of the course, student's interaction with peers and instructor, student engagement, teacher's presence, and student perceived enjoyment are all important factors that determine how well online learning goes. Various factors, including technological aspects, user-friendly online platforms, class activities, and assessments, might influence the success of online learning (Wijekumar *et al.,* 2006; Shuey, 2002). According to Waight and Stewart (2005), designing learning assignments with interesting tasks can speed up the learning process and help students apply their newly gained knowledge, abilities, and concepts in the workplace in a way that will ultimately increase their level of satisfaction. According to Yengin *et al.* (2011), user satisfaction and net benefits are the two main components that must be evaluated when determining how effective e-learning platform is. DeLone and McLean (1992, 2003) framework consists of a number of dependent variables that are further divided into elements like user satisfaction, (Holsapple and Lee-Post, 2006), performance in academics (Lee and Lee, 2008), student advantages (Klobas and McGill, 2010), and grades of students (McGill and Klobas, 2009). User satisfaction is defined by Kim and Malhotra (2005) as the perceived knowledge acquired from an online learning platform. According to Hung *et al.* (2024), learners' satisfaction can be assessed based on the experience of user, the system's functioning, and its usefulness to the end user. Several scholars have noted that if a system benefits the student, it is effective (Somers *et al.,* 2003; Zviran *et al.,* 2005).

RESEARCH METHODOLOGY

For this study, the students of Higher Education Institutes (HEI) of Punjab were considered as the population. The relevant sample for the investigation was chosen using a multistage sampling procedure. Respondents were recruited from various academic subjects such as management, commerce, humanities, science, and engineering among the selected universities. A total of 300 under-graduate and post-graduate students were included in the study. Respondents were given a scientifically designed questionnaire to determine how effective the learning had been based on the technology utilised and gadget used. The technology platform under the scope of the study includes Blackboard, My Class, Zoom, Google Meet, Microsoft Teams and the gadgets under the purview of the study includes desktop, laptop, tablet/iPad and smart phone. To analyze the objective, one-way ANOVA was used.

DATA ANALYSIS AND FINDINGS

The primary goal of any learning platform is to enrich the knowledge of the learners. In order to understand the effect of technology differentiation and gadget category on learning effectiveness, one way ANOVA was performed for data analysis.

The findings revealed that a significant difference exists among the technology platforms for knowledge construction dimension. My Class was found to be the most successful in facilitating knowledge construction among the students (mean score of 3.9743), followed by Microsoft Teams (3.7274). The design of My Class is tailored to specifically meet academic

requirements. The least effective platform came out to be Google Classroom (mean score of 3.2023) in case of knowledge construction. This platform did not support direct practical exercises, leaving students with predominantly theoretical content. The findings highlighted a significant difference among the technology platforms regarding the level of student engagement. My Class (mean score of 3.7706) and Microsoft Teams (3.5472) were identified as the most significant platforms in fostering an interactive learning environment among students thereby enhancing their learning outcomes. Both platforms provided a variety of features and promoted collaboration, fostering an environment that motivated users to engage in discussions, contribute their expertise, and demonstrate their understanding of the course content. The least effective platform under student's interaction came out to be Google Classroom (mean score of 3.3104) because the platform did not provide the opportunities for effective interaction. With regard to instructor's presence in the online class, a significant difference was found among technology platforms. My Class platform came out to be most effective, with mean score of 3.9083, followed by Microsoft Teams (3.7700) and Blackboard (3.7300). All these three platforms facilitate direct interactions between students and instructors enabling instructors to offer guidance and support in virtual settings. However, Zoom was found to be least effective in terms of instructor presence with mean score of 3.5233. The Zoom platform lacks features that enable instructors to enhance the educational experience for students.

The study's findings indicate that the laptop was the most effective gadget in terms of knowledge construction with mean score of 3.8520. The advantages of using laptop includes its multifunctionality, improved readability due to larger screens, and mobility. The study also reveals that laptops can aid in the development of students' creativity, independent learning, and intrinsic motivation. It was found that, in terms of knowledge construction, there was no major difference between laptops and desktops (mean score of 3.6981) whereas significant difference found between laptop (3.8520), mobile phone (3.6061) and tablet/iPad (3.2486). The small screen size of tablet/iPad hindered effective display and readability of content, rendering it less usable for students. It was also found that the laptop was the most effective device in facilitating increased collaboration and interaction among students (mean score of 3.8574), with the desktop following closely behind (mean score of 3.7414). Therefore, there was no discernible difference between desktops and laptops as far as students' interaction dimension was concerned. According to the current study analysis, tablet/iPad were found to be least effective device in students' interaction (mean score of 3.3278) and a significant difference was found when compared to laptops and desktops. The results of the study also indicates that there is no significant difference between laptop and desktop for the dimension of instructor's presence. The findings revealed that students have a more immersive learning experience when they use laptops (mean score of 4.0112) and desktops (8.8900) due to their larger screens and enhanced functionality. This enables them to concentrate more effectively on the teacher's instructions, visual aids, and interactive qualities. In the current study, the least effective device for instructors' presence came out to be tablet/iPad (mean score of 3.4161). A significant difference was found between the laptop and desktop and tablet/iPad for the instructor presence dimension.

CONCLUSION

This study investigated the effect of technology platforms (Zoom, Blackboard, Google Classroom, My Class, Google Meet, Microsoft Teams) and devices (desktop, laptop, tablet/iPad, mobile phone) on the efficacy of students' learning in three distinct domains: knowledge construction, student interaction, and instructor presence. One-way ANOVA was applied to analyse the collected data. The results indicated that there are substantial

disparities among platforms, with My Class being the most effective in all three dimensions, followed by Microsoft Teams and Blackboard, owing to their interactive features and academic design. Conversely, Zoom's instructor presence was the lowest, as it lacked features that could enhance engagement, and Google Classroom was the least effective for knowledge construction and interaction.

Laptops were determined to be the most effective learning device in terms of gadgets, as they provide multifunctionality, mobility, and improved readability. Desktops were in close second place. The effectiveness of laptops and desktops was not substantially different, but they were both significantly more effective than tablets/iPads and mobile phones across all dimensions. Tablets/iPads were the least effective in terms of instructor presence and interaction due to their limited usability and tiny screen sizes. The study emphasizes that the learning outcomes are considerably influenced by the choice of platform and device. In online education, tailored academic platforms and larger multifunctional devices are more effective.

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