

Digital Access and Educational Engagement among College Students: Implications for Academic Achievement and Adjustment

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Abstract

Digital technologies have become an integral part of higher education. College students increasingly use smartphones, computers, internet services, digital libraries, learning-management systems, online classes, educational applications, and other digital resources as part of their academic lives. At the same time, access to these resources is not equally distributed. Differences in device availability, internet connectivity, affordability, digital literacy, access to learning resources, and students' ability to use technology meaningfully can influence their educational experiences. This paper examines digital access as a multidimensional aspect of higher education and discusses its possible implications for educational engagement, academic achievement, and adjustment among college students. The paper is conceptual in nature and draws on theoretical perspectives and recent literature on the digital divide, digital inclusion, educational engagement, online learning, academic outcomes, and student adjustment, with particular attention to the Indian context. The discussion suggests that digital access should not be understood simply as possession of a device or availability of an internet connection. Meaningful digital access also involves affordability, continuity and quality of connectivity, digital competence, appropriate educational resources, and the ability to use technology productively for learning. Educational engagement may provide an important link between students' digital opportunities and their academic experiences, while adjustment may become increasingly important as higher education incorporates technology into routine teaching and learning. Individual differences, including personality-related characteristics, may also influence how students respond to digital learning environments. The paper concludes that equitable digital education requires institutions to move beyond device provision towards meaningful, inclusive, and learner-centred digital participation.

Keywords: Digital access; digital divide; educational engagement; college students; academic achievement; adjustment.

1. Introduction

Digital technology has changed the way education is organised, delivered, and experienced. In higher education, students can now attend classes through digital platforms, access electronic books and journals, communicate with teachers and classmates online, submit assignments electronically, participate in virtual discussions, and use a wide range of digital resources for independent learning.

What was once considered an additional support to classroom teaching has increasingly become part of the everyday academic environment. This transformation has created new educational possibilities. Students can access learning materials beyond the physical boundaries of their institutions, revisit recorded lectures, communicate with teachers outside regular classroom hours, and explore academic resources from different parts of the world. Digital technologies can also provide flexibility to students who may not always be able to depend upon conventional classroom arrangements.

However, the expansion of digital education has also raised an important question: Do all students have the same opportunity to benefit from digital learning? The answer is not necessarily affirmative. Students differ considerably in their access to devices, quality of internet connectivity, financial capacity to purchase data and software, digital skills, availability of suitable study spaces, and familiarity with educational technologies. These differences become particularly important when digital resources are closely connected with academic participation. The issue is therefore not simply whether a student has a smartphone or internet connection. A student who attends an online class using a personal laptop and stable broadband connection may have a very different learning experience from another student who depends upon a shared smartphone and an intermittent mobile-data connection. Both students may technically be "connected", but their educational opportunities are not necessarily equivalent.

This broader understanding of digital inequality has developed considerably over the last two decades. Earlier discussions of the digital divide often concentrated on the distinction between those who had access to computers and the internet and those who did not. Subsequent research demonstrated that differences also exist in people's digital skills, patterns of use, and ability to derive meaningful benefits from technology (Hargittai, 2002; van Dijk, 2005). Warschauer (2002) similarly argued for a broader understanding of technology access in relation to social inclusion.

The issue has particular relevance in India because of the size and diversity of its higher-education system. The country's higher-education population includes students from different socioeconomic, geographical, linguistic, and educational backgrounds. The National Education Policy (NEP) 2020 recognises the potential of technology in education and emphasises equitable access to educational opportunities (Ministry of Education, Government of India, 2020).

The COVID-19 pandemic made these inequalities especially visible. When educational institutions moved rapidly towards online modes of teaching, students were required to depend upon digital devices and connectivity for academic participation. Research undertaken during and after this period highlighted differences in access, digital skills, learning experiences, and students' ability to adapt to technology-mediated education. The situation has changed since the emergency phase of the pandemic. Digital learning is no longer limited to emergency online classes. It has become increasingly integrated into blended learning, digital libraries, learning-management systems, online assessments, academic communication, and independent learning. Consequently, digital access should now be considered as part of the broader educational environment in which college students learn.

Against this background, the present paper examines digital access and its possible implications for educational engagement, academic achievement, and adjustment among college students. The paper is conceptual and does not present primary data. Its purpose is to bring together relevant theoretical perspectives and recent research and to develop a conceptual framework that may guide future empirical investigation.

2. Approach to the Review

This paper adopts a conceptual, narrative-review approach rather than an empirical design. Literature was selected to connect five strands relevant to the proposed framework: digital access and the digital divide; educational engagement; academic achievement; student adjustment; and individual differences. Foundational theoretical works were considered alongside recent peer-reviewed studies published mainly between 2020 and 2025, with particular attention to Indian higher education. The review is intended to identify recurring themes, clarify the relationships among the constructs, and develop propositions that can later be examined through primary data. Because the author's Ph.D. field study is still at the instrument-standardisation stage, no primary findings or statistical claims are presented in this paper.

3. Understanding Digital Access in Higher Education

3.1 From digital divide to meaningful digital access

The term "digital divide" initially referred primarily to differences in access to computers and internet connectivity. This material dimension remains important. Without an appropriate device or reliable connection, participation in technology-mediated education becomes difficult. Nevertheless, technological development has made it increasingly clear that physical access alone cannot adequately explain digital inequality.

Hargittai (2002) demonstrated that internet users themselves differ in their online skills. Two people may both have internet access but may not possess the same ability to search for information, evaluate online sources, navigate websites, or use digital resources effectively.

Van Dijk (2005) developed a broader perspective on digital inequality by distinguishing among different forms of access, including motivational, material, skills, and usage access. This approach is particularly useful in education because it draws attention to what students are able to do with technology rather than simply whether technology is available.

Warschauer (2002) also argued that access to information and communication technologies should be understood within the broader context of social inclusion. Technology becomes meaningful when individuals have the human, social, institutional, and educational resources required to use it effectively. Based on these perspectives, digital access in higher education may be understood through several interconnected dimensions:

Material access: availability of suitable devices such as smartphones, tablets, laptops, or computers.

Connectivity access: availability of reliable, continuous, and sufficiently fast internet.

Economic access: ability to afford devices, data, software, and other digital resources.

Digital skills: ability to search, evaluate, communicate, create, and learn through digital technologies.

Educational usage: ability to use digital resources for meaningful academic purposes.

These dimensions are not independent. A student may possess a smartphone but have limited educational access if the device is shared among family members, internet connectivity is unreliable, or the student does not possess sufficient digital skills. Digital access should therefore be understood as a multidimensional educational resource.

4. Digital Inequality and Educational Equity

Digital inequality is closely connected with broader social and educational inequalities. Students do not enter higher education with identical material, social, or educational resources. Family income,

geographical location, parental education, institutional infrastructure, previous exposure to technology, language, and digital literacy may influence students' opportunities to benefit from digital education. Helsper (2012) emphasised the relationship between social and digital exclusion, suggesting that inequalities in the social world and inequalities in the digital world can reinforce one another. This perspective is particularly relevant to higher education because students who experience socioeconomic disadvantages may also face greater difficulties in acquiring appropriate devices, maintaining connectivity, or developing digital skills. Indian evidence provides support for this concern. Jafar et al. (2023), studying access to online education in Tamil Nadu, documented differences associated with location and access to digital resources. Their findings illustrate that the expansion of online education does not automatically remove existing inequalities.

Similarly, Malla et al. (2024) examined digital learning, digital divide, and equity among Scheduled Tribe students in rural Kashmir and highlighted limitations in access to digital infrastructure among disadvantaged learners. Nivetha and Radha (2024) examined the rural–urban digital divide in undergraduate women's access to and use of social media platforms. Such evidence suggests that the digital divide in higher education is not simply a question of technological availability; it is also related to social location and educational opportunity. Jaiswal and Sarraf (2024), in their systematic literature review of digital exclusion in higher education, further highlighted the possibility that digital inequalities can reproduce wider socioeconomic inequalities.

These studies are important because they shift the discussion from "Who has technology?" to "Who is able to use technology effectively for education?"

This distinction is central to the present paper.

5. Digital Access in the Indian Higher-Education Context

India has made considerable progress in expanding digital infrastructure and digital educational resources. At the policy level, NEP 2020 recognises technology as an important instrument for improving educational access, teaching, learning, assessment, and institutional processes. At the same time, it acknowledges that digital inequalities need to be addressed if technology is to contribute to equitable education.

The importance of this issue is understandable given the scale of Indian higher education. Students enrolled in colleges and universities come from diverse socioeconomic and geographical backgrounds. Their experiences with digital education therefore cannot be assumed to be uniform. The COVID-19 period exposed many of these differences. Students who had personal devices, reliable internet connections, suitable study environments, and prior experience with digital learning were generally better positioned to participate in online education than those without these resources.

Bast (2021) examined students' experiences and perceptions of online education in India and discussed the relevance of digital access and inclusion in the transition towards online learning. Chalil et al. (2023) similarly reported that students experienced difficulties while adapting to online modes of education. Their work is particularly relevant to the present discussion because it draws attention to the adjustment dimension of technology-mediated learning. Jafar et al. (2023) provided further evidence of digital inequalities in access to online education in India, while Malla et al. (2024) highlighted challenges faced by disadvantaged students.

The significance of these findings extends beyond the pandemic. Digital resources continue to be used in higher education, although their role has changed. The challenge is therefore to ensure that the normalis-

ation of digital learning does not normalise digital exclusion.

6. Educational Engagement among College Students

Educational engagement refers broadly to students' involvement in learning and educational activities. It is not limited to classroom attendance. Fredricks, Blumenfeld, and Paris (2004) proposed three broad dimensions of engagement: behavioural, emotional, and cognitive.

Behavioural engagement concerns participation in academic activities, attendance, effort, and persistence. Emotional engagement concerns students' interest, enjoyment, sense of belonging, and emotional responses to learning. Cognitive engagement concerns investment in learning, strategic thinking, self-regulation, and willingness to understand complex ideas. This multidimensional understanding is important in digital education. A student may log into an online class but remain cognitively disengaged. Another may participate actively in online discussions, search for additional resources, and collaborate with classmates. Simply being present online therefore does not necessarily mean that meaningful engagement has occurred.

Kahu (2013) argued that student engagement in higher education needs to be understood from multiple perspectives and that the concept is closely connected with both educational processes and outcomes. Kahu and Nelson (2018) subsequently emphasised the educational interface through which student characteristics and institutional conditions interact to shape engagement.

This perspective helps explain why digital access alone cannot guarantee engagement. Students require opportunities, support, motivation, confidence, appropriate learning design, and meaningful interaction.

7. Digital Access and Educational Engagement

Digital access can influence educational engagement through several pathways. First, reliable access makes it possible for students to participate in online classes and academic activities. Students who experience frequent connectivity interruptions may have difficulty attending classes regularly or participating in discussions. Second, access to digital resources can broaden learning opportunities. Students may use electronic books, online journals, recorded lectures, educational videos, academic databases, and open educational resources. Third, digital skills may influence the quality of participation. A student who knows how to search academic databases and evaluate online information is in a stronger position to engage with learning than someone who struggles to locate or assess reliable resources. Fourth, device characteristics matter. A smartphone can provide useful access, but a laptop or desktop may be more suitable for activities such as academic writing, data analysis, presentation preparation, programming, or extended reading.

Recent international research reinforces this argument. Katz et al. (2021), in a large study of undergraduate students, found that difficulties with internet and device access were associated with challenges in remote learning. Getenet et al. (2024) examined digital technology attitudes, digital literacy, self-efficacy, and online learning engagement among first-year students. Their findings highlight the importance of digital competence and students' perceptions of technology in understanding engagement. Michikyan et al. (2025) examined relationships among digital access, connectivity, digital skills, engagement, and motivation among undergraduate students. This study is particularly relevant because it brings together several dimensions that are often examined separately. Taken together, these studies suggest that the relationship may be better represented as:

Digital Access → Digital Competence and Meaningful Use → Educational Engagement

rather than: Digital Access → Engagement

This distinction is important for educational policy. Providing a device without developing the student's ability and confidence to use it meaningfully may not produce the expected educational benefits.

8. Digital Access and Academic Achievement

Academic achievement remains an important indicator of students' educational progress. It may be reflected through examination performance, grades, grade-point averages, course completion, or other institutional measures. Digital access can potentially support academic achievement by expanding access to information and learning resources. Students can revisit instructional materials, search for supplementary information, practise through digital exercises, and communicate with teachers and peers. However, it would be too simplistic to assume that greater technology use automatically leads to higher achievement. The purpose of technology use is important. A device used to access academic resources may contribute differently to learning from the same device being used primarily for entertainment or social networking.

Wang et al. (2024), in a meta-analysis examining digital device use and academic performance, reported that the relationship differed according to the purpose and context of technology use. Educationally oriented use was associated with more favourable academic outcomes, whereas entertainment-oriented uses showed less favourable associations.

This suggests that the question should not be: How much technology do students use? but rather: How do students use technology, and under what conditions does that use support learning? Academic achievement is also influenced by many factors other than digital access. Prior academic preparation, motivation, teaching quality, socioeconomic circumstances, self-regulation, institutional support, and personality may all contribute to academic outcomes. Digital access should therefore be viewed as one component within a broader educational system.

9. Digital Access and Student Adjustment

College life requires students to adapt to new academic expectations, social relationships, institutional structures, and learning practices. Adjustment may involve academic, social, emotional, and personal dimensions. The increasing use of digital technology adds another dimension to this process. Students are expected to learn how to use learning-management systems, digital libraries, online communication platforms, electronic assessments, and other educational technologies.

For students who possess adequate digital resources and skills, technology may make adjustment easier. They can obtain information quickly, communicate with teachers, organise their learning, and participate in academic activities. For students who face technological barriers, however, digital learning can become an additional source of difficulty.

Chalil et al. (2023) highlighted difficulties associated with students' adaptation to online education in India. Jaiswal et al. (2024) examined college students' adaptation to synchronous distance learning and considered academic adjustment, sense of belonging, and perceived stress.

These findings suggest that adjustment deserves greater attention in discussions of digital education. The issue is especially important because technology-mediated learning often requires greater independence. Students may need to organise their schedules, manage multiple platforms, communicate digitally, monitor deadlines, and solve minor technical problems independently.

Consequently, digital access and digital competence may contribute not only to academic participation but also to students' ability to adjust to contemporary learning environments.

10. Personality and Individual Differences

Students do not respond to digital learning environments in exactly the same way. Even when two students have similar technological resources, their patterns of use, motivation, persistence, and engagement may differ. Personality is therefore relevant to the broader conceptual framework, although it is not treated as the central variable of the present paper. For example, conscientiousness is generally associated with organisation, persistence, responsibility, and goal-directed behaviour. These characteristics may be relevant when students are required to manage independent digital learning.

Mammadov (2022), in a meta-analysis of research on personality and academic performance, found a particularly consistent relationship between conscientiousness and academic achievement. Recent research focusing on university students has also continued to examine the relationship between Big Five personality characteristics and academic performance.

Chen et al. (2025) likewise synthesised evidence from university students and found that conscientiousness was the most robust Big Five predictor of academic performance, while also showing that some personality–achievement relationships vary by context.

This literature does not suggest that personality determines students' academic success. Rather, it indicates that individual differences may influence how students approach educational environments. For the present conceptual framework, personality may therefore be considered an individual-difference factor that could influence the relationship between digital access, engagement, academic achievement, and adjustment.

This issue would be particularly valuable for future empirical research.

11. Review of Recent Literature: 2020–2026

Recent literature provides a useful foundation for understanding the emerging relationship between digital access and student outcomes

Author(s)	Year	Main focus	Relevance to present paper
Bast	2021	Online education and digital inclusion in India	Indian context of digital learning
Katz, Jordan & Ognyanova	2021	Digital inequality and remote learning	Device and connectivity barriers
Rathee	2022	Educational inequality and online schooling in India	Digital access and participation inequalities
Jafar, Ananthpur & Venkatachalam	2023	Digital divide and online education in Tamil Nadu	Indian evidence on unequal digital access
Chalil, Hoque & Kumar	2023	Higher education during and after COVID-19	Student experiences and coping with online education
Getenet et al.	2024	Digital literacy, self-efficacy and engagement	Digital competence and online engagement
Jaiswal & Sarraf	2024	Digital exclusion in higher education	Systematic review of digital exclusion

Malla, Noor-ul-Amin & Malla	2024	Digital learning and equity in rural Kashmir	Disadvantaged students and digital equity
Nivetha & Radha	2024	Rural–urban digital divide	Undergraduate students and differential digital use
Wang et al.	2024	Digital device use and academic performance	Purpose and context of technology use
Jaiswal et al.	2024	Adjustment in synchronous distance learning	Academic adjustment and belonging
Michikyan et al.	2025	Digital access, skills, engagement and motivation	Integrated digital-inequality perspective

The literature does not present a single uniform picture. Instead, it points towards a complex relationship in which access, skills, use, engagement, and student characteristics interact. This complexity strengthens the case for a multidimensional conceptual framework.

12. Research Gap

The recent literature establishes that digital inequality remains relevant in higher education. However, several areas require further attention.

First, earlier research often treated digital access primarily in terms of device ownership or internet availability. Contemporary digital environments require a broader understanding that includes connectivity quality, affordability, digital literacy, and meaningful educational use.

Second, much Indian research on digital education was generated during the COVID-19 period. That literature remains valuable, but higher education has now moved beyond emergency online teaching. Digital technologies have become part of blended and routine educational practices. There is therefore a need to examine digital access in the post-pandemic higher-education environment.

Third, research on digital access and educational engagement is growing, but the relationship between access and engagement is not always considered alongside academic achievement and adjustment.

Fourth, academic achievement and adjustment are often examined as separate outcomes. An integrated approach could provide a better understanding of students' overall educational experiences.

Fifth, individual differences such as personality have received comparatively less attention within digital-access frameworks. Students may differ in how they organise their learning, respond to technological difficulties, seek assistance, and regulate their digital behaviour.

Finally, there remains a need for research that specifically examines these relationships among college students in the Indian context using multidimensional measures of digital access.

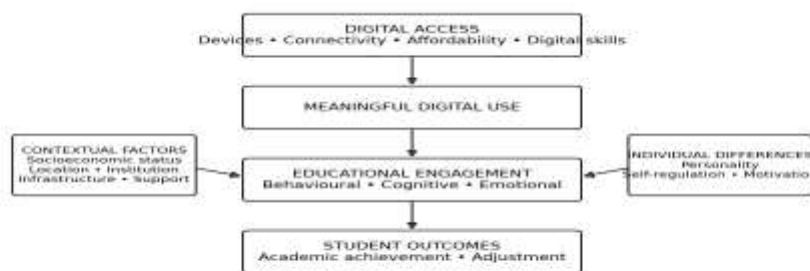
The present paper addresses this conceptual gap by bringing together digital access, educational engagement, academic achievement, adjustment, and individual differences within a single framework.

13. Conceptual Framework

The framework proposed in this paper draws upon the digital-divide perspectives of Hargittai (2002), van Dijk (2005), and Warschauer (2002), together with the student-engagement perspectives of Fredricks et al. (2004), Kahu (2013), and Kahu and Nelson (2018).

The framework begins with the assumption that digital access is multidimensional.

Figure 1. Proposed conceptual framework



Proposed relationship: access creates opportunities; meaningful use and engagement shape how those opportunities are translated into educational experiences.

The framework should not be interpreted as claiming a simple or automatic causal relationship between digital access and academic achievement. Instead, it proposes that digital access creates conditions and opportunities for participation. The educational value of these opportunities depends on students' digital skills, the quality of their usage, institutional support, and individual characteristics. Educational engagement is therefore positioned as an important connecting mechanism.

14. Educational Implications

The discussion has several implications for colleges and universities.

14.1 Digital inclusion should go beyond device distribution

Providing students with devices is important, particularly for those from economically disadvantaged backgrounds. However, device distribution alone cannot ensure meaningful digital inclusion. Institutions should also consider connectivity, affordability, maintenance, software access, and technical support.

14.2 Digital literacy should be treated as an educational skill

Students need more than basic computer knowledge. They should be supported in developing academic digital literacy, including:

- searching academic databases;
- evaluating online information;
- using digital libraries;
- managing digital files;
- communicating academically online;
- using productivity and presentation tools;
- understanding digital safety; and
- using emerging technologies responsibly.

14.3 Institutions should provide reliable digital infrastructure

Reliable campus internet, computer facilities, digital libraries, learning-management systems, and technical support can help reduce inequalities in educational participation.

14.4 Digital pedagogy should promote engagement

Technology should not simply reproduce lecture-based teaching through a screen. Digital learning activities should encourage interaction, discussion, collaboration, reflection, problem solving, feedback, and independent learning.

14.5 Student adjustment should be considered

Students may need orientation and continuing support when institutions introduce new digital systems.

Academic advising and student-support services can help students manage technology-mediated learning.

14.6 Rural and disadvantaged students require particular attention

Policies should recognise that students from rural areas and disadvantaged socioeconomic backgrounds may face different barriers. Flexible access to learning resources, device-lending programmes, downloadable materials, and campus facilities can help address these difficulties.

14.7 Individual differences should not be ignored

Students vary in confidence, motivation, self-regulation, learning preferences, and personality. Digital education should therefore provide multiple opportunities for participation rather than assuming that all students will respond to technology in the same way.

15. Implications for Future Research

The conceptual framework developed here can be tested through empirical research among college students. Future studies may examine the relationship between:

Digital Access → Educational Engagement → Academic Achievement

while also examining: Digital Access → Adjustment

and considering personality and other individual differences. Future researchers should use reliable and valid measures of digital access and should distinguish between:

- availability of technology;
- quality of connectivity;
- affordability;
- digital skills;
- educational use; and
- meaningful engagement.

Research may also compare students according to:

- rural and urban background;
- government and private institutions;
- socioeconomic status;
- discipline;
- undergraduate and postgraduate level;
- gender;
- digital literacy; and
- institutional support.

Longitudinal research would also be valuable because it could examine changes in digital access and educational outcomes over time rather than relying only on a single point of measurement. For researchers developing their own instruments, proper procedures for expert validation, pilot testing, reliability estimation, and standardisation should be followed before the main study.

16. Limitations of the Present Paper

The present paper has several limitations. First, it is conceptual and does not contain primary data. Therefore, the relationships proposed in the framework should not be interpreted as empirically established causal relationships.

Second, the literature reviewed includes studies conducted in different countries and educational contexts. Findings from one setting cannot automatically be generalised to all Indian college students. Third, a substantial part of the recent literature emerged from the COVID-19 period. Although this research remains important, the conditions of emergency remote education differed from the more established digital and blended-learning environments now emerging in higher education. Fourth, digital technology continues to develop rapidly. Artificial intelligence, generative AI, adaptive learning systems, and other technologies are introducing new questions about digital access, digital competence, and educational equity. Finally, personality is included in the conceptual framework as an individual-difference factor, but its relationship with digital access, engagement, academic achievement, and adjustment has not been empirically examined in this paper.

17. Directions for Future Empirical Research

The conceptual discussion provides a foundation for empirical investigation among college students in India. A future empirical study can examine whether students with greater and more meaningful digital access demonstrate higher levels of educational engagement and whether engagement is associated with academic achievement. At the same time, adjustment can be examined to understand whether students' ability to access and use digital resources is related to their adaptation to technology-mediated academic environments.

Personality can also be incorporated into the research model to determine whether individual differences are associated with students' patterns of digital engagement and academic experiences. Such research would be particularly useful if it employs standardised and reliable instruments and includes students from different institutional and socioeconomic backgrounds. Importantly, future empirical research should avoid assuming that digital access automatically produces better educational outcomes. Instead, it should examine how, when, and for whom digital access becomes educationally meaningful. This question may be more useful for education policy than simply measuring the number of students who possess a digital device.

18. Conclusion

Digital technology has become an important part of contemporary higher education, but access to technology does not automatically translate into equal educational opportunity. The central argument of this paper is that digital access should be understood as meaningful educational access rather than mere technological ownership. A student needs an appropriate device, reliable connectivity, affordable services, adequate digital skills, accessible educational resources, and the ability to use these resources productively.

The literature also suggests that educational engagement provides an important link between digital opportunities and student learning. Students who are able to participate actively, think deeply, communicate, collaborate, and regulate their learning may be better positioned to benefit from technology-mediated education. Academic achievement is another important outcome, but the relationship between technology and achievement is not straightforward. The purpose and quality of digital use matter considerably. Technology used for academic learning may provide opportunities for achievement, whereas excessive or poorly regulated non-academic use may not produce the same benefits. Adjustment deserves equal attention. As digital technologies become embedded in higher

education, students must adapt to new forms of communication, learning, assessment, and academic organisation. Unequal digital access may make this adjustment more difficult for some students.

The role of individual differences, including personality, should also be recognised. Students approach technology-mediated learning differently, and these differences may influence engagement, self-regulation, academic achievement, and adjustment. For India, the issue is particularly significant because the higher-education system serves a large and diverse student population. Digital education can expand opportunities, but it can also reproduce existing inequalities if access is uneven. Therefore, the goal of digital education should not simply be to place technology in students' hands. The larger goal should be to ensure that students have the resources, skills, support, and confidence required to use technology meaningfully for learning.

The conceptual framework proposed in this paper brings together digital access, educational engagement, academic achievement, adjustment, personality, and contextual factors. It can provide a useful theoretical foundation for future empirical research among college students in India and, more broadly, for educational policies aimed at making digital higher education more inclusive and equitable.

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