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AN EXAMINATION OF THE CONVENTIONAL AND ONLINE LEARNING MODELS IN COMPUTER SCIENCE IN NORTHERN INDIA

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Abstract
The education system in Northern India has undergone a radical transformation, partly due to the growth of e-learning, which has acquired enormous momentum throughout the present pandemic. The conventional and online learning models in the field of computer science are examined in this paper. In the past, bridging educational gaps has been largely accomplished by non-transitional educational practices including part-time and distance learning, which were first developed in southern India universities. To reach remote students, creative strategies including radio broadcasts were used. On the other hand, the northern state of Rajasthan pioneered the idea of open universities with a purpose of raising literacy rates without onerous requirements. Accredited courses are introduced as a result of the fast computerization of Indian companies and growing demand of qualified computer specialists.
A change from radio to television broadcasts for lectures, notably in computer literacy, was also seen during this period of transition. Traditional, closed learning environments with set schedules have transformed into open, web-based environments that provide students with unmatched flexibility. This study examines the effects of online learning on employability and knowledge enhancement in Northern India while taking into account variables like age, locality, and educational background. In general, e-learning has transformed education in Northern India, overcoming regional limitations and giving a wide range of learner's access to high-quality instruction in the digital age.
Keywords: Online, Conventional, e-learning, learners, Northern India.

Introduction

Amidst the ongoing pandemic, e-learning has emerged as the prevailing and rapidly expanding domain, witnessing a surge in its popularity. Consequently, a multitude of online courses are being introduced on a weekly basis, catering to the educational needs of universities, institutions, and schools (Mishra et al. 2020). The prevalence of online schooling has increased in contemporary times. Online courses are beneficial for students with varying backgrounds, including those from other areas, states, and even countries.
The inception of non-traditional (part-time, distance learning) courses within universities emerged as a means to facilitate education for individuals who are unable to follow conventional courses due to various factors, such as geographical distance, time constraints, or societal circumstances. The universities at the forefront of implementing distant learning courses were located in the southern region of India, including Anna University, Annamalai University, and Madurai Kamraj University(Bozkurt et al., 2020). Delivering educational content to pupils in remote locations poses a significant challenge due to its sensitive nature. In the 1980s, certain universities also implemented the practice of disseminating lectures via radio broadcasts. Another concept that emerged was that of Open Universities, where there was no requirement for prior education as a prerequisite for enrolling in the available courses. The Kota Open University in the northern state of Rajasthan was the pioneering institution to introduce the concept of Open University (Bhatnagar, 1997). The primary objective of this initiative was to enhance the literacy rate throughout the state, given its historically low levels of literacy.
The advent of computerization in the banking and industrial sectors has created new opportunities for individuals seeking employment. Evidently, there has been a noticeable rise in the demand for proficient computer operating personnel. Consequently, there emerged a demand for accredited courses. The shift in lecture broadcasting from radio to television occurred with the establishment of the Indra Gandhi National Open University in New Delhi. Several courses were initiated to appeal to a range of disciplines, including Vocational, Arts, Science, and Engineering. In this context, our

primary focus revolves around the computer literacy classes. The process of acquiring knowledge in the field of Information Technology (or Computer Science/Application) has evolved from conventional, restricted modes of learning to inclusive, web-based platforms, and has also made significant contributions to research endeavors. By closed learning, we imply the traditional courses that were launched; when the student enters a course with specified hours and years to successfully finish it to gain a certificate or degree at a specific place such as a school, college, or university. Online learning offers a significant degree of freedom, allowing students to finish courses without being bound by attendance requirements or fixed timing schedules. Online learning courses offer numerous advantages, although they also have certain drawbacks (Lei & Gupta, 2010; Dhawan, 2020).

Online learning can be categorized into two main modalities: synchronous and asynchronous (Shahabadi & Uplane, 2015).Synchronous learning refers to a form of instruction that involves real-time engagement of students in the learning process through the utilization of the Internet. Typically, the utilization of several tools is included in this process, including but not limited to: - Online chat platforms - Audial and video conferencing technologies - Allocation of data and applications - Shared whiteboard functionalities - Implementation of a "hand raising" indicator - Collaborative programming of multimedia presentations and live slide shows. Asynchronous learning leverages the time-delayed capabilities of the Internet. The system encompasses a variety of technologies, including but not limited to: electronic mail (e-mail), threaded discussion platforms, as well as newsgroups and bulletin boards, File attachments Asynchronous courses maintain instructor involvement but do not adhere to real-time management, allowing students and teachers to engage in course-related activities at their own convenience rather than during scheduled class sessions. In contrast to synchronous learning, asynchronous courses offer a more flexible approach to learning, as they do not require a predetermined schedule or real-time interaction. This technology enables students and mentors to derive advantages from its use regardless of their location or the time of day (Shahabadi & Uplane, 2015).

Online learning modules

The Indian education system was also adopted in accordance with the eligibility of the education applicants, although it is progressing very slowly. On the worldwide level, Open Software Systems has long been highly well-liked. However, the number of pupils has increased as a result of the explosive expansion in internet users, particularly on smartphones and other portable devices. We can look at the pioneers in providing open courses appropriate for Indian students, NPTEL, SWAYAM, and IIT Spoken Tutorials (Krishan, 2022).

Through collaborative efforts, the NPTEL created a number of video courses based on the syllabus (109 existing courses compressed into digital visual format, 129 web-based e-courses and 110 new courses), which were then approved by 7 (seven) IITs, IISc Bangalore as Partner Institutions (PI), and numerous other prestigious institutions as Associate Partner Institutions (API). The main goal of NPTEL is to develop the greatest learning materials available for the students of engineering institutes around the nation by learning about high-quality ICT technologies (Dutta, 2016). For the first time, all IITs and IIMs advocated working together to raise the bar of management, engineering, and scientific education throughout the regions by offering modules through VCTEL. SWAYAM is a program that the Indian government launched with vigor. Its goal is to achieve the three key tenets of the education plan: access, equity, and quality. Bringing top teaching-learning resources is the key goal. Courses that are offered through SWAYAM are free for students to take, and upon successful completion of the course for a low price, students are registered and given a certificate. Public Portal (NPTEL, Swayam, and IIT Spoken Tutorial) offers computer science courses including Introduction to Internet of Things, Software Engineering, C, C++, Cloud Computing, Data Base Management System, etc.

The Indian government has launched yet another project. To participate in the DIGITAL INDIA project and encourage the use of FOSS (Free Open Source Software), however, it needs assistance from the main institutions in the nation. In order to reach students and institutions and promote

FOSS, the IITs have begun using the spoken tutorial approach. It succeeded in achieving the expected results. The National Mission on Education through Information and Communication Technology (ICT) launched The Spoken Tutorial project as part of the "Talk to Teacher" program on January 26, 2010, according to the Ministry of Human Resources and Development of India. When animation and narrative are provided side by side, learning is more effective. In 2011, the IIT spoken tutorials began offering their services. Since 2011, there have been 68729 training/workshops held for 3514891 individuals in 3770 institutions across India. The manner that the students enroll at the school, receive entrance to the normal course, and finish the tutorials while being supervised by a local trainer and receiving online assistance makes the IIT spoken tutorials' learning methodology distinctive. The fact that they do not need to set aside additional time after regular lectures for practice at home or in a hostel is a benefit, as is the fact that the courses offered are in sync with the regular courses they are expected to complete in a given year or semester. As a result, using free software to conduct practical exams gives both students and the institute benefits. There are also no costs associated with hardware licensing, online training assistance, etc., and the IIT spoken tutorials do not require the appointment of any supervisors at the learning place. At the central location, the master trainers are monitoring the enrolled pupil online. The main objectives of these initiatives are to recruit all of the nation's top professors into the field of online education; record their lectures, seek their collaboration with IITs/IISc, and make their courses available to the general public under a free and open source agreement.

3. Literature Survey

E-learning, according to **Michal Baczeket al.** (2021), was extremely important in the Covid-19 pandemic crisis. Both knowledge and social skills can be greatly improved by it. The majority of students approved of this method of instruction in this circumstance. With online learning, students may actively engage with the curriculum while also receiving feedback.

Bhatt and Maniar (2017) found that schools that don't know how important E-learning is, are always at a loss and don't know what to do. E-learning is now considered to be a necessity for modern education in Indian colleges and universities in order to meet worldwide standards and draw in reasonably priced overseas students. Therefore, the subjects and courses must be chosen in a way that will allow them to meet the demands of every student as well as the worldwide standards. A teacher-free classroom has gained popularity in higher education. Technology-based learning makes it possible to access the entire world of knowledge.

Msomi (2016) came to the conclusion that the universities and other higher education institutions profit from e-learning in the educational system. The way that people teach and learn has undergone a paradigm shift. The teaching and learning process employs cutting-edge techniques. Both the teaching and learning processes are addressed by the e-learning techniques and materials. The learners should find it simple to revise and update the content. The key determinants of the success of e-learning are faculty and student satisfaction.

E-learning is not new, according to **Singh and Kaur** (2015), but it has evolved like the World Wide Web in every nation. E-education is the practice of delivering instruction and training online. India is home to a diverse range of pupils from various socioeconomic backgrounds. These factors are very tough to change, but we can offer web-based learning that is a consistent teaching-learning resource. Higher education institutions must overcome numerous obstacles to integrate e-learning. Despite these difficulties, interactive information delivery made possible by e-learning circumvents the limitations of conventional resources. It offers a flexible setting for the students to develop the habit of independent study. Many organizations, including IGNOU, NCERT, EKALAVYA, NPTEL, and others, are making great efforts to popularize e-learning by offering e-textbooks, econtent, and interactive animations to teach high-quality learning material. Every type of student can benefit from elearning by doing it from home.

In India, **Upasana** (2014) talked about both traditional and online education. In traditional education, there is just one means for the teacher to communicate with the students. For students who want to speak with the gurus in person, it is more advantageous. Traditional education offers knowledge and

skills, and it is affordable for all socioeconomic groups. It makes the learner productive for their own well-being and the welfare of others. On the other hand, e-learning is a term used to describe teaching and learning for individuals of all levels using networking and communications technology, although it requires a significant amount of infrastructure facilities. For both students and teachers to function effectively in an online environment, they must both have at least a basic understanding of computers. Through e-learning, we may learn at our own pace and on our own schedule, but it also demands more self-discipline and self-direction than traditional education does. It also involves writing abilities, navigational skills, and the capacity to create knowledge utilizing digital technology.

In their study, **Iqbal and Islam** (2013) came to the conclusion that e-learning and knowledge management improve one's own and an organization's knowledge skills. But compared to an e-learning course, knowledge management is a more recent and relevant activity. E-learning is currently out of date. Therefore, e-learning and KM both need to work in tandem by feeding content into e-learning to make it more current, and learners were to be plugged into a sustainable knowledge after completing the course, as well as e-learning should be fed to KM by giving an easy mechanism for organizing information. If a significant impact on the learning process was tested by combining these two technologies.

Siddiqui and Masud (2012) mentioned e-learning in their article. The learning process was made possible by the use of current ICT. In today's interconnected world, learners seek an innovative approach to information acquisition that is both convenient and online. The way in which students can meet their needs is through e-learning. The best approach to strengthen the higher education system is through e-learning, which also makes it easier to distribute lectures and other information in outlying locations. The use of a mobile web application benefits the pupils.

Dighe (2010) investigated how ICT might be used to boost literacy innovation. The area where literacy is lacking had neither experts nor active participation in technical maintenance. One of the nations that uses ICT sparingly is Egypt. ICT has emerged as a crucial technique for delivering fundamental skills in adult education. It is a potent strategy for improving literacy and numeracy levels. Additionally, it offers enticing ways to learn utilizing a computer, multimedia, and the internet. ICT allows for the efficient, interactive, self-paced, and flexible delivery of adult education. The quality of education as well as the knowledge of adult learners has changed in some ways thanks to ICTs and media like newspapers, radio, television, computers, and so forth.

4. Objective

The main goal of this study is to evaluate how well subscribers' employability and knowledge might increase as a result of using online learning platforms. Studies focusing on evaluation-related difficulties, especially from the viewpoint of the students, are ironic in the context of online learning. The location of residence, education level, and age are also highlighted in this study as they affect subscribers and are examined together with service quality and other OLLP elements.

5. Research Questions

The popularity of IIT's speaking tutorials, NPTEL, and SWAYAM's online recruitment drive demonstrate their resounding success. It is clear that students who have already started college are choosing online education in addition to the traditional methods of instruction. The question at hand is how this will affect the way that education is delivered.

6. Research Methodology

In this study, there are two different research methodologies applied. In the initial stage, specific attributes were discovered and validated by literature review and content analysis using a qualitative survey. The OLLP system services that featured specific OLLP system projects that were made available for students to view and use were the subject of the content analysis. A list of attributes from the OLLP system for several Indian states in the north was analyzed. The result from the first phase is used in the second phase to create a clear questionnaire that was sent to students in Haryana,

Himachal Pradesh, Jammu, Punjab, and cities like Chandigarh and Delhi to gather their replies. Students in graduate and postgraduate programs were asked to rate how important they thought the traits were in the context of the OLLP system. The main goal of this survey was to collect qualitative information to determine which characteristics should be taken into account by the OLLP system, hence addressing the study questions. To gain a deeper understanding of the OLLP system implementation, a well-defined questionnaire was distributed to persons from various degree colleges, engineering institutions, and universities, including graduate and postgraduate students. In total, 350 students from the northern area of India, with a range of educational backgrounds, including graduate and post-graduate degrees, and ages, were part in the survey. This questionnaire contains eleven elements (Q1-Q11) that measure the OLLP system's performance, features, and overall quality. The questions in Table 1's surveys are denoted by the abbreviations (Q1-Q11).

Table 1: Items in Questionnaire 1

Item	Statement
Q1	The OLLP system is user-friendly.
Q2	The OLLP provides assistance via an interactive conversation system known as a chatbot.
Q3	The OLLP system has a level of simplicity that renders it easily executable.
Q4	The utilization of OLLP proves to be advantageous in comprehending the topic at hand.
Q5	The OLLP promptly addressed the concerns of its subscribers.
Q6	OLLP data can be obtained regardless of the technical constraints imposed by hardware or software.
Q7	The OLLP platform provides a range of formats for data, text, audio, video, and power-point presentations.
Q8	The OLLP (Online Learning Platform) has been developed with a focus on addressing the needs and preferences of students.
Q9	The Online Learning Platform (OLLP) provides users with hyperlinks that direct them to external resources.
Q10	The OLLP undergoes ongoing amendments in accordance with the specific demands of students.
Q11	The OLLP system places emphasis on subjects that are exclusively taught at a specific university.

Table 2: Correlation for student’s satisfaction

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Q1	1.00										
Q2	0.74	1.00									
Q3	0.61	0.86	1.00								
Q4	1.00	0.75	0.59	1.00							
Q5	0.19	0.03	0.17	.24	1.00						
Q6	0.25	0.27	0.31	0.26	0.28	1.00					
Q7	0.72	0.93	0.76	0.69	0.08	0.18	1.00				
Q8	0.36	0.37	0.41	0.36	0.07	0.21	0.29	1.00			
Q9	0.34	0.06	0.32	0.37	0.16	-0.03	0.04	0.41	1.00		
Q10	0.22	0.41	0.34	0.18	0.23	0.01	0.61	0.11	0.00	1.00	
Q11	-0.21	-0.19	-0.11	-0.22	-0.03	-0.21	-0.30	-0.11	-0.07	-0.01	1.00

The observed correlation coefficient between item 1 and item 2 is 0.74, indicating a strong positive linear relationship. Similarly, the correlation coefficient between item 2 and item 3 is 0.86, suggesting a moderate positive linear association. The computed value of Cronbach's alpha is 0.84. The value is quite elevated. The reliability of this source is widely acknowledged, despite the presence of a poor correlation coefficient in certain individual items. The quantity of items, namely eleven, in this inquiry is deemed satisfactory according to statistical analysts. It is evident that there is a positive correlation between the amount of items and the predicted rise in reliability.

Table 3: Cronbach's alpha of OLLP parameters for student’s satisfaction

	raw_alpha	std. alpha	G6(smc)	average_r	S/N	alpha se	var.r	med.r
Q1	0.73	0.83	0.91	0.28	4.2	0.059	0.061	0.24
Q2	0.72	0.82	0.91	0.28	4.1	0.061	0.055	0.23
Q3	0.75	0.84	0.93	0.29	4.3	0.063	0.063	0.24
Q4	0.73	0.83	0.92	0.29	4.2	0.060	0.064	0.24
Q5	0.77	0.85	0.93	0.34	5.5	0.049	0.077	0.32
Q6	0.71	0.83	0.89	0.28	4.00	0.061	0.079	0.23
Q7	0.75	0.81	0.92	0.29	5.1	0.063	0.059	0.24
Q8	0.80	0.85	0.95	0.35	5.6	0.060	0.082	0.28
Q9	0.78	0.84	0.92	0.35	5.3	0.051	0.069	0.28
Q10	0.76	0.82	0.91	0.31	5.2	0.054	0.073	0.26
Q11	0.82	0.85	0.94	0.35	5.6	0.046	0.074	0.31

The correlation coefficient, which is below 0.36, suggests that the inclusion of the item in the scale may not be warranted. The potential cause for the observed low value could be attributed to the interdependence of certain questions within the questionnaire, while others exhibit independence. Therefore, Cronbach's alpha is solely regarded as a measure of reliability. The frequently accepted threshold for the conventional Cronbach alpha value in this particular scenario is 0.70. The coefficient for the aforementioned elements is determined to be 0.84, with a level of confidence of 95%. The table presents the shown reliability of the data obtained from the act of dropping an object. If one item is removed, the coefficient will remain within the range of 0.80 and 0.85. Therefore, it is unnecessary to exclude any variables from the inquiry in order to enhance the dependability of the data.

In a separate inquiry, the assessment of the online educational platform is conducted using a 5-point Likert scale to gauge its effectiveness in providing efficient services that aid respondents in enhancing their skills. The questionnaire consists of a total of twelve items, two of which are designed to measure OLLP enables the streamlined provision of impactful skill-based services, aiding students in attaining supplementary certifications and aligning with their individual interests.

Table 5: Items in Questionnaire 2

I-1	Throughout the entire program, the course runs quite smoothly.
I-2	The OLLP facility is designed for online use.
I-3	The OLLP offers new and improved services.
I-4	OLLP's services pay close attention to the needs of the students.
I-5	In OLLP, the service is directly explained to the learners in clear, understandable terms.
I-6	The OLLP offers the in-depth/complex questions on the subject.
I-7	The OLLP system's services and courses are entirely satisfactory to students.
I-8	The tasks, tests, and content are modified in response to student requests.
I-9	Course curriculum and assignments are revised on a regular basis.
I-10	Accessible course material enhances the knowledge.
I-11	The ideas and abilities are practical and satisfy both the needs of academia and industry.
I-12	OLLP offers courses that follow the university's syllabus.

Table 6: Cronbach's alpha for efficient delivery of services

	raw alpha	std. alpha	G6(SMC)	average_r	S/ N	alpha se	var. r	med. r
I-1	0.80	0.82	0.97	0.24	4.3	0.03	0.66	0.41
I-2	0.79	0.80	0.92	0.21	4.1	0.02	0.61	0.37
I-3	0.76	0.79	0.96	0.18	3.9	0.11	0.75	0.48
I-4	0.79	0.80	0.93	0.23	4.2	0.12	0.53	0.32
I-5	0.76	0.78	0.90	0.20	3.7	0.07	0.85	0.56
I-6	0.81	0.82	0.93	0.24	4.4	0.09	0.48	0.29
I-7	0.77	0.79	0.92	0.19	4.0	0.22	0.78	0.50
I-8	0.81	0.82	0.91	0.23	4.3	0.16	0.56	0.34
I-9	0.81	0.81	0.92	0.22	4.3	0.18	0.64	0.39
I-10	0.79	0.80	0.91	0.21	4.0	0.15	0.41	0.20
I-11	0.81	0.83	0.93	0.26	4.9	0.19	0.44	0.22
I-12	0.82	0.83	0.94	0.24	4.7	0.2	0.72	0.46

At the 95% level of confidence, the coefficient is 0.82 for these items. The Table displays the data's dependability when an item is dropped. In the event that any component is removed, the coefficient stays between 0.76 and 0.83. In order to maximize the trustworthiness of the data, it is not necessary to omit any items from the query.

The following five-point Likert scale is used in an ANOVA test to see whether the respondent's age, location, and qualification have any significant effects on the services, content, and quality of the response:

- The OLLP system is user-friendly.
- OLLP system aids in a complete knowledge of the topic at hand.
- In OLLP, the learner receives the service immediately and in a language they can understand.
- The course material's concepts and skills are thorough and acceptable for employment.
- Students receive satisfaction from their certificates.

Table 7: ANOVA Results

	User-friendly	**Aid in knowledge**	**Understandable services**	**Thorough and acceptable content**	**Satisfaction form certificates**
Age (Younger vs Older)	F(350)= 9.22, p<0.01	F(350)=13.59, p<0.01	F(350)= 8.563, p<0.01	F(350)= 9.364, p<0.05	F(350)= 7.963, p<0.05
Place (Urban or rural)	F(350)= 18.3866, p<0.01	F(350)= 17.866, p<0.01	F(350)= 8.19, p<0.01	F(350)= 11.225, p<0.05	F(350)=9.222, p<0.05
Qualification (Multiple levels)	F(350)= 36.58, p<0.05	F(350)= 44.556, p<0.05	F(350)=55.32, p<0.05	F(350)=61.563, p<0.05	F(350)=45.236, p<0.05

The ANOVA test yielded statistically significant variations in individuals' perceptions, as determined by their age, place, and level of qualification. The F-statistic is presented alongside the degrees of freedom (df) in parenthesis, followed by the p-value that denotes the level of significance.

Results and Discussion

The data is gathered via both online and offline modes using a questionnaire. Data on location, age, and qualifications is gathered in order to assess the experiences of users with the portal's services, namely in terms of appearance and content. The analysis summary is being replicated as presented below.

- A discrepancy in viewpoints regarding the feasibility of the task was noted among respondents belonging to various age cohorts. It has been observed that younger generations have a

greater proficiency in navigating internet platforms and comprehending subjects through technological mediums compared to their older counterparts.

- The survey also indicates that respondents from various age groups hold differing perspectives regarding the adequacy of the content provided by the online learning portal for enhancing employability, as well as the issuance of certificates upon completion of online courses offered by the portal.
- In terms of location, respondents exhibit a greater concern regarding the issuance of certificates upon course completion for the purpose of employability, compared to other factors. Additionally, the younger generation expresses a higher level of concern in comprehending the course content for employability, particularly when it is presented in a clear and straightforward manner through online learning portals, as opposed to older individuals.
- The analysis also revealed a divergence in perspectives among respondents from various age groups. Specifically, it was found that the younger generation exhibits a greater level of anxiety regarding the issuing of a certificate upon course completion, as it relates to employability, compared to older individuals.
- There exists a discrepancy in the viewpoints of respondents from various geographical places regarding the functionality of the online learning platform. Individuals residing in metropolitan areas tend to find it convenient to utilize internet platforms and exhibit a greater inclination towards comprehending subjects through technological means compared to their counterparts.
- There are differences in respondents' perceptions of the online learning portal's usability and effectiveness in helping them understand the topic at hand across a range of educational backgrounds. Respondents residing in metropolitan areas have a greater level of proficiency in navigating internet portals compared to individuals residing in non-urban areas.
- The findings of the study indicate that respondents with different levels of qualifications hold divergent viewpoints regarding the adequacy of utilizing plain and simple language in the content of the online learning portal, particularly in relation to its effectiveness in enhancing employability. The potential factors contributing to this phenomenon include geographical location, cultural differences, varying levels of literacy, and disparities in comprehension.
- The majority of respondents expressed agreement with the utilization of clear and concise language employed by the online learning platform, as compared to alternative options.
- Respondents with varying educational backgrounds and residents of various locations expressed varying opinions regarding issuing certificates for courses taken through online learning portals. Geographically, participants exhibit a higher level of concern over the provision of credentials upon course completion, specifically in relation to enhancing their employability, compared to other factors.

Conclusion

In conclusion, this research provides insights on the changing educational environment in Northern India, with a specific focus on the field of Computer Science. The global pandemic has expedited the implementation of online learning, granting students unparallel flexibility and enhanced access to instructional materials. The digital transitions owe its origins to the historical backdrop around non-traditional learning methodologies, including remote education and Open Universities. The growing dependence of sectors on technology has resulted in a significant increase in the need for computer-related skills. Consequently, this has prompted the emergence of authorized online courses to cater to this demand. Our study has investigated the effects of online learning on employability and knowledge acquisition, taking into account factors such as age, geographical location, and educational qualifications. The results underscore the considerable impact of online learning in addressing educational disparities and empowering a heterogeneous student body. In the context of Northern India, it is imperative for educational institutions and governments to persistently adopt digital education, while prioritizing inclusivity and adaptability to cater to the evolving requirements of learners.

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