

Perception of Students on Technology-enabled Learning

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ABSTRACT Education 4.0 reiterates that technological innovations will act as an inevitable substitute for classroom teaching and learning, with a learner-centered approach. In India, the transition towards using technology for teaching-learning ever since the COVID-19 pandemic lockdown has caused radical shifts in the education system in terms of process and outcomes. The present study is an attempt to examine the use of technological aids for learning by the students and to analyze the student's perception of the use of technology based on learning, classroom experience, student behavior, and assessment and evaluation. The perception of students of an engineering college was surveyed using a structured questionnaire and Garret's ranking technique was used to rank the students' perceptions. The findings of the study indicated that the use of technology-enabled learning strengthened the confidence of the students and promoted peer learning and effective classroom communication.

INTRODUCTION

The technological revolution has enabled universal access to gadgets that facilitate information and communication with incredible speed and quantity. It has penetrated all industries and sectors globally and the education sector is no exception. The evolution of technology in education has caused radical shifts in the teaching-learning process of the educational institutions. Education 4.0 is also reiterating the fact that technological advancements will soon act as strong substitutes for classroom teaching and distance learning and will be more learners centered in approach. The Indian education sector is witnessing a paradigm shift in its process guided by the National Education Policy (NEP) 2020 and Education 4.0. Innovations in teaching methodology and events like the present pandemic have caused radical shifts in the process of education leading to the path of a personalized learning

experience, with the marriage of Information and Communication Technology (ICT) and human interface.

The teaching-learning process is best assessed quantitatively by the levels of attainment by the students with various parameters as decided by the governing institutions. In this context, the quality of student engagement and acceptance of the teaching methodology thereof creates value for the institution at large. This has been explained in the theory of student engagement, propounded by Kearsley and Schneiderman (1998) which acts as a guiding principle to analyze the effectiveness of innovations in higher education on students' learning experience. The theory advocates for meaningful engagement of students in the learning process with the use of worthwhile tasks. The authors presented a model for learning in technology-based environments which synthesizes many elements from past theories of learning. They described that the role of technology in the theory was to facilitate all aspects of engagement and the tools such as e-mail, online conferencing, web databases, groupware, and audio/video conferencing increased the extent and ease of interaction as well as access to information. This theory helps in understanding the need to

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validate the use of technology-enabled learning in higher educational institutions. Mishra and Mehta (2017) in their study remarked that the student engagement theory acts as a baseline in this study to assess the use of technology for classroom engagement and its impact thereof on students learning.

The perspectives of online teaching and its impact on learning have drawn the attention of several researchers across the globe. The findings of the researchers have been heterogeneous and have paved the way to identify the research gap and limitations related to the use of technology in the teaching-learning process. The research article “Inroad of Digital Technology in Education: Age of Digital Classroom” by Singh (2021) examined the pros and cons of the digital classroom using the explanatory approach, and established that technology removed the barriers in education and promoted lifelong learning. Kathula (2021) in his study used the “Technology Acceptance Theory” developed by Davis in 1989 to investigate the role of technology in shaping the classrooms in the Universities of Kenya. The study found that technology caused a shift in the teaching-learning methodology and recommended the development of online platforms to promote the online classroom experience. By focusing on issues with students, faculty members, technology, and administration, Albahusain (2021) identified the difficulties in implementing online learning during the COVID-19 pandemic from the perspectives of pre-service teachers affiliated with the special education program at King Saud University (KSU).

Al-Subaie (2021) examined the perspectives of Arabic Language Teachers (ARL) regarding WhatsApp’s efficiency during COVID-19, the difficulties teachers in the ARL perceived with WhatsApp during COVID-19 and the benefits and drawbacks of WhatsApp during COVID-19. Joshi et al. (2020) described the strategies used by higher education institutions to continue teaching while there is a lockdown. This research highlighted the difficulties teachers experienced when teaching remotely from their homes. Muthuprasad et al. (2021) focused on understanding how agricultural students perceived and preferred online learning. The study also looked into the preferences of the students for several aspects of online classrooms, which

will be useful in creating an efficient online learning environment through an online survey of 307 students. As a result of this pandemic, the majority of respondents (70%) chose to manage their coursework online. The vast majority of pupils favored using their smartphones for online learning. It was discovered through content analysis that students preferred recorded lessons with a quiz after each lesson to increase learning efficacy. Price and Kirkwood (2014) examined the educational practices with technology in higher education, using a structured questionnaire. The study interviewed 55 educational practitioners and the content and thematic analyses were used to identify the factors that influenced the teachers’ use of technology in teaching. The findings revealed that there was a partial influence on practice by evidence of the use of technology, but the consultations of colleagues and academic partners influenced the adoption of technology by the teachers.

Ogunleye (2010) in his study evaluated the effectiveness of students’ participation in the online teaching program by administering a structured questionnaire to the students of a college at the University of London. The study found that online learning contributed more to the acquisition of skills irrespective of age and sex and that students faced problems such as internet access, availability of computers, and printing facilities that were the essential prerequisite for accessing the online learning mode. Dede (2008) recognized the role of technology in education and has come forward with a handbook “International Handbook of Information Technology in Primary and Secondary Education” that puts forth the relationship between technology and curriculum. In the chapter on “Theoretical Perspectives influencing the use of technology in teaching and learning”, Chris explains the various theories of pedagogy that help to shape the use of technology and portrays the widening range of instructional tools available with the advent of technology. The approach Chris acts as a guide to researchers to combine the theoretical perspectives of teaching-learning while introducing technological innovations in classroom instruction.

In the Indian context, specifically with the integration of online teaching-learning since the COVID lockdown, Kumar (2021) examined the

impact of COVID-19 on education in India from 50,936 students across the states, and varied age groups, educational levels, and disciplines. The study revealed that students preferred webinars and video conferencing as their preferred choice for online learning and flexibility of study time was one of the main reasons to prefer online learning. Bisht et al. (2020) found that the online examinations conducted by the higher education institutions were more efficient than the regular examinations. Taso and Chakrabarty (2020), Sheikh (2017) and Ray (2012) in their studies on the higher education system of India examined the challenges and efforts of the Government of India to improve e-learning, which was regarded as a method that provided equal opportunities to education.

Objectives

The literature surveyed highlights the influence of technology in education both at the school and college levels. The findings of the literature surveyed indicated the influence of technology on the learning process during the pandemic, the challenges of the online mode of teaching-learning, the extent of student engagement, and teachers' and students' perception of the online mode of teaching-learning. This creates a roadmap for the identification of specific research problems in the use of technology for education. The present study identifies the need to examine the impact of technology-enabled learning on classroom engagement, assessment and evaluation, and students' behavior in higher education institutions. The objectives of the present study are

- ◆ To examine the use of technological aids for learning by the respondents.
- ◆ To analyze the student's perception of the use of technology based on learning, classroom experience, student behavior and assessment and evaluation.

METHODOLOGY

Sample

Using the random sampling technique, data were collected from respondents identified as students pursuing undergraduate engineering in Coimbatore, Tamil Nadu.

Tools of Data Collection

The study used a structured questionnaire prepared based on the literature surveyed and was validated using a pilot test. The questionnaire was administered using an online survey method to 300 students and received 263 valid responses.

Tools of Data Analysis

The responses were rated on a five-point scale ("5 denoting strongly agree and 1 denoting strongly disagree"). The data was consolidated using frequency and percentages. Further, the responses regarding the impact of technology on the classroom, student behavior, assessment and evaluation were ranked to identify the most significant impact by using Garrett's Ranking Technique.

RESULTS AND DISCUSSION

Student's Response Based on Use of Technological Aids

Technology-enabled learning required a shift from the traditional model with the use of technological aids and e-learning platforms. The learning environment was dependent on the e-learning platform and the infrastructure. The technical availability for online learning was surveyed and it was found that devices like smartphones, laptops, and desktops were preferred by the respondents. The majority of the students (44%) used smartphones for online learning indicating the need for colleges to develop learning platforms that are compatible with smartphones, the finding which aligns with a similar study by Muthuprasad et al. (2021) and Sun and Chen (2016). 40 percent of the students used both smartphones and laptops for learning, and 16 Percent of the students used laptops or smartphones or desktops.

The parameters of technology used for learning by the students included mode of internet use, time spent in hours on internet usage, time spent in online learning, and challenges faced during the shift to online learning. The respondents included 20 percent and 80 percent of female and male students, respectively. Based on

the year of study of the respondents from the engineering undergraduates, 63 percent were from II years, followed by 23 percent from IV years and 14 percent from III year students.

Table 1 presents the percentage distribution of students' responses based on parameters of technology used for learning. The majority of the students (60%) used mobile hotspots, inferring the fact that students own their mobiles in comparison to laptops (Bawanti and Arifani 2021). The education system which prohibited the use of smartphones on campuses has now shifted its approach to the use of smartphones as a medium for classroom instruction. This transition was smoothly enabled by the pandemic lockdown in major countries and India was no exception to this (Bao 2020; Hodges et al. 2020; Zhu et al. 2020). The inclusion and access to the internet as a resource was the challenge that was visible in remote locations of the country and posed a challenge for the transition (Sengupta 2022). It was found that 30 percent of students spent more than 8 hours in a day on the internet surfing for various purposes, which in-

cluded learning as well. This shows that the online mode of learning has become an integral part of the student's life and they did not face much difficulty in transitioning to the online mode since the pandemic lockdown started (Reschly and Christenson 2012). 37 percent of students spent 4 to 6 hours on online learning, which was inclusive of average class hours of 3 to 4 hours. This reveals the fact that online learning has not caused a reduction in learning hours or stress on the usage of learning platforms. On the challenges faced to shifting to online learning mode, owing to the pandemic lockdown, it was found that accessibility to the internet due to network issues was reported by the majority of the students (61%). A strong information technology infrastructure is crucial, including accessible technical support, sufficient bandwidth and storage capabilities, and a learning management system that enables student individualization and personalization (Davis et al. 2008; Demski 2012).

Students' Perception of Use of Technology for Learning

The study assessed the influence of technology based on the students' perceptions on "classroom experience", "student behavior" and "assessment and evaluation". The students' responses to their perceptions were collected using the Likert scale and the responses were ranked based on their perceptions using Garrett's ranking technique. Annexure 1 presents the frequency distribution of students' responses. From the calculated frequency values, the percentage scores and the Garrett values for the corresponding percentages for each of the perception statements were calculated.

The derived Garrett's score is then used to find the total scores and the mean scores for individual attributes, which are then ranked accordingly. The individual rankings arrived from the total and mean scores for "Classroom Experience", "Students' Behavior" and "Assessment and Evaluation" are presented in Tables 2, 3 and 4.

Concerning classroom experience, the statements "technology-enabled interactive communication between instructor and students" and "technology provides the flexibility of commuting and economical classroom" obtained ranks I

Table 1: Percentage distribution of student's response based on parameters of technology use for learning

Variables	Category	Frequency	Percentage
<i>Mode of Internet Used</i>	WiFi	80	30.42
	Internet dongle	26	9.89
	Mobile hotspot	157	59.70
	Total	263	100
<i>Time Spent in Hours on Internet Usage</i>	Less than 2 hours	15	5.70
	2 hours to 4 hours	32	12.17
	4 hours to 6 hours	63	23.95
	6 hours to 8 hours	73	27.76
	More than 8 hours	80	30.42
Total	263	100	
<i>Time Spent in Hours on Online Learning</i>	Less than 2 hours	9	3.42
	2 hours to 4 hours	48	18.25
	4 hours to 6 hours	98	37.26
	6 hours to 8 hours	78	29.66
	More than 8 hours	30	11.41
Total	263	100	
<i>Challenges Faced during the Shift to Online Learning</i>	Gadgets availability	29	11.03
	Internet accessibility due to cost	33	12.55
	Internet accessibility due to network	160	60.84
	No challenges faced	41	15.59
Total	263	100	

Source: Calculations based on Primary Data

Table 2: Calculated weighted sum, mean and the rank for “classroom experience”

<i>Classroom experience</i>	<i>Total score</i>	<i>Mean score</i>	<i>Rank</i>
Technology provides the flexibility of commuting and economical classroom	10825	41.16	II
Technology gives adequate resources for learning	10650	40.49	IV
Technology enables interactive communication between instructors and students	12415	47.21	I
Technology enables easy and quick sharing of learning materials	9790	37.22	V
Technology aids self-paced learning	10745	40.86	III

Source: Calculations based on primary data

Table 3: Calculated weighted sum, mean and the rank for “student behavior”

<i>Student behaviour</i>	<i>Total score</i>	<i>Mean score</i>	<i>Rank</i>
I am confident in adopting technological tools for learning	11105	42.22	III
I am confident in using online learning materials	11360	43.19	II
I am confident in taking tests and assignments online	10775	40.97	IV
I am confident in participating in the online classrooms	10775	40.97	IV
I am confident in engaging with peers in online mode	12025	45.72	I

Source: Calculations based on primary data

Table 4: Calculated weighted sum, mean and the rank for “assessment and evaluation”

<i>Assessment and evaluation</i>	<i>Total score</i>	<i>Mean score</i>	<i>Rank</i>
I am comfortable doing college work remotely	11665	44.35	III
I stay focused on completing my online assignments at home	11650	44.30	IV
I complete the online works assigned within the deadline	10295	39.14	V
I ask for regular feedback and clarifications from my teachers	11945	45.42	I
I get adequate learning opportunities in the online learning mode	11940	45.40	II

Source: Calculations based on primary data

and II, respectively. The results were similar to the findings of Dabbagh (2007), Wengrowicz et al. (2018) and Meyer (2014), indicating that online classrooms provide greater flexibility to students and engage them leading to self-directed learning experiences.

Online learning has a significant influence on students’ attitudes. The scores obtained for the statements reflecting students’ behavior towards the use of teaching for learning indicate that most students held a positive attitude towards adopting technology (Baber 2020). The students’ confidence in engaging with peers and ease of using online learning materials received ranks I and II, respectively. These findings are in accordance with the studies by Mehra and Omidian (2011), Wong and Fong (2014), Wengrowicz et al. (2018), and Ferrer et al. (2020).

The examination of students’ perception of using technology for classroom assessment and evaluation found that the ranking was high for “regular feedback and clarifications from the

teachers” and “adequate learning opportunity in the online learning mode”. This finding showed that students’ preferred using technology for taking up assessments and evaluation because the asynchronous mode help students to take up the assessments at their convenience and also facilitates self-assessment. The personalized feedback and the clarifications by the teachers using technology act as a catalyst for enhancing the learning experience. The findings are similar to Akimov and Malin (2020), who found that the technology has to lead to expansion in the delivery system and reliable and validated assessment and feedback in the education system.

CONCLUSION

The study concludes that technology has become an integral part of the teaching-learning process. It is evident that transition and integration of classroom teaching in colleges enhanced the learning activities and student engagement.

The findings of the study indicate that technology enabled learning paved the way for interactive communication between instructors and students and increased the confidence of students in engaging with their peers. The study, however, is limited to students' perception which is specific to particular educational background.

RECOMMENDATIONS

The perception of the student's on the use of technology-enabled learning indicates that there is higher scope for adoption of e-learning as part of the regular curriculum in the future. The study proposes higher educational institutions formulate online pedagogies that will motivate the learning process. Educational institutions should also formulate assessments and feedback considering the students' perspectives for better outcomes.

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ANNEXURE

Annexure 1: Frequency distribution of students' responses

<i>Perception statements</i>	<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Disagree</i>	<i>Strongly disagree</i>	<i>No. of samples</i>
<i>Classroom Experience</i>						
Technology provides the flexibility of commuting and economical classroom	53	130	59	15	6	263
Technology gives adequate resources for learning	56	125	70	10	2	263
Technology enables interactive communication between instructor and students	37	79	82	43	22	263
Technology enables easy and quick sharing of learning materials	89	125	42	4	3	263
Technology aids self-paced learning	62	109	73	16	3	263
<i>Student Behavior</i>						
I am confident of adopting technological tools for learning	49	116	73	19	6	263
I am confident of using online learning materials	45	111	76	22	9	263
I am confident in taking tests and assignments online	61	115	66	15	6	263
I am confident of participating in the online classrooms	62	115	61	20	5	263
I am confident of engaging with peers in online mode	41	96	73	31	22	263
<i>Assessment and Evaluation</i>						
I am comfortable doing college work remotely	45	95	85	24	14	263
I stay focused to complete my online assignments at home	43	107	74	22	17	263
I complete the online works assigned within the deadline	74	114	63	11	1	263
I ask for regular feedback and clarifications from my teachers	33	86	105	33	6	263
I get adequate learning opportunities in the online learning mode	32	110	73	34	14	263

Source: Calculations based on primary data