



Digital Learning Adoption and Constraints among Higher Education Students: An Empirical Study

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Abstract

The digital transformation of higher education has expanded students' access to search engines, learning management systems, online courses, video resources, virtual meeting platforms, electronic scholarly resources and artificial intelligence applications. This study examines the pattern of digital tool usage and the major challenges faced by higher education students in using digital technologies for learning. The analysis is based on 564 responses collected from Higher education pursuing students from Coimbatore District. The Analysis shows that Google Search has the highest mean usage score, followed by SWAYAM/NPTEL) and Google Classroom. YouTube and AI Chat Bots share a mean of, while zoom/Google Meet and online libraries/e-journals record lower values respectively. The study also examines barriers measured on a five-point scale. The results reveal a strong preference for accessible and user-friendly digital resources, while scholarly e-resources and synchronous platforms are comparatively underused. The findings highlight the need to improve digital infrastructure, affordability, training, academic resource awareness and responsible technology use.

Keywords: Digital learning tools, higher education, SWAYAM, NPTEL, Google Classroom, AI chatbots, e-resources, digital barriers

1. Introduction

Digital transformation has altered the way higher education students obtain information and participate in learning. Search engines, virtual classrooms, online courses, video platforms, electronic journals and AI-enabled applications have created multiple pathways for students to access knowledge. The contemporary learner can move between institutional learning platforms and publicly available digital resources within a single academic task. This flexibility can support self-directed learning, but it also creates a need for digital competence and appropriate resource selection.

The present study examines actual patterns of digital tool usage among 564 higher education students from Coimbatore District of Tamil Nadu. The analysis is useful because access and usage are not uniform across platforms. A student may frequently use a search engine while rarely accessing scholarly databases. Similarly, a student may use an online course platform but not regularly participate in synchronous virtual

classes. Understanding these differences helps institutions identify which technologies have become part of students' routine learning behaviour and which resources require greater promotion.

The study also focuses on barriers. Digital learning can be affected by connectivity problems, financial constraints, lack of training, language difficulties, digital fatigue and device-related limitations. These barriers can reduce the educational value of technology even when digital resources are technically available. Consequently, digital transformation requires not only platforms and devices but also infrastructure, skills, support and appropriate pedagogical integration.

II. Review of Literature

Previous studies show that digital technologies have become an important part of higher education, offering flexibility and wider access to learning resources (Dhawan, 2020; Muthuprasad et al., 2021). However, internet connectivity, affordability, digital infrastructure and students' technological readiness continue to influence effective digital learning (Nambiar, 2020; Pokhrel & Chhetri, 2021; Sophonhiranrak, 2021). Studies have also emphasized the importance of digital competence and training for effective use of online learning resources (Zhao et al., 2021; Audrin & Audrin, 2022; Vishnu et al., 2022). More recently, AI-based tools such as ChatGPT have expanded students' digital learning opportunities, while also creating concerns regarding responsible use and academic practices (Crompton & Burke, 2023; Montenegro-Rueda et al., 2023). Overall, the literature indicates that digital learning adoption depends on access, digital skills, infrastructure and institutional support. However, limited studies have examined the adoption of multiple digital learning platforms together with the constraints experienced by higher education students, which provides the rationale for the present study.

III. Objectives of the Study

To identify the digital tools and online platforms most commonly used by students for academic purposes.

To evaluate the challenges and barriers faced by students in developing and using digital literacy skills.

IV. Research Methodology

The study is based on 564 valid responses. The digital platform variables are binary measures coded 0 = No and 1 = Yes. Accordingly, the mean values represent the proportion of respondents reporting use of each platform. The barrier variables are measured on a five-point scale, with higher mean scores indicating greater agreement with the stated challenge. Descriptive statistics, mean ranking and standard deviation are used to interpret the pattern of digital tool usage and barriers.

The analysis is descriptive and does not attempt to infer causality. The results are interpreted in relation to the specific sample and measures reported in the dataset. The purpose is to identify the relative prominence of different tools and barriers and to translate those findings into practical recommendations for higher education institutions.

V. Digital Tool Usage

Digital Tool / Platform	Mean	Std. Deviation	Rank
Google Search	0.66	0.475	1
SWAYAM / NPTEL	0.63	0.482	2
Google Classroom	0.57	0.496	3
YouTube	0.38	0.486	4*
AI Chat Bot	0.38	0.486	4*
Zoom / Google Meet	0.23	0.420	6
Online Libraries / E-Journals	0.15	0.358	7

The usage results show a clear hierarchy. Google Search ranks first with a mean of 0.66, meaning that approximately 66% of respondents reported using it for academic purposes. SWAYAM/NPTEL ranks second at 0.63, indicating strong adoption of structured online learning resources. Google Classroom ranks third at 0.57. YouTube and AI Chat Bots share the fourth rank at 0.38. Zoom/Google Meet records 0.23, while online libraries/e-journals have the lowest mean at 0.15.

VI. Interpretation of Digital Platform Preferences

6.1 Google Search

Google Search is the most commonly used digital resource in the study. Its high mean suggests that students rely heavily on general information-search facilities when undertaking academic activities. The accessibility, speed and familiarity of search engines may explain their prominence. The result also indicates the importance of teaching students how to refine searches, evaluate source credibility and distinguish scholarly information from general web content.

6.2 SWAYAM/NPTEL

SWAYAM/NPTEL ranks second with a mean of 0.63. The result indicates substantial use of structured online learning platforms. Such platforms can supplement classroom teaching, enable students to explore subjects beyond their curriculum and support self-paced learning. The relatively high usage suggests that students recognize the value of organized online courses.

6.3 Google Classroom

Google Classroom ranks third with a mean of 0.57. Its position reflects the role of learning management and course communication platforms in higher education. Such platforms can support distribution of learning materials, assignment submission, announcements and interaction between teachers and students.

6.4 YouTube and AI Chat Bots

YouTube and AI Chat Bots both record a mean of 0.38. Their equal rank suggests moderate adoption. YouTube can support visual and explanatory learning, while AI chatbots can provide interactive assistance and rapid explanations. Their educational value depends on the quality of use, source verification, academic integrity and appropriate guidance.

6.5 Zoom/Google Meet

Zoom/Google Meet records 0.23, indicating comparatively lower use. The lower value may reflect reduced reliance on continuous synchronous virtual classes compared with periods when online teaching was more dominant. Nevertheless, video-conferencing platforms remain useful for guest lectures, mentoring, collaborative activities and blended learning.

6.6 Online Libraries and E-Journals

Online libraries and e-journals have the lowest mean, at 0.15. This is a significant academic concern because scholarly digital resources are important for research, assignments and evidence-based learning. The finding suggests that institutions may need to strengthen awareness, orientation and hands-on training in the use of electronic scholarly resources.

VII. Challenges and Barriers

Challenge	Mean	Std. Deviation	Rank
Poor internet connectivity affects academic activities	3.19	1.074	1*
Financial constraints limit access to digital resources	3.19	1.096	1*
Lack of proper training to use advanced digital tools	3.16	1.085	3
Stress or distraction while using digital technologies	3.15	1.130	4
Language barriers restrict effective use of digital platforms	3.06	1.086	5
Difficulty due to lack of proper digital devices	3.01	1.122	6

The barrier analysis shows that poor internet connectivity and financial constraints jointly occupy the first rank, each recording a mean of 3.19. Lack of training ranks third with 3.16, followed by stress/distraction at 3.15. Language barriers record 3.06, while lack of proper digital devices records 3.01. All six means are around or above the midpoint of the five-point scale, indicating that barriers remain relevant for the respondents. □ filecite□turn0file0□L2108-L2264□

VIII. Results and Discussion

8.1 Internet Connectivity

Connectivity is one of the strongest barriers identified. A mean of 3.19 indicates that poor internet connectivity affects academic activities to a substantial extent. Reliable connectivity is fundamental to accessing online courses, submitting assignments, downloading materials and participating in digital communication. Institutions can respond through campus Wi-Fi improvement, access points and offline alternatives for essential learning materials.

8.2 Financial Constraints

Financial constraints also rank first with a mean of 3.19. Digital learning can involve expenses related to devices, connectivity, subscriptions, repairs and data usage. Institutions can reduce this barrier through device-support schemes, digital resource centres, subsidized connectivity and greater use of freely available educational resources.

8.3 Lack of Advanced Digital Training

Training is the third-ranked barrier at 3.16. This finding is particularly important because the availability of digital tools does not guarantee effective use. Students may need training in learning management systems, digital research, data tools, scholarly databases, presentation software and responsible AI use. Training should be continuous rather than limited to a single induction programme.

8.4 Stress and Distraction

Stress and distraction record a mean of 3.15. Digital environments expose students to notifications, entertainment content, multiple applications and information overload. Academic digital literacy should therefore include time management, attention management and responsible technology use. Students need strategies to separate academic and non-academic digital activities.

8.5 Language Barriers

Language barriers record 3.06. Digital content is often available in languages that may not match students' preferred learning language. Institutions can support multilingual resources, simplified explanations, translated learning materials and language-sensitive digital literacy training.

8.6 Device Availability

Lack of proper digital devices records the lowest barrier mean at 3.01 among the six challenges, but it remains above the neutral midpoint. This means device access continues to matter for a section of respondents. Shared device facilities, digital laboratories and loan schemes can provide practical support.

IX. Conclusion

The study provides evidence that higher education students rely most strongly on accessible and familiar digital resources such as Google Search, SWAYAM/NPTEL and Google Classroom. At the same time, the comparatively low use of online libraries and e-journals highlights an important opportunity for strengthening academic digital research skills. AI chatbots have entered the student digital-learning environment at a moderate level, creating a need for responsible-use guidance.

The barrier analysis demonstrates that digital transformation remains constrained by infrastructure and affordability as well as by training, language and digital well-being concerns. Poor internet connectivity and financial constraints are the most prominent challenges, while lack of advanced digital training is also significant. Higher education institutions should therefore move beyond simply providing digital platforms and focus on creating an inclusive digital learning ecosystem in which students have reliable access,

appropriate skills, academic guidance and support. The results suggest that digital transformation strategies should address four dimensions: infrastructure, affordability, capability and academic resource awareness. Infrastructure includes reliable connectivity and access to devices. Affordability includes support for students who face financial limitations. Capability includes digital literacy and advanced tool training. Academic resource awareness includes systematic promotion of scholarly databases and e-journals, Strengthen campus internet connectivity and provide reliable digital access points, Create or expand digital resource centers where students can access computers and online resources, Promote SWAYAM/NPTEL and other structured online learning opportunities, Conduct hands-on workshops on online libraries, e-journals and academic databases, Provide training on effective information search and evaluation, Develop responsible-use guidelines for AI chatbots and other AI-enabled tools, Offer multilingual and accessible digital learning materials, Introduce digital well-being and distraction-management sessions and Consider device-loan or support mechanisms for students facing access difficulties.

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