



Influence of Artificial Intelligence (AI) in the Online Learning Environment: a Study on Higher Education Students

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Abstract

Artificial intelligence and online learning technology acceptance positively impact users of e-resources. In the current scenario, the benefits of the teaching and learning process help achieve learning benefits among higher education students. This study aimed to learn about the influence of artificial intelligence (AI) on students' learning outcomes and the use of e-resources for creative growth in online learning environments. The results of the study with 103 university students at two higher education institutions in India show their attitude and learning behaviour towards AI and online learning, student engagement, and learning outcomes. Data for this study was acquired through an online Google form for a survey. This survey revealed various aspects of the benefits of AI technology in the educational process, with a vision to improve learning quality, availability, and cost-effectiveness to achieve learning outcomes in the online learning environment. However, this study has certain limitations, such as the fact that the research was conducted in a university context among all the education levels of students, and future studies should be conducted in specific subject backgrounds. The other limitation of this study is that a quantitative method has been used through a survey to investigate students' engagement and learning outcomes in the online learning environment. Future research will employ qualitative methods through interviews and observation that investigate student engagement and motivation to use e-resources for learning outcomes.

Keywords: Artificial intelligence, e-resources, online learning, higher education, learning outcome, student engagement

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1. Introduction

The swift advancement of science and technology over recent decades has paved the way for enhancements across numerous domains. One notable area of progress is the judicious application of AI technologies, which has ushered in numerous innovations in education. AI and expansive models of languages have been meticulously crafted and introduced for both public and corporate utilization. While these advancements have unfolded independently, the adoption of AI-driven field applications in spanning education, science, business, the arts, and entertainment has surged rapidly (c et al., 2024). The attitude towards e-learning mediates the links between student motivation and engagement. This shows that the structure of educational environments can significantly impact the quality of learning experiences (Ferrer et al., 2022). Students' emotional involvement is based on their sense of connection and support from teachers and individuals within the virtual educational environment, which includes connectivity and interactivity. On the other hand, social engagement refers to relationships with teachers and peers that are facilitated by quick faculty input and technology-mediated interactions.

The utilization of social networking and sharing information skills has been indicated to enhance students' academic success. Additionally, engaging with social networking facilities enhances learning outcomes, making the insights valuable for learners, educators, and institutions of learning looking to improve their educational achievement (Shafiq and Parveen, 2023). Reflections from students can inform the development of educational strategies aimed at bolstering student engagement in the online higher education environment. The incorporation of technological advances into the process of education can improve the skills of learners, understanding, attitudes, and motivation.

Still, the gap between student engagement and behaviour instructional practices continues to be mostly unresolved. While students can engage with educational content anytime, anywhere using online platforms, technological barriers may hinder access for students without essential tools like laptops, internet connections, scanners, or cameras. Students identified several drawbacks of distance learning, including the absence of live communication with teachers and classmates, challenges in time management, and insufficient familiarity with technology. Interestingly, the study revealed that young people are more motivated by social influences in terms of online learning. This research aims to create and appreciate the processes that connect student engagement to the learning outcomes of higher education students in online learning environments using AI.

2. Research Model and Hypotheses

Figure 1 shows the theoretical framework proposed for this research work. The researcher aimed to explain how the use of AI and online learning affects student engagement, motivation, and attitude, which impact other variable learning outcomes either directly or indirectly. For the present study, the following hypotheses have been formulated, which guided the investigator to achieve the survey objectives.

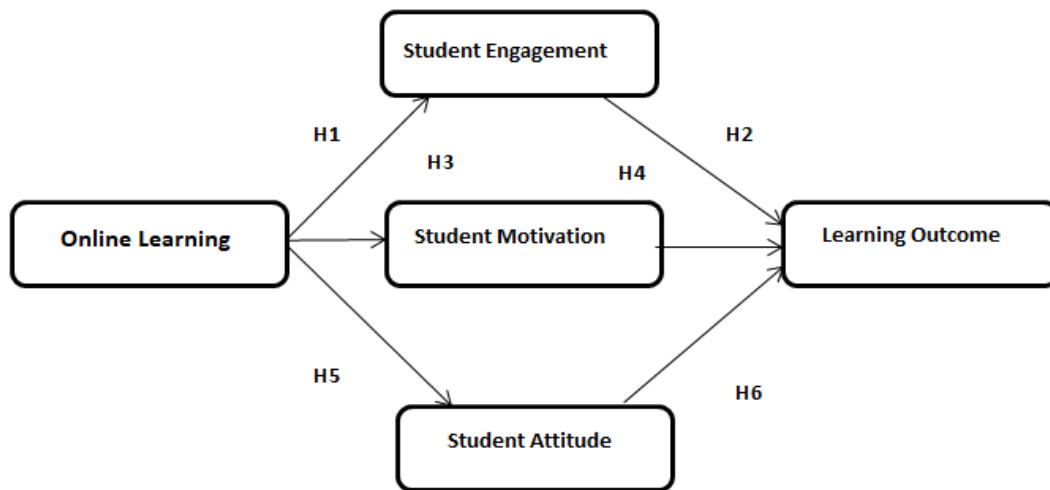


Figure 1: Proposed research model

3. Online Learning

The incorporation of AI and machine learning technologies into online learning platforms has been shown to significantly enrich the incorporation and efficacy of the learning process. In the realm of online learning, it is crucial to prioritize responsiveness in system features to ensure continuous attention to students. Adequate IT support plays a pivotal role in fostering student motivation to actively engage in the online learning process (Singh et al., 2024). Students exposed to a novel learning method in the group participating in the experiment displayed more ability and enthusiasm to interact with the information, leading to improved vocabulary learning than the control group, which used traditional approaches (Jedi-Sari-Biglar and Liman-Kaban, 2023). Learning outcomes extend beyond traditional measures and encompass improved cooperation, heightened interest in learning, and cooperative abilities to solve problems.

4. Student Engagement

Student engagement was characterized by themes such as excitement, enjoyment, instructor support, motivation, and emotional security, while behavioral engagement encompassed efforts, time spent on tasks, attendance, active participation, and positive behavior (Salhab and Daher, 2023). Encouraging student engagement involves fostering communication with instructors and peers, and designing online courses to be interactive, appealing, and motivating. The intervention group had an improved experience with the application in comparison to the control group. It exhibited higher usage rates, was perceived it as more useful, and reported greater satisfaction compared to the control group. The use of mobile technology in education has been shown to improve engagement among learners and academic results in educational institutions (Anuyahong and Pucharoen, 2023).

H1: There is an extensive connection between online learning and student engagement

H2: In online learning, student engagement positively affects students' learning outcome

5. Student Motivation

Motivation is a factor that needs special attention and is not guaranteed either in a traditional classroom or in a virtual classroom. Moreover, the grass is not all green when it comes to virtual learning. Screen boundaries in virtual classrooms have resulted in teacher-student relationships being more robotic than the more personal kind in traditional classes (Gupta and Chopra, 2022). The presence of an online educator increases students' exam performance, engagement with the course content, and satisfaction with acquiring knowledge. Furthermore, the visual qualities of teaching entities in online learning environments have an independent impact on student motivation and academic performance (Shiban et al., 2015). The usefulness of communication can be measured using a variety of venues, including social media. Learning analytics can use data from extra-curricular endeavors and unorganized behaviors, as well as organized behaviors of learners like assignment completion and exam performance.

H3: Online learning has a positive association with student motivation

H4: Student motivation in an online learning environment positively affects students' learning outcome

6. Students' Attitude

Learners' attitudes towards independence contribute to their engagement with e-mentors. Those who take initiative in their own learning tend to interact more with their mentors, appreciating the flexibility offered by online learning (Omar et al., 2012). Accessibility of utilization, favorable perceptions around technological advances, social implications, expected value, psychological or behavioral influences, reduced perceived hazards, and minimal stress all contribute to a favorable mindset and use of online learning (Abdaljaleel et al., 2024). Students' beliefs regarding the usage of mobile devices in the classroom are highly favorable and they especially value the convenience of having rapid access to educational resources and materials for the course. Improved peer and instructor communication contributes to higher academic achievement, and mobile learning fosters the development of a computer system, critical, and taking observations skills, among other skills.

H5: There is a significant relationship between online learning and student attitudes.

H6: Student attitude positively affects the learning outcome during online learning

7. Learning Outcome

In addition to the opinions of students on the online learning environment and academic performance, students' technology acceptance for online learning also affected their perceptions of online learning and course satisfaction (Wei & Chou, 2020). Both educators and students acknowledge the negative impact of frequent movements within and outside the campus, including in classrooms, labs, and libraries, on long-term academic performance (Hossain et al., 2022). Students benefit from effective utilization of learning resources, while educators can leverage this information, such as learning patterns, to anticipate performance. The integration of MOOCs with traditional classrooms requires adjustments to the workload, evaluation procedures, and learning objectives. The effort of students should be taken into consideration, especially in light of prior knowledge and any language obstacles; for those who don't speak English well, the actual workload is frequently greater than that which is formally claimed for MOOCs (O'Connor, 2014; Bralić and Divjak, 2018).

8. Method

This study was conducted within two prominent higher education institutions in Jharkhand, India, encompassing diverse age groups and genders. This institution was chosen due to its robust integration of technology to enhance learning experiences. A Google form link was shared among university students, including undergraduates, postgraduates, and PhD candidates. In this survey a total of 103 valid responses of the questionnaire were collected and prepared for analysis according to the conceptual model outlined in Figure 1. The demographic analysis of the sample revealed a composition of 75% females and 25% males. Regarding age distribution, 63% fell within the 15–25 years age group, while 28% were aged 26–35, with the remaining 5% aged 36-45 years, and 4% were aged 46 and above. Analysis of educational attainment indicated that 50% of respondents were undergraduates, 43% were postgraduates, and 7% were PhD scholars, as detailed in Table 1.

Table 1: Demographic profile

Items	Description	No. of responses	%
Gender	Female	77	75
	Male	26	25
Age	15 - 25 years	65	63
	26 - 35 years	29	28
	36 - 45 years	5	5
	46 years and above	4	4
Education level	Undergraduate	51	50
	Post Graduate	44	43
	PhD	8	7

9. Data Analysis

In this study, a questionnaire was used to collect data. The investigator has selected all received 103 responses for analysis of data. With this moderate rate of response, the data then were structured, classified, tabulated, and managed, considering different variables. The analysis of the present study is reflected in the different tables in the succeeding pages. In the present study, Microsoft Excel was employed as statistical tools for data analysis. Microsoft Excel is commonly known for its versatility and widespread use in various applications. While it is often utilized for basic tasks such as working with tables and simple calculations, its capabilities extend to more advanced functions such as financial decisions, statistical analyses, database management, graphical representation of data, and optimization and

mathematical modelling (Jablonsky, 2014). It serves as a powerful tool for conducting sophisticated statistical analyses in data analysis processes.

10. Results and Discussion

10.1. Frequency of using e-resources

Most of the respondents, i.e., 65%, were accessing e-resources daily, 21% respondents used e-resources twice a week, 8% respondents used them occasionally, and 6% respondents said that they were using e-resources once a week. The resulting responses are shown in Figure 2.

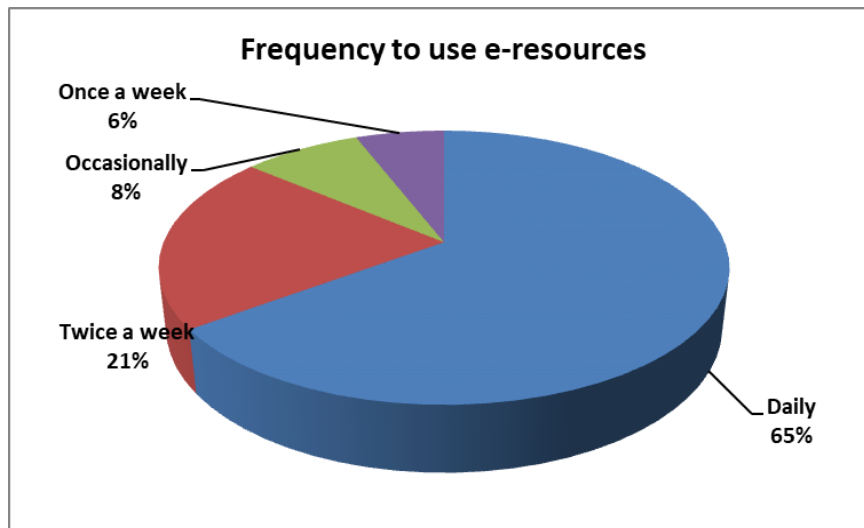


Figure 2: Frequency of using e-resources

The integration of online technology in higher education is steadily deepening. Similar to traditional face-to-face settings, student motivation and engagement remain crucial for their learning experience in the online environment (Ferrer et al., 2022). Several influential factors, including students' awareness levels, the types of e-learning technologies employed and perceived use and usefulness play crucial roles in determining how students utilize and accept e-learning devices (Edumadze et al., 2022). In summary, the study findings offer compelling evidence supporting the influence of AI and online learning technologies on enriching the engagement of students and their learning achievements. Therefore in this study majority of the students preferred to access e-resources daily. The analysed data reflected in Figure 2, shows that 63 (65%) students were accessing e-resources daily. Thus, the above data supports the hypothesis 1 and, therefore, it's proved true.

10.2. Time spent daily on e-resources

Table 2: Time spent daily on e-resources

Time spent daily on e-resources	No. of responses	Percentage %
1 - 2 hours	46	45
3 - 5 hours	31	30
More than 5 hours	15	15
Less than 1 hour	11	10

Table 2 reveals that the majority of respondents, 46 (45%), accessed e-resources for 1-2 hours, followed by 31 (30%) who utilized them for 3 - 5 hours. Additionally, 15 (15%) respondents utilized them for more than 5 hours, while 11 (10%) stated using e-resources for less than 1 hour, daily.

This study underscores the potential of online learning platforms, which consistently influence student engagement and motivation, thereby enhancing learning outcomes in higher education settings. The adoption of online learning in education has established favorable results across diverse contexts. Prior research has highlighted numerous benefits associated with the incorporation of online learning technologies into higher education (Rawashdeh, 2021). Notably, existing literature often examines e-learning adoption from an organizational viewpoint rather than an individual one. Many studies employ various technology adoption models to assess attitudes toward online learning, capturing respondents' personal opinions and approaches concerning different features of online learning (Kimiloglu et al., 2017; Ferfolja et al., 2020).

The respondents mostly access e-resources daily at least 1-2 hours. The analysed data reflected in the table 2, shows that 46 (45%) respondents were accessing e-resources 1 – 2 hours, 31 (30%) respondents using e-resources 3 - 5 hours in a day. So the above data shows the hypothesis 2 is correct.

10.3. Purpose of using e-resources

Table 3: Purposes of using e-resources

Purposes of using e-resources	No. of responses	Percentage %
For study and education	103	29
To update knowledge	92	26
To improve the learning process	80	23
To seek assistance in studies and research	63	19
Others	9	3

Table 3 illustrates that most of the respondents utilize e-resources primarily for study and educational purposes, with 29% respondents indicating so. Additionally, 26% respondents use e-resources to update their knowledge, 23% to enhance the learning process, and 19% to seek assistance in studies and research. A small portion of respondents, 3%, reported using e-resources for other purposes.

In contemporary society, electronic devices such as laptops, tablets, and smartphones have become indispensable, transforming communication and entertainment systems (Chang et al., 2021). Particularly, smartphones have evolved beyond communication tools to serve as mini-computers. However, the educational advantages of mobile devices remain largely unexplored, especially in less developed educational contexts such as those found in the Middle East. While some countries have successfully integrated mobile devices into their educational frameworks, there exists substantial untapped potential (Khan et al., 2015). Although this study highlights the promising facets of online learning platforms in higher education, there remains considerable area for further optimization. To effectively compete with Western industrialized nations, developing countries must undergo a fundamental shift in their perception of education's value and improve the provision of teaching and learning. Moreover, strong support from other nations is crucial in this endeavor (Richter & McPherson, 2012; Koshy et al., 2023).

The respondents mostly use e-resources for the purpose of study and education. From Table 3, the data indicates purpose of using e-resources for study and education is 29%, and 26% students use e-resources to update knowledge. So the above data shows the hypothesis 3 is correct.

10.4. Benefits of using e-resources

Table 4: Benefits of using e-resources

Benefits of using e-resources	No. of responses	Percentage %
Enhanced searching and browsing capabilities	86	23
Convenience	86	23
Time and space-saving	81	22
Mobile friendly	67	18
Efficient and rapid communication	54	14

In Table 4 it has been shown that the majority of the respondents, 23%, said that the benefits of using e-resources are to enhance searching and browsing capabilities, and convenience, 22% respondents said that the use of e-resources saves their time and space, 18% respondents said that it is mobile friendly, and 14% respondents said that use of e-resources is more beneficial and efficient in rapid communication.

To harness students' enthusiasm and leverage the benefits of mobile learning in higher education institutions, educators should develop their teaching approaches (Criollo-C et al., 2021; Bearman et al., 2023). The positive impacts of IoT technologies on education are evident from the consequences analyzed, fostering discussions on their benefits (Defranco & Laplante, 2020; Littman-Ovadia & Freidlin, 2022). These findings demonstrate significant progress in e-learning within the academic realm and highlight the advantages of addressing potential challenges for the seamless integration of current technologies in education. Both educators and institutions aiming to adopt novel methodologies in their teaching-learning processes can find value in these findings. The majority of the respondents said that the benefits of using e-resources are enhanced searching and browsing capabilities, and it is convenience too. In Table 4, the data indicates views and opinions of respondents that benefits of using e-resources enhanced their searching and browsing capabilities and convenience i.e. 23%. So the above data shows the hypothesis 6 is proved true.

10.5. Devices used for accessing e-resources

The analysis of devices used for accessing e-resources indicates that the majority of respondents, 44%, utilize mobile devices, followed by 32% who use laptops, 11% who access e-resources via desktop computers, 8% who employ other devices, and 5% who opt for tablets, as represented in Figure 3.

Moreover, the involvement group displayed higher mean course grades and consistent test scores, affirming the optimistic influence of the online learning approach on student academic performance. These results align with prior studies illustrating the effectiveness of online learning platforms in improving academic outcomes (Anuyahong & Pucharoen, 2023; Zhang et al., 2021). In summary, this study provides compelling evidence supporting the usefulness of online learning platforms in bolstering student engagement and learning achievement. Future research endeavours could explore avenues for optimizing online learning platforms to further enhance student academic achievement, in addition to

examining the scalability and sustainability of integrating technologies used in higher education in online learning environments.

Most of the respondents use mobile devices for accessing e-resources. The result of the survey indicates in Figure 3, that majority of the respondents 44% were use mobile and 32% respondents use laptop, for accessing e-resources. So the hypothesis 5 is proved true.

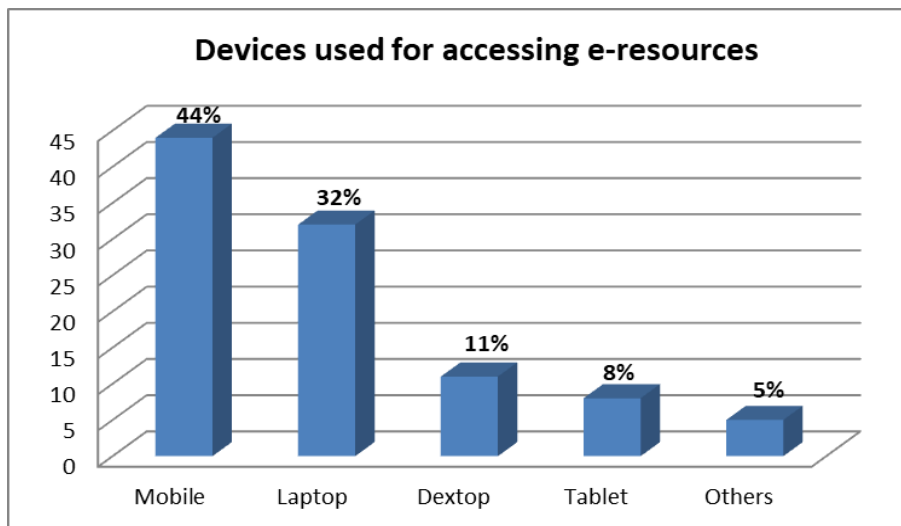


Figure 3: Devices used for accessing e-resources

10.6. Primary location for accessing e-resources

Most of the participants, i.e., 37%, accessed e-resources from home, 29% respondents used e-resources from the library, 16% respondents used them from their respective departments; and the rest of the respondents said that they were using e-resources from anywhere, which are departments, libraries, hostels, homes and others. The resulting responses are shown in Figure 4.

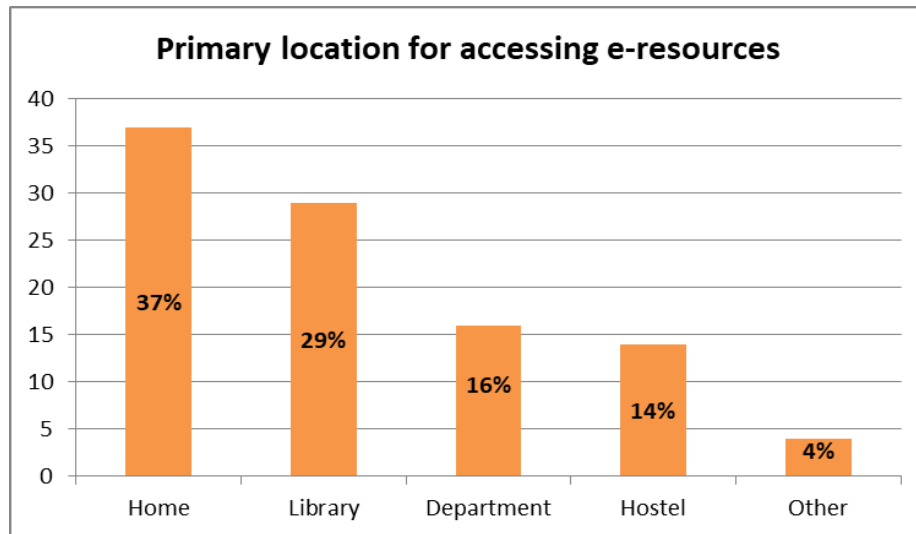


Figure 4: Primary location for accessing e-resources

The pandemic accelerated the adoption of e-learning modalities like hybrid and mixed learning in university curricula. With most teaching and learning done online, educators and students are exploring students' perceptions of e-learning (Kozlova & Pikhart, 2021). Additionally, attitudes toward e-learning have shaped the dynamic between intrinsic and extrinsic motivation, influencing engagement. This underscores the potential for well-designed online learning environments to enhance overall learning experiences (Lazaro & Duarte, 2023). In conclusion, this study provides support for the efficiency of e-learning and the use of e-resources to improve student's academic achievement through a positive attitude. Online learning platforms improve student learning achievement, as well as investigate the usability of e-learning technologies in higher education.

10.7. Challenges encountered in accessing e-resources

Table 5: Challenges encountered in accessing e-resources

Challenges	No. of responses	Percentage %
Insufficient availability of e-resources	60	31
Slow internet	48	25
Lack of technical knowledge	44	22
Inadequate infrastructure	44	22

In Table 5 it has been shown that most of the respondents, i.e., 31%, said that the challenges faced in using e-resources are due to the insufficient availability of e-resources, 25% respondents said that they face challenges due to slow internet, and 22% respondents said that

they face challenges due to a lack of technical knowledge, and inadequate infrastructure to use e-resources.

While the strategies delineated are tailored to the education domain, they may serve as broader solutions for challenges encountered in various sectors, such as manufacturing. Common concerns like data security, contextual comprehension, and personalized instruction are prevalent across institutions and industries (David et al., 2024; Donelan & Kear, 2023). Although our current assessment draws from existing research, our discoveries offer avenues for future investigations. Therefore, future research endeavours could discover approaches to address these challenges and ensure the continued sustainability of online learning involvement in the higher education system. In summary, this study contributes to the expanding body of literature highlighting the advantages of AI and online learning among students of higher education.

There are many challenges encountered in accessing e-resources by students. The analysed data reflected in the table 5, shows that 31% students face challenges in using e-resources is due to insufficient availability of e-resources, and 25% respondents face challenges due to slow internet. So the result shows that hypothesis 4 is not correct.

11. Limitations of the Study

This study advocates for the utilization of technology to enhance learning outcomes among higher education students. Such a finding is uplifting for students, educators, and policymakers as it suggests that technology-driven initiatives can effectively bolster the development of higher education students. However, this study has certain limitations. First, the limited sample size prevents the generalization of results and calls for a broader academic population to validate findings. Nonetheless, it serves as an initial step for future research endeavors. However, due to time constraints for completing this research, certain limitations are imposed: This study exclusively encompasses higher education institutions. The geographical scope of this research is limited to the Jamshedpur city only.

12. Conclusion and Future Research

Understanding students' perceptions regarding e-learning quality in hybrid learning modes is crucial for academic institutions. This study identified objectives, emphasizing the importance of comprehending students' perceptions and preferences to optimize the e-learning process. Exploring the factors that influence online learning acceptance, consistency,

and academic results in online environments is vital for successful technology integration in education and maximizing its benefits. Factors such as student engagement, motivation, attitude, and learning outcomes were found to influence technology adoption and acceptance of e-resources, shedding light on student perceptions and experiences.

The study suggests that adoption and continuity intentions vary based on factors such as system attitude and usefulness for adoption, while experience and satisfaction drive continuity intentions. Literature also indicates that learning outcomes are influenced by factors like self-efficacy, collaborative learning, engagement, self-regulation, and interest. Moreover, this study explored the influence of AI and online learning platforms on student engagement and academic outcomes in higher education. The findings revealed the perceived utility of e-learning platforms and satisfaction with their utilization of e-resources. Notably, students reported a favorable experience with e-resources, utilizing the platform more often and finding it increasingly beneficial, resulting in heightened satisfaction. Additionally, higher education students demonstrated positive effects on engagement and academic performance through the adoption of online learning platforms. In essence, these results highlight the constructive influence of online learning platforms on student engagement and academic achievements in higher education.

Moreover, it might be beneficial for future research endeavors to delve into the impacts of technology-based instructional methods. Exploring instructional approaches that integrate e-learning techniques could provide valuable insights into students' perceptions and experiences with e-resources. To augment existing knowledge, several suggestions are proposed for future investigations:

- The current study focused on only three demographic variables. Subsequent research could consider incorporating a broader range of socio-demographic variables, such as the rural-urban background of learners, family income, and the educational level of parents.
- Future studies should encompass learners, teachers, and parents from various departments in both rural and urban high schools, offering a more comprehensive understanding of the subject.
- Additionally, further research could be conducted with a more extensive research sample spanning different countries, enabling a broader examination of the subject matter.

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