Impact of Reformation in Teaching Methods on Higher Education: A Comparison of Online and Traditional Learning Methods

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With an emphasis on a comparison of online and traditional learning approaches, this study investigates the effects of modified teaching strategies on higher education. Universities have adopted a variety of instructional methodologies in recent years due to shifting educational paradigms and technological breakthroughs. This study compares online and traditional classroom environments to assess efficacy, student engagement, learning outcomes, and overall academic performance. A representative sample of students from several institutions from Gujarat were used to gather data through questionnaire. The quantitative analysis reveals disparities in academic accomplishment, motivation, and resource accessibility between the two modes. Results show that traditional classrooms are better at promoting engagement and interpersonal skills through in-person interaction, even while online learning provides flexibility and wider access to resources. In the end, the study proposes that a hybrid model that combines the advantages of both approaches would provide a more complete way to address a range of educational needs. The comparative analysis's conclusions offer educators and policymakers a useful foundation for improving Gujarat's higher education system's calibre and accessibility.

Keywords: Distance education and online learning, Gender studies, Media in education, Mobile learning, Pedagogical issues, Reformed Teaching Methods, Online Learning vs Classroom Learning, Impact of Digital Education, Traditional vs Digital Pedagogy.

1. Introduction

There has been a push for reformation in teaching methods due to the advancement of technology and research in education. Traditional teaching methods have been in place for centuries, but with the advancement of technology and research in education, there has been a push for reformation. Tools that make use of information and communication technology (ICT) are gaining more and more significance in the field of education due to the fact that they have the potential to improve the educational experience for both students and instructors. Learning Management Systems (LMS), Educational Software, Multimedia Tools, Tools for communication, Online Libraries & Database, Virtual Classrooms, Educational Mobile Apps,

Web Conferencing Tools, Social-Media are some of the most frequently used forms of ICT in education. 2020 will be remembered as a turning point year. Everything has changed, including how children and university students attend classes. Many teachers and students have faced issues as a result of the abrupt shift to online teaching, ranging from a lack of internet access to finding the right tools to overcome the limitations of online learning. Educators at all levels tried tools and programmes during these months until they selected their favourites. National Digital Educational Architecture (NDEAR), PM eVidya Program, Diksha, Swayam, Swayam Prabha, ePathshala Portal, Nishtha, Olabs, Virtual Labs are some of the initiatives of Indian Government for online education. Along with these, the government has started other digital programmes, such as Shiksha Vani, which encourages people to listen to radio, the Central Board of Secondary Education's (CBSE) podcast, sign language content on the National Institute of Open Schooling (NIOS) website/YouTube and Digitally Accessible Information System (DAISY), which helps people who are deaf or blind access special e-content, as well as Free Open-source Software for Education (FOSSEE).

Objectives

1.   To assess the accessibility of ICT infrastructure in educational institutions for both male and female students.

2.   To analyse and compare the learning experiences of male and female students in online and traditional education methods.

2. Literature Review

The literature analysis has been conducted to examine three different delivery modes, taking into account the utilization of information and communication technology (ICT). One method of instruction involves utilizing information and communication technology (ICT) equipment such as personal computers, laptops, and projectors inside the confines of an educational institution, without the need for internet connectivity or a network. ICT technologies play a pivotal role in facilitating the efficient delivery of content. Another approach is utilizing information and communication technology (ICT) resources, including leveraging the internet and network infrastructure inside the educational institution. This method includes delivering educational content through the utilization of search engines, animation, graphics, and web-based communication platforms. Another approach involves utilizing web-based apps that have been tailored to suit the individual course being taught.

Impact of Digital and Blended Learning on Academic Performance

Gupta, M., & Laur, B. (2017), Discusses the positive impact of digital teaching on student performance and engagement. [7] Phalachandra, B., & Krishnan, D. (2011), Highlights the effectiveness of blended learning in enhancing critical thinking, problem-solving skills, and engagement. [14] Kelaskar, P., & Gupta, D. (2019), Acknowledges the advantages of mobile-based and online learning over traditional methods. [9]

Accessibility and Flexibility of Digital Learning

Kothari, I. R., & Kotecha, D. (2018), Examines the benefits of digital learning in terms of accessibility and personalized pacing. [10] Vasantha, S., & Thanji, M. (2020), Focuses on

flexibility, ICT infrastructure, and student satisfaction in digital learning environments. [18] A, S. K., & Sundar, P. V. (2017), Addresses engagement challenges in online learning and emphasizes the importance of tracking to prevent dropout. [1]

Role of Digital Media in Student Satisfaction and Decision-Making

Kirpalani, R. S. A. C., & Kumar, M. (2021), Discusses the influence of online information and user reviews on student decisions for enrolment. [09] Ranu, S. K., & Garelli, G. (2017), Recommends the use of educational networking on social media to enhance knowledge acquisition and engagement. [15]

Technological Integration in Higher Education

Paila, A., D, & Pillai, A. (2020), Emphasizes the importance of ICT in maintaining high-quality management education. [13] Lodi, A. K., & Tripathi, B. (2020), Recommends active learning strategies with digital support for enhanced academic outcomes in secondary education. [11]

Ethics, Curriculum Restructuring, and Teacher Perceptions

Marian, P., & KURIAKOSE, L. (2019), Highlights the need for ethical guidelines and digital literacy within the curriculum. [12] C, N. P., & Femi, J. (2019), Examines the disparity between teachers' perceptions of technology's importance and the challenges they face in implementation. [2] Rathod, V. R., & Chauhan, J. (2017), Discusses ethical instructional design principles essential for developing effective e-learning materials. [16]

Challenges in Digital Education Acceptance and Alignment

D, B. S. R., & B, N. (2017), Explores the growing acceptance of online education by employers, especially if offered by prestigious institutions. [3] Verma, D., & Kaushik, M. (2020), Highlights the need for vertical and horizontal alignment among stakeholders to ensure successful adoption of digital learning. [19]

3. Research Methodology

The research adopts a quantitative research design to systematically analyse the impact of ICT tools and e-learning on higher education. Primary data collection included structured surveys to assess ICT infrastructure, time management, social interaction, motivation, concentration, feedback, academic performance, and student engagement. Standardized, quantified data allowed robust statistical analysis. The study targets approximately 12,00,000 students enrolled in higher education institutions across Gujarat, as indicated by the AISHE report. A statistically sufficient sample of 530 students was chosen to capture group differences. With a 95% confidence level and 5% margin of error, a power analysis showed that 384 responses were needed to make the sample size robust. A random sampling technique was employed to maintain the sample's representativeness across gender, academic discipline (science, arts, commerce), and educational level. The primary data were collected through structured questionnaires with 40 statements covering; ICT infrastructure availability and accessibility, Time management skills, Learning style preferences (online vs. traditional), Personal attention, motivation and concentration, Engagement and resource availability, Interaction and

socialization opportunities, Quality of content, and Academic performance. Semantic Differential Scale questions (1 = poor to 5 = excellent) captured nuanced data on student satisfaction, engagement, and learning outcomes. Quantitative data analysis used XLSTATE and SPSS. The main statistical methods were: ICT infrastructure and student experiences were summarized using frequencies, means, and percentages.

Inferential Statistics: T-tests contrasted gender, learning mode, and traditional and online learning results. Additionally, frequency and cross-tabulation analysis were employed to understand trends and predict results.

Data Analysis and interpretation

Availability of ICT Infrastructure

The purpose of this study is to determine whether or not male and female students at educational institutions have equal access to ICT infrastructure, identify plausible causes of observed discrepancies, and evaluate the effect on academic performance.

1. H_0: There is no significant difference in the accessibility of ICT infrastructure between male and female students in educational institutions.

2. H_1: There is a significant difference in the accessibility of ICT infrastructure between male and female students in educational institutions.

Table.1 (2 Sample "t" Test)

Male-298 / Female - 232	Mean	Std. deviation	t (Observed value)	|t| (Critical value)	p-value (Two-tailed)
Computers & Laptops	3.379	1.295	0.478	1.964	0.633
	3.328	1.149			
internet Access	2.721	1.412	-0.640	1.964	0.522
	2.797	1.278			
Learning Software	3.245	1.265	-0.007	1.964	0.995
	3.246	1.175			
IT Hardware	3.309	1.228	1.583	1.964	0.114
	3.147	1.091			
Technical Support	3.477	1.274	0.673	1.964	0.501
	3.405	1.124			
Learning Management System	3.366	1.238	-0.897	1.964	0.370
	3.461	1.184			
Video Conferencing Tool	3.403	1.328	-1.347	1.964	0.179
	3.552	1.176			
Social Media Platform	3.594	1.271	-1.327	1.964	0.185
	3.737	1.179			
Apps for Learning	2.399	1.350	-4.024	1.964	0.0000655
	2.858	1.235			
Digital Library	2.812	1.350	-1.626	1.964	0.104
	3.000	1.279			

From the above table the fact revealed that there is no significant difference in availability of ICT Infrastructure at educational institute between male & female, (p>0.05) except Apps for Learning. Therefore, Null hypothesis is accepted except Apps for Learning.

Table.2 Frequencies (Apps for Learning)

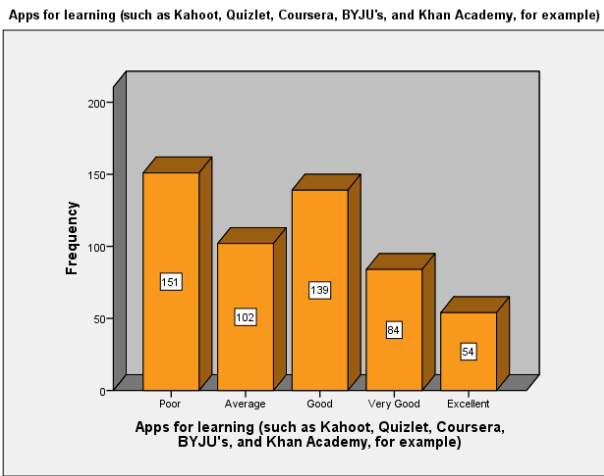| Apps for learning (such as Kahoot, Quizlet, Coursera, BYJU's, and Khan Academy, for example)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	151	28.5	28.5	28.5
	Average	102	19.2	19.2	47.7
	Good	139	26.2	26.2	74.0
	Very Good	84	15.8	15.8	89.8
	Excellent	54	10.2	10.2	100.0
	Total	530	100.0	100.0	

Figure.1 Frequencies (Apps for Learning)

The frequency analysis reveals that 52.3% of students gave a good to excellent rating and 47.7% gave a poor to average rating, indicating that over half of students think the learning app selection and accessibility is inadequate. The large number of poor to average evaluations suggests that learning applications need to enhance their availability, diversity, and functionality to satisfy student expectations.

Table.3 Crosstabulation (Apps for Learning)

Apps for learning (such as Kahoot, Quizlet, Coursera, BYJU's, and Khan Academy, for example) * Gender Crosstabulation				
Count				
		Gender		Total
		Male	Female	
Apps for learning (such as Kahoot, Quizlet, Coursera, BYJU's, and Khan Academy, for example)	Poor	112	39	151
	Average	49	53	102
	Good	72	67	139
	Very Good	36	48	84

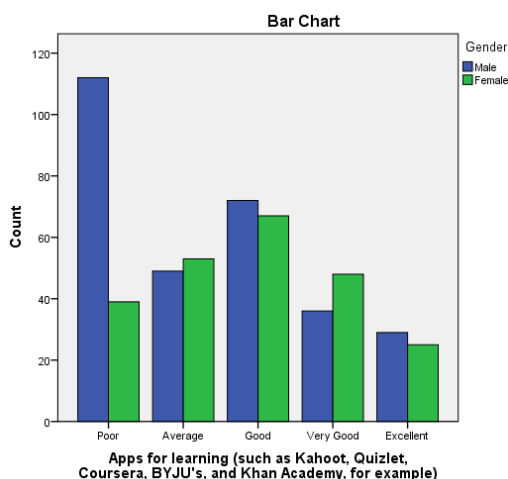|				
	Excellent	29	25	54
Total		298	232	530

Figure.2 Crosstabulation (Apps for Learning)

A significantly higher percentage of male students (37.5%) gave poor ratings for the availability of learning apps compared to female students (16.8%), a larger proportion of female students (60.3%) rated the availability of learning apps as good to excellent, compared to (45.9%) of male students, the disparity in ratings shows a clear difference in how male and female students perceive the availability of learning apps, with males being more critical and females expressing satisfaction.

Comparison of Online Education with Traditional Education System

The objective of this study is to conduct a comprehensive analysis and comparison of the merits and drawbacks of online education and traditional education. The purpose is to provide significant insights into their relative influences on the learning experiences & satisfaction of students.

1. H_0: There is no significant difference in the learning experience between male and female students when comparing online and traditional education methods.

2. H_1: There is a significant difference in the learning experience between male and female students when comparing online and traditional education methods.

Table.4 (t-test for two paired samples)

Paired Samples "t" Test						
		Paired Differences			t	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean		
Pair 1	Save Time and Money Online	0.215	1.763	0.077	2.809	0.005
	Save Time and Money Traditional					

Pair 2	Self-Paced Learning Online	-0.33	1.595	0.069	-4.767	0
	Self-Paced Learning Traditional					
Pair 3	Better Time Management Online	-0.049	1.82	0.079	-0.62	0.535
	Better Time Management Traditional					
Pair 4	Personal Attention Online	-1.068	1.745	0.076	-14.086	0
	Personal Attention Traditional					
Pair 5	Access Information Easily and Lifelong Online	-0.27	1.612	0.07	-3.854	0
	Access Information Easily and Lifelong Traditional					
Pair 6	Resources and Material Online	-0.202	1.667	0.072	-2.789	0.005
	Resources and Material Traditional					
Pair 7	Connect Globally Online	0.24	1.733	0.075	3.183	0.002
	Connect Globally Traditional					
Pair 8	Review your Learning Online	-0.613	1.615	0.07	-8.741	0
	Review your Learning Traditional					
Pair 9	Diversity in Learning Online	-0.275	1.53	0.066	-4.146	0
	Diversity in Learning Traditional					
Pair 10	Engagement in Course Online	-0.753	1.604	0.07	-10.807	0
	Engagement in Course Traditional					
Pair 11	Interaction with Peers Online	-0.892	1.579	0.069	-13.012	0
	Interaction with Peers Traditional					
Pair 12	Collaboration among Students Online	-1.128	1.654	0.072	-15.704	0
	Collaboration among Students Traditional					
Pair 13	Social Interaction Online	-1.004	1.678	0.073	-13.769	0
	Social Interaction Traditional					
Pair 14	Self-Motivation Online	-0.906	1.63	0.071	-12.792	0
	Self-Motivation Traditional					
Pair 15	Flexibility in Learning Online	-0.292	1.773	0.077	-3.797	0
	Flexibility in Learning Traditional					
Pair 16	Concentration while Learning Online	-0.977	1.734	0.075	-12.98	0
	Concentration while Learning Traditional					
Pair 17	Pedagogical tools Online	-0.428	1.465	0.064	-6.729	0
	Pedagogical tools Traditional					

Pair 18	Practical Subjects Learning Online	-1.23	1.811	0.079	-15.634	0
	Practical Subjects Learning Traditional					
Pair 19	Quality Assurance Online	-0.883	1.578	0.069	-12.885	0
	Quality Assurance Traditional					
Pair 20	Assessments and Feedback Online	-0.723	1.581	0.069	-10.523	0
	Assessments and Feedback Traditional					
Pair 21	Overall Academic Performance Online	-0.853	1.584	0.069	-12.399	0
	Overall Academic Performance Traditional					

Data Interpretation

Identify Significant Differences

Pairs with Sig. (2-tailed) values less than 0.05 show significant differences between online and traditional education.

Save Time and Money (Pair 1): Online education is significantly better at saving time and money, with a mean difference of 0.215. Self-Paced Learning (Pair 2): Traditional education is rated significantly higher for self-paced learning, with a mean difference of -0.33.

Non-Significant Differences

Pairs with Sig. (2-tailed) values greater than 0.05 indicate no significant differences.

Better Time Management (Pair 3): No significant difference between online and traditional education.

Direction of Differences

Positive mean differences indicate online education is perceived more favourably.

Negative mean differences suggest traditional education has an advantage.

Interaction with Peers (Pair 11): Traditional education scores significantly higher with a mean difference of -0.892.

Key Focus Areas

Attributes where online education performs better:

Save Time and Money (Pair 1) and Connect Globally (Pair 7).

Attributes where traditional education excels:

Personal Attention (Pair 4), Social Interaction (Pair 13), and Collaboration among Students (Pair 12).

Save Time and Money - Online vs. Traditional: The mean difference is 0.2150 with a significant p-value ($p = 0.005$), indicating online learning is perceived to save more time and money than traditional methods.

Self-Paced Learning - Online vs. Traditional: With a mean difference of -0.33 and a highly

significant p-value (p < 0.001), online learning is rated higher for self-paced learning benefits.

Better Time Management - Online vs. Traditional: The mean difference of −0.049 with a non-significant p-value (p = 0.535) suggests no notable difference in time management benefits between methods.

Personal Attention - Online vs. Traditional: A substantial negative mean difference of −1.068 with a highly significant result (p < 0.001) suggests traditional learning offers considerably more personal attention.

Ease of Access to Information - Online vs. Traditional: With a mean difference of −0.27 and a significant p-value (p < 0.001), online learning provides better access to information and lifelong learning resources.

Resources and Material - Online vs. Traditional: With a mean difference of −0.202 and a significant p-value (p = 0.005), traditional learning slightly outperforms online learning in providing resources and material.

Global Connectivity - Online vs. Traditional: The positive mean difference of 0.240 with a significant p-value (p = 0.002) suggests that online learning is significantly better for global connectivity.

Reviewing Learning - Online vs. Traditional: A substantial negative mean difference of −0.613 with a highly significant result (p < 0.001) indicates that traditional learning provides better opportunities for reviewing.

Diversity in Learning - Online vs. Traditional: With a mean difference of −0.275 and a highly significant p-value (p < 0.001), traditional methods again show an advantage in offering diverse learning experiences.

Course Engagement - Online vs. Traditional: A significant negative mean difference of −0.753 and a highly significant p-value (p < 0.001) suggests that students feel more engaged in traditional learning environments.

Interaction with Peers - Online vs. Traditional: A significant negative mean difference of −0.892 and a highly significant p-value (p < 0.001) suggests that traditional learning methods offer much stronger peer interaction.

Collaboration among Students - Online vs. Traditional: With a notable mean difference of −1.128 and a highly significant p-value (p < 0.001), traditional learning significantly outperforms online learning in facilitating student collaboration.

Social Interaction - Online vs. Traditional: A mean difference of −1.004 and a highly significant result (p < 0.001) indicate that traditional learning provides superior social interaction opportunities.

Self-Motivation - Online vs. Traditional: A significant mean difference of −0.906 and a highly significant p-value (p < 0.001) suggests that students in traditional settings report higher levels of self-motivation.

Flexibility in Learning - Online vs. Traditional: Although the mean difference is smaller at −0.292, it is still significant (p < 0.001), showing that online learning is perceived as more

flexible, likely due to its adaptable schedules and location independence, which are less common in traditional learning.

Concentration while Learning - Online vs. Traditional: A substantial mean difference of −0.977 with a highly significant result (p < 0.001) indicates that students experience better concentration in traditional learning environments.

Pedagogical Tools - Online vs. Traditional: A mean difference of −0.428 and a highly significant p-value (p < 0.001) indicates that traditional learning provides more effective pedagogical tools.

Practical Subjects Learning - Online vs. Traditional: With a large mean difference of −1.23 and a highly significant p-value (p < 0.001), traditional learning is clearly superior for practical subjects, likely due to hands-on requirements and in-person guidance.

Quality Assurance - Online vs. Traditional: A mean difference of −0.883 and a highly significant p-value (p < 0.001) suggests that traditional learning provides better quality assurance, which could stem from more established feedback mechanisms and oversight typically found in face-to-face instruction.

Assessments and Feedback - Online vs. Traditional: A significant mean difference of −0.723 and a highly significant p-value (p < 0.001) indicates that traditional methods are more effective for assessments and feedback.

Overall Academic Performance - Online vs. Traditional: The mean difference of −0.853 and a highly significant p-value (p < 0.001) suggests that traditional learning environments positively impact overall academic performance compared to online learning.

Factor Analysis

The factor analysis puts together variables that are very similar to each other. These variables can be thought of as making up larger themes or patterns that affect how people learn online.

Table.5 Factor Analysis

Component Matrix Layout (Factor Loadings)			
Variable	Factor 1	Factor 2	Factor 3
Save Time and Money Online	0.589		
Self-Paced Learning Online	0.57		
Better Time Management Online	0.581		
Personal Attention Online	0.626		
Access Information Easily and Life Long Online	0.665		
Resources and Material Online	0.702		
Connect Globally Online	0.755		
Review your Learning Online	0.527	0.543	
Diversity in Learning Online	0.662		
Engagement in Course Online	0.676		
Interaction with Peers Online	0.697		

Collaboration among Students Online	0.734		
Social Interaction Online	0.67		
Self-Motivation Online	0.676		
Flexibility in Learning Online			0.578
Concentration while Learning Online	0.728		
Pedagogical tools Online	0.565		
Practical Subjects Learning Online	0.713		
Quality Assurance Online	0.625		
Assessments and Feedback Online	0.559	0.537	
Overall Academic Performance Online	0.569	0.52	
Relevance of Course Content to Learning Goals Online		0.694	
Clarity and Organization of the Course Structure Online		0.713	
Comprehensiveness and Accessibility of Learning Materials Online		0.706	
User-Friendliness of the Learning Platform Online		0.669	
Effectiveness of Interactive Tools Online		0.726	
Accommodation of Different Learning Style Online		0.759	
Motivates Me to Engage in Learning Activities Online		0.697	
Conduciveness of the Learning Environment Online		0.663	
Timeliness and Helpfulness of Instructor Feedback Online		0.697	

Factor 1

Online Learning Engagement and Interaction:

This component measures online student involvement, social interaction, and collaboration. These variables have highest factor loadings:

1.   Online Student Collaboration (.734): The greatest loading variable indicates a considerable impact on student involvement.

2.   Peer-to-peer interactions are essential in online learning (.697).

3.   Social Interaction Online (.670) and Engagement in Course Online (.676): Peer interaction is a major factor in online learning engagement, with learners feeling more involved.

Factor 2 Online Learning Quality and Structure.

This component includes elements relating to the quality, organization, and usability of the online learning platform.

1.   The effectiveness of online interactive tools is crucial for enhancing student engagement and learning outcomes (.726).

2.   Clear and planned course structure and practical subject learning greatly enhance the perceived effectiveness of online learning (.713).

3.   Comprehensive and accessible online learning material is crucial (.706).

4.   Online Learning Style Accommodation (.759): This highlights the importance of adapting to diverse learning methods for student satisfaction.

Factor 3 Flexibility and Personalization in Learning:

Learning Flexibility and Personalization Online learning offers flexibility and self-paced, self-motivated learning.

1.   Key to online learning is flexibility, allowing students to learn at their own pace (.578).

2.   Personal Attention Online (.626): Despite the flexibility of online learning, personal attention remains essential.

3.   Online Save Time and Money (.589), Self-Paced Learning (.570), and Better Time Management (.581):

Factor 4 Global Information and Lifelong Learning

This relates to the accessibility of information and resources in online learning:

1.   Enhance learning experience with worldwide connections through online learning (.755).

2.   Easy Access to Information and Lifelong Learning (.665): This is a crucial aspect of online education.

Factor 5 Learning Environment and Assessment Feedback

This factor encompasses online education characteristics linked to learning environments and feedback systems:

1.   Assessments and Feedback Online (.559) and Overall Academic Performance Online (.569): These highlight the significance of feedback and performance tracking in online learning.

2.   A favourable online learning environment is crucial for student achievement (.663).

3.   This element highlights the significance of a learning-friendly environment, adequate assessments, and timely feedback.

Findings

ICT Infrastructure

Statistically Significant Differences

Apps for Learning: A significant difference was observed between male and female respondents ($p = 0.0000655$), with females reporting a higher mean score (2.858) compared to

males (2.399). This suggests that females find apps for learning more effective or accessible than males.

Non-Significant Differences:

In most categories, such as Computers & Laptops, Internet Access, IT Hardware, Technical Support, and others, no statistically significant differences were found ($p \geq 0.05$). This indicates parity between male and female respondents in their access to and satisfaction with these resources.

Trends in Mean Scores:

Social Media Platforms and Video Conferencing Tools: While females reported slightly higher satisfaction in these categories, the differences were not statistically significant.

Digital Library:

Females scored slightly higher than males (3.000 vs. 2.812), but the difference was not significant, highlighting comparable perceptions of access to digital library resources.

Overall Parity Across Categories:

The lack of significant differences in most areas suggests that both genders have similar experiences and satisfaction levels with technical tools and resources in education.

Comparison Online & Traditional Education:

Significant Differences ($p < 0.05$):

Online Education Strengths:

Save Time and Money (Pair 1): Online education is significantly better at saving time and money, with a mean difference of 0.215.

Connect Globally (Pair 7): Online education also excels in global connectivity, with a positive mean difference of 0.24.

Traditional Education Strengths:

Self-Paced Learning (Pair 2): Traditional education is rated significantly higher for self-paced learning, with a mean difference of -0.33.

Personal Attention (Pair 4): Traditional education outperforms online education with a substantial mean difference of -1.068.

Social Interaction (Pair 13): Traditional education is perceived as significantly better, with a mean difference of -1.004.

Collaboration among Students (Pair 12): A significant mean difference of -1.128 highlights traditional education's strength in fostering collaboration.

Non-Significant Differences ($p \geq 0.05$):

Better Time Management (Pair 3): There is no significant difference between online and traditional education for time management, indicating parity in this aspect.

Other areas with non-significant differences include Technical Support and Learning Management Systems.

Direction of Differences:

Positive Mean Differences: Reflect attributes where online education is favoured, such as saving time and money and global connectivity.

Negative Mean Differences:

Highlight traditional education's advantages in interpersonal aspects like social interaction, collaboration, and personal attention.

4. Conclusion

According to the data, there are clear distinctions between traditional and online learning, and opinions about educational resources vary by gender. Online education received much better ratings for features like time and money savings and worldwide connectivity, highlighting its advantages in accessibility and ease. Traditional education, on the other hand, demonstrated its superiority in promoting human connections and engagement by excelling in interpersonal elements including individual attention, social contact, and student participation. Analysis by gender revealed a considerable disparity in how people see learning applications, with women giving these resources much higher ratings. This result implies that certain tactics are required to improve men's use of these technologies. Equal access and satisfaction between male and female respondents, however, is indicated by parity across the majority of technical resources, indicating balanced resource allocation in the educational sector.

To close gaps in each modality, the insights demand focused enhancements. While conventional education may embrace the flexibility and accessibility that online platforms provide, online education should concentrate on emulating traditional education's interpersonal benefits through creative tools and methodologies. By filling in these gaps with evidence-based tactics, both modalities will be able to play to their strengths and offer a more comprehensive educational experience.

Limitations

1.   Sample Size and Representation: Despite being sizable, the study's sample might not accurately reflect the diversity of students across several categories, including location, socioeconomic level, and educational background.

2.   Subjectivity in Responses: Self-reported data is used, participants may overestimate or underestimate their experiences or perceptions, which introduces subjectivity and potential biases.

3.   Contextual Variability: Variables including resource accessibility, institutional quality, and cultural perspectives on traditional and online learning were not taken into account, the results' generalizability in a variety of contexts was restricted.

4.   Cross-Sectional Design: The study only records perceptions at one particular moment in time, it might not accurately represent shifts in beliefs or experiences across longer time

periods or as technology advances.

5.   Technological Developments: As online learning platforms continue to innovate and fix existing issues, rapid technological development may make certain conclusions outdated.

6.   Absence of Context-Specific Analysis: Findings are extrapolated from traditional and online learning environments without taking into account differences in topic areas, program kinds, or educational levels.

7.   Lack of Longitudinal Data: The study is unable to evaluate how perceptions change over time or as a result of ongoing exposure to traditional or online learning environments since it lacks longitudinal data.

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