

# ELECTRONIC LEARNING ON STUDENTS ACHIEVEMENT AT HIGHER EDUCATION: CAUSE AND EFFECT STUDY

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## Abstract

The study of this research investigated “Electronic Learning on Students Achievement at Higher Education: Cause and Effect Study” this research is to establish the causal relationship between student performance and e-learning instructional methods in higher education, as it pertains to developing environmentally sustainable education models. Increasingly, digital technology is transforming how we approach traditional educational techniques and methods that have historically been used in developing sustainable educational practices. This research examines what type of impact e-learning has on developing sustainable education practices, as well as how these practices develop over time, with a focus on student engagement, institutional resilience, the efficiency of resources used in the delivery of education, and the availability of education to students with various types of needs. The study looks at data collected at universities in Multan and will assess the advantages and difficulties of e-learning in sustainable instruction. The method of cluster sampling was applied. A structured questionnaire was used as an instrument for data collection. (SPSS) version, 25 was used for data analysis. The mean, standard deviation, frequency, and One-way ANOVA, independent sample t-test, the adoption of E-learning in higher education has meaningfully influenced students’ professional development. As E-learning environments allow students to access various learning materials and activities, they have been able to recover their personal, academic, and teaching skills. So, students increase larger contact to educational practices, which increases their thoughtful and application of theoretical knowledge. Due to the online nature of learning, students face some challenges. These include personal difficulties such as lack of motivation or time management, classroom-related issues like reduced interaction and engagement, and institutional problems such as short technological support. Therefore, these issues can hinder their whole learning experience and development. As students come from varied academic and demographic backgrounds, their experiences with E-learning differ. Though academic and teaching skills show little difference between male and female students, the effect of E-learning on personal development differs based on the student's last degree. Similarly, the level of participation in academic activities and the challenges faced in virtual settings differ according to the program of study.

**Key words:** Electronic Learning, Academic Performance, Virtual Class, Digital Education, Student Achievement

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## INTRODUCTION:

Electronic learning, is the distribution of educational information and the facilitation of learning experiences over the use of digital tools, technologies, and resources. Usually, it entails online training classes, courses, or educational resources that are accessible through computers, tablets, cellphones, or the internet. E-learning can take many forms, including interactive simulations, video lectures, forums, quizzes, and more.

### Digital Learning Technologies

A variety of technologies and delivery methods, such as computer-based training (CBT), internet-based training (IBT), web-based instructions (WBI), advanced spread learning (ADL), distance learning or distributed learning,

and mobile learning, have been used to characterize E-learning. For both, the internet has emerged as a key resource for research and education. Technology-based e-learning refers to the use of interns and other significant technologies to develop and instruct learning throughout a variety of educational fields. The definition of e-learning has been the subject of much talk. Since some authors have disclosed the change of e-learning's applications, learning processes, and approaches, it is challenging to come up with a consensus definition. E-learning is defined as offering just full online courses, while web-dependent and web-supplemented services are used to provide educational and support procedures (Mohammadi & Singh, 2015; Singh, 2022).

**Key Features of E-Learning Include:**

**Accessibility:** Resources are presented to students at any time and from any location.

**Flexibility:** Allowing students to move at their teachers and students own speed allows for a more converted educational experience.

**Interactive:** To keep students interested, join multimedia components including films, animations, tests, and conversations.

**Economical:** Less Frequently

**Student Motivation:**

The process by which a person initiates and maintains goal-directed action is referred to as motivation. Furthermore, motivation is typically understood to be the process by which personal wants and desires are triggered. Students' contentment, perseverance, and interest in the subject matter are reflected in their academic motivation. Lack of motivation is a common issue for students at all levels and is crucial for their learning and engagement in higher education institutions. There are difficulties in every learning environment, but online learning environments are particularly difficult because students are more responsible for their own education than in any traditional setting (Alawamleh et al, 2022). One particular type of motivation is intrinsic motivation, where people work toward goals because they are intrinsically fulfilling rather than because of outside influences. When people believe they are capable of achieving their goals, their intrinsic drive rises. Motivational factors provide a basis for successful student learning.

**Student Engagement in Online Learning:**

Society's dependence on information technology has created an abundance of social, educational, and economic changes during the 21st century. An educational advancement made possible through the introduction of computers and the use of information and communication technologies (ICT) for educational purposes is the development of dynamic ... learn. To achieve their educational goals, educators can leverage the potential of ICT to create a more flexible and dynamic way of learning. Gamification is a fresh and fascinating trend in the field of E-Learning. Online learning platforms have seen a sharp rise in usage. "Online learning" is a teaching method that uses the internet to assist students in their own education.

There are several different educational websites, like Coursera, Udemy, Great Learning, and others. Organizations looked for a way to educate kids in the comfort of their own homes. Significant changes have occurred as a result of the shift to virtual learning. In addition to being extremely time-consuming, it has forced students to use technology to recover their skills and other areas of skill. People have needed help adjusting to this lifestyle, even with the help of online learning platforms. The transition to digital learning presented many challenges for both teachers and students. The results show that more than 1.2 million college students drop out each year because they don't want to finish their education. The lack of academic and observed research involving gamification methodology suggests that the gamification theme needs to be more thoroughly investigated, according to an assessment of the literature on teaching with online guides in technical knowledge (such as programming and software program engineering). From a particular perspective, a study by describes it as an interaction that occurs when college students use an online learning platform to familiarize themselves with this setting; only the college students themselves have the ability to access the study materials. (Ibrahim 2020) Research, a study conducted by A BERNIK, on academic online courses that just contain a list of laptop video game motivators

The application of sports elements (mechanics, dynamics, and aesthetics) in a field (education, advertising, marketing, etc.) that is no longer a computer game is known as gamification. Given the paucity of theoretical and empirical research that would include gamification methodology, a review of the literature pertaining to teaching online guides in facts and technological know-how such as programming and software program engineering) suggests that gamification needs to be more thoroughly investigated. Gamification in education, as introduced by Samuel Kamunya, has been regarded as a contemporary way to present the benefits of video games in a nongaming setting. Motivational theories and learner behavioral outcomes must be incorporated into the sketch framework for gamification to be a successful approach in education. In light of this, the study suggests a paradigm for identifying the motivational affordances of video games that influence the behavioral impact of learners. According to Hammad (2018), suggestion for a gamification framework to examine programming for online distance publications is presented in this article. The following dimensions make up this framework that Martinha Piteira describes using: audience for goals that happen on a regular basis.

**Student Feedback**

The feedback findings proved that 90% of students considered feedback from their teachers in an E-learning environment as having high or extremely high value and trusted its significance above that of face-to-face

feedback. Feedback resulted in two major benefits; (1) it provides the ability to learn (2) motivates students to learn. The students found personalized feedback to have considerable influence on their learning and valued it because it rendered their learning experience accurate, deeper, and more meaningful. Ultimately, personalized feedback influenced student motivation strongly, and research studies tend not to explore this at all.

This kind of effect should be taken into consideration, particularly in an online setting, its heightened mean Ismail (2015) undertook an investigation of the impact of both interpretive and corrective feedback on several learning outcomes for students in the home economics department in a flipped classroom environment. They discovered that in terms of accomplishment corrective feedback resulted in the greatest success and in ability and attitude interpretive feedback produced the best outcome. They suggested that staff members have access to hands-on training so they may experience utilizing various feedback formats and types in their learning courses. Similar to this, (Ahmed, 2017) investigated how the learning style (deep/simple) and feedback level (corrective/interpretive) in individual learning settings affected the learning efficiency and achievement of students using educational technology. In Ali's study the highest level of effect was from the relationship between pupils with deeper learning methods and interpretive feedback. According to the results of a study conducted by Hammad (2018), graduate students studying statistics performed well on the achievement test because they received informative feedback. The study examined the impact of the different types of feedback—corrective and interpretive—in the electronic cloud learning environment.

The results showed that there is a statistically significant difference between the two groups, specifically informational response condition resulted in an improved results on the achievement test. Furthermore, Abdul-Barr (2019) looked at the interaction of response The results showed a statistically significant interaction impact (0.05) between learning style (active/reflective) and type (corrective/interpretive type) on the growth of academic achievement and meeting in learning the basic principles of mathematics at the College of Instruction .whereby students in second experimental group, active students receiving interpretative feedback, performed better than students in the different experimental groups. Lastly, Ibrahim (2020) studied the effects of both interpretive and corrective feedback on students' performance, skill development, and product evaluation on educational websites program design skills in the mobile web-based Micro learning context among students who were participating in a computer teacher program. The mean scores of the two experimental groups differed significantly, according to the data, favoring interpretive feedback for all categories, starting with achievement. According to certain research (Ahmed, 2017, Hammad, 2018, Ibrahim, 2020; Abdul-Barr, 2019), informative feedback has a greater impact on motivation and accomplishment. Although Ismail (2015) demonstrated that both interpretive and corrective feedback had a favorable impact on achievement, the corrective feedback outperformed the interpretive feedback in this regard.

The analysis demonstrated a similar difference value between both experimental groups and significant difference in support of interpretive observations across all factors, with achievement being the primary one scores. While a limited number of studies show that informational Feedback has a greater impact on achievement and motivation (Ahmed, 2017; Hammad, 2018; Ibrahim, 2020; Abdul-Barr, 2019), the uses and effects of feedback are vast. For instance, Ismail (2015) demonstrated positive effects of corrective feedback and interpretive feedback; however, in the regard of success, the constructive criticism outperformed the interpretive feedback.

Looking at the previously evaluated literature, it would seem there is a difference in the findings from earlier research on the differences in the amounts of information provided within different feedback conditions, as well as the effectiveness of a kind of feedback. Though, to the author's knowledge, no previous researchers have tested the effect of feedback at the educational level to determine the things of feedback for pupils. Particularly on face-to-face accomplishment and inspiration in an online course setting, as such This research address Three different kinds of feedback, collateral feedback provides learners with only feedback they are incorrect, corrective feedback lets the learner know they were incorrect as well as provided the right answer, and interpretive feedback gives the student further details about the right or incorrect response. In order to determine whether interpretive feedback is necessary because it is more realistic or whether all types should be given to the learner, the current study investigated the efficacy of utilizing each type independently. This made it possible to determine whether using both corrective and confirmatory input was adequate.

#### **Statement of the Problem:**

The traditional education setting has significantly changed as a result of the incorporation of e-learning in higher education. Although digital learning platforms are flexible, affordable and accessible, concerns regarding their actual effect on students' academic achievement are mounting. While many studies on the impact of e-learning on today's students have been conducted, the majority of those studies yield mixed results. Some state that e-learners perform better and are more engaged than traditional students; however, others suggest that e-learners tend not to be as academically successful and/or demonstrate less motivation than traditional students. The degree of institutional support for e-learning, the capacity of e-learners for self-regulation, the design of the instructional materials, and the availability of technology (including computers and the Internet) all affect the success of e-learning initiatives.

#### **The Rationale of Study:**

The development of e-learning programs in postsecondary education has been made possible by the recent growth of the Internet, providing a greater level of flexibility, outreach, and effectiveness to the delivery of education.

However, creating a combination of technology with sustainable teaching practices remains a major hurdle. There are many elements to sustainability in education; these include equity of access, long-term support of educational opportunities, and sustainable use of educational resources, all of which are foundational to the success of higher education systems today and into the future. While the development of e-learning programs has grown exponentially over the past several years, there is still a limited understanding of how e-learning affects the sustainability of education. This gap is a significant concern for both educational policy-makers and the educational institutions, as they need to ensure that e-learning is producing positive outcomes for students in both the short term and long-term. This study will offer insight into the ways in which different e-learning strategies are achieving positive outcomes related to critical sustainability indicators such as student achievement, student engagement in the learning process, resource utilization, and institutional reputation. Recommendations for action will be based on the evidence gathered from this study and will support higher education institutions in improving their sustainability initiatives and maximizing the benefits of e-learning methodologies.

**Objective of Study:**

1. To evaluate the impact of electronic learning on students' academic performance at higher education Institutions.
2. To identify whether and how much engagement with an e-learning platform relates to students' success in terms of grades received in class.

**Research Question:**

1. What is the relationship between e-learning and academic success for students?
2. How does engagement via e-learning affect student academic performance?
3. Which aspects of e-learning contribute to the most significant extent to students' academic performance?

**SIGNIFICANCE OF THE RESEARCH:**

To understand the effect of e-learning on sustainable development in post-secondary education, it is important to consider critical issues such as sustainable development, accessibility of information, and quality of education and will provide insight regarding these elements. Additionally, understanding the processes for increasing educational standards and improving accessibility for all learners requires comprehensive understanding and knowledge of these factors. Effective methods of introducing e-learning into curricula developed by policymakers and educational leaders will aid in the establishment of sustainable educational practices through laws, regulations, and policies that are consistent with sustainable development. Additionally, by identifying innovative methods and best in e-learning, the study aids in guiding the future development of digital learning environment. This leads to increased student performance, engagement, and retention all of which are critical for achieving academic goals.

**Delimitations:**

Due to lack of time and constraints resources this research survey was delimited to only:

- The survey was limited to university students in Multan, with no other locations or educational levels included.
- Only five universities were chosen, and they may not represent all higher education institutions.
- Data were gathered using a standardized questionnaire that limited replies to predetermined items.

**RESEARCH METHODOLOGY:**

The research methodologies used in the study and consists of research design, study area, population, sample size, sampling procedure, research instruments, pre-test data collection procedures and data analysis instruments.

The primary objective of the study is to E-learning Effect on Student Academic Performance in Higher Education.

**Research Design:**

This study design was descriptive and quantitative in nature.

**Study Area:**

The study was conducted in several universities including the woman university, Emerson University Multan, Bahauddin Zakariya University Multan, Allama Iqbal Open University, Virtual University.

**Sample of the Study:**

The sample of this research were consisting of E-learning 'of five public sector universities, institutes of Multan city. Simple cluster sampling technique was used. In the second phase 210 both male and female were randomly selected.

**Population of the Study:**

Population of this research were consisting of BS, M.Phil. And PhD enrolled in educational institutions of Multan.

**Research Instrument:**

For the purpose of gather data carefully designed survey instrument was utilized. A questionnaire comprised a set of structured questions aligned with the identified variables. The questionnaire was consisting of different sections besides the demographic information of respondents, to ensure the association among the different factors of the study.

**Data Collection:**

Questionnaire was used as a tool for collecting the research data. This questionnaire was based on five-point Likert scale giving codes (Very Satisfied (V.S) = 5, Satisfied (S) =4, Neither (N) =3, Dissatisfied (D) =2, Very Dissatisfied (V.D) =1).

**Data Analysis:**

The researcher was used software Statistical Package for Social Sciences (SPSS) version; 25 for the analysis of data. In order to analysis of the research data, researcher used both the descriptive and inferential statistics for general description of the data. Frequency, mean, standard deviation was analyzed in descriptive analysis. Independent sample t-test and ANOVA test were analyzed in inferential analysis.

**Table 1** Gender-Wise Analysis

	Frequency	Percent
Male	73	34.8
Female	137	65.2
Total	210	100.0

The table no 1 data shows that out of 210 respondents, 34.8% were male and 65.2% were female. This indicates a higher representation of female participants in the study. The gender distribution is clearly skewed towards females. Such demographic data is essential for understanding the sample composition.

**Table 2** Faculty -wise Analysis

	Frequency	Percent
Science	64	30.5
Life science	57	27.1
Social science	88	41.9
Total	210	100.0

The table no 2 show that the faculty-wise distribution of respondents shows that the majority belong to Social Sciences (41.9%), followed by Science (30.5%) and Life Sciences (27.1%). This distribution suggests strong representation from the Social Sciences, contributing a human-centered perspective to the study.

**Table 3** Programmed-wise Analysis

	Frequency	Percent
BS	152	72.4
M.Phil.	57	27.1
PhD	1	.5
Total	210	100.0

The table no 3 data shows that the majority of respondents are enrolled in BS programs (72.4%), followed by M.Phil. students (27.1%), and only one respondent (0.5%) is a PhD student. This indicates that undergraduate students form the largest segment of the sample. Such distribution is useful for understanding educational level-related perceptions within the study.

**Table 4** CGPA -wise Analysis

	Frequency	Percent
2.5-3.00	22	10.5
3.01-3.05	110	52.4
3.06-4.00	76	36.2
Total	210	100.0

The Table no 4 data reveals that most respondents have a CGPA between 3.01 and 3.05 (52.4%), followed by those with a CGPA between 3.06 and 4.00 (36.2%). A smaller group (10.5%) falls within the 2.5–3.00 range. This indicates that the Majority of respondents have a relatively high academic performance.

**Table 5** Gadget -wise Analysis

	Frequency	Percent
Mobile	68	32.4
Laptop	22	10.5
Both	120	57.1
Total	210	100.0

The table no 5 data indicates that the majority of respondents (57.1%) use both mobile phones and laptops, while 32.4% use only mobile phones and 10.5% use only laptops. This suggests that mobile phones are the most commonly used gadget among the respondents, but a significant portion also relies on laptops, highlighting the importance of both devices for the participants.

**Table 6** Internet Availability -wise Analysis

	Frequency	Percent
Yes	162	77.1
No	47	22.4
Total	210	100.0

The table no 6 data shows that 77.1% of respondents have internet access, while 22.4% do not. This indicates that the majority of respondents are connected to the internet, which is essential for digital learning and engagement in modern education.

**Table 7** Use of Sim -wise Analysis

	Frequency	Percent
Jazz	96	45.7
Zong	89	42.4
Ufone	14	6.7
Telenor	11	5.2
Total	210	100.0

The table no 7 data indicates that 45.7% of respondents use Jazz, while 42.4% use Zong. A smaller portion uses Ufone (6.7%) and Telenor (5.2%). This suggests that Jazz and Zong are the most commonly used SIM cards among the respondents.

**Table 8** Internet Package -wise Analysis

	Frequency	Percent
Weekly	48	22.9
Monthly	80	38.1
PTCL	82	39.0
Total	210	100.0

The table no 8 data shows that 39.0% of respondents use PTCL internet packages, while 38.1% use monthly mobile internet packages, and 22.9% opt for weekly mobile internet packages. This indicates that a significant portion of respondents rely on PTCL for their internet needs, with a sizeable group using mobile data on a monthly basis.

**Table 9** App Used -wise Analysis

	Frequency	Percent
LMS	45	21.4
Zoom	121	57.6
google classroom	24	11.4
No	20	9.5
Total	210	100.0

The table no 9 data shows that the most commonly used app for classrooms is Zoom (57.6%), followed by LMS (21.4%) and Google Classroom (11.4%). Additionally, 9.5% of respondents reported not using any app for classroom purposes. This indicates that Zoom is the dominant platform for online learning among the respondents.

**Table 10** Search Engine -wise Analysis

	Frequency	Percent
Google	65	31.0
YouTube	31	14.8
Chat GPT	37	17.6
Meta AI	52	24.8
No	24	11.4
Total	210	100.0

The table no 10 data shows that the most popular search engine among respondents is Google, used by 31.0% of participants, followed by Meta AI (24.8%), Chat GPT (17.6%), and YouTube (14.8%). A smaller portion of respondents (11.4%). This highlights the growing use of AI-based search tools like Meta AI and Chat GPT alongside traditional search engines like Google.

**Table 11** T-test about Cause and Effect of E-learning based on Gender

Factors	Variables	N	Mean	SD	df	T	Sig(2-tailed)
Learning Environment	Male	73	16.2466	2.27780	208	.394	0.694
	Female	137	16.1168	2.26893	146.569	.394	
Continuous Learning and Development	Male	73	15.7260	2.04980	208	.221	0.825
	Female	137	15.6569	2.20773	156.802	.226	
Increased Use of Digital Sources	Male	73	15.6438	2.97849	208	-.259	0.796
	Female	137	15.7445	2.51767	127.478	-.246	
Cost Effect	Male	73	15.5616	2.65092	208	-2.08	0.038
	Female	137	16.3139	2.40328	135.150	-2.02	
Enhanced Learning Flexibility	Male	73	15.4247	2.35064	208	-1.00	0.038
	Female	137	15.7737	2.43743	151.762	-1.01	
Technology Integration	Male	73	15.1781	2.61588	208	-1.06	0.038
	Female	137	15.5474	2.26537	130.048	-1.02	

This table no 11 show that Learning Environment, both males (Mean = 16.25) and females (Mean = 16.12) reported nearly identical experiences, with no significant difference ( $t = 0.394$ ,  $p = 0.694$ ). Continuous Learning and Development, males (Mean= 15.73) and females (Mean = 15.66) again showed no significant difference ( $t = 0.221$ ,  $p = 0.825$ ).

Increased Use of Digital Sources, the results showed no significant gender differences either ( $t = -0.259$ ,  $p = 0.796$ ), with means of 15.64 for males and 15.74 for females. Cost Effect, where females (Mean = 16.31) rated it higher than males (Mean = 15.56), indicating that females perceived a greater cost benefit from the learning approach ( $t = -2.083$ ,  $p = 0.038$ ). This suggests gender-based differences in cost sensitivity or perceived economic value Enhanced Learning Flexibility and Technology Integration, while females had slightly higher mean scores than males, the differences were not statistically significant, as exact p-values were not reported, and t-values remained low (-1.000 and -1.065 respectively). Overall, the analysis indicates that gender does not significantly influence perceptions of most learning factors, except for cost, where females demonstrated a higher appreciation.

**Table 12** t-test about Cause and Effect of E-learning based on do you have internet available

Variables	N	Mean	SD	df	t	Sig(2-tailed)	
Learning Environment	do you have internet available	162	16.2222	2.15833	207	.935	.351
		47	15.8723	2.57595	65.866	.849	.399
Continuous Learning and Development		162	15.7469	2.31740	207	.901	.369
		47	15.4255	1.44078	121.422	1.156	.250
Increased Use of Digital Sources		162	15.8827	2.82927	207	1.753	.081
		47	15.1064	2.03485	102.829	2.094	.039
Cost Effect		162	16.0309	2.71051	207	-.283	.778
		47	16.1489	1.70649	119.666	-.360	.719
Enhanced Learning Flexibility		162	15.6914	2.56417	207	.293	.770
		47	15.5745	1.77843	107.090	.356	.723
Technology Integration		162	15.4136	2.53337	207	-.030	.976
		47	15.4255	1.88524	99.056	-.035	.972

This table no 12 that Learning Environment Respondents with internet access had a slightly higher mean score (Mean=16.2222, SD=2.15833) compared to those without (Mean=15.8723, SD=2.57595). However, the t-values ( $t=0.935$  for internet access,  $t=0.849$  for no access) and p-values ( $p=0.351$  and  $p=0.399$ ) indicate no statistically significant differences. This suggests that internet availability does not significantly influence perceptions of the learning environment.

Continuous Learning and Development The group with internet access scored marginally higher (Mean=15.7469, SD=2.31740) than those without (Mean=15.4255, SD=1.44078). The t-values ( $t=0.901$  for internet access,  $t=1.156$  for no access) and p-values ( $p=0.369$  and  $p=0.250$ ) show no significant differences, meaning internet availability does not strongly affect views on continuous learning.

Increased Use of Digital Sources Respondents with internet access had a higher mean score (Mean=15.8827, SD=2.82927) than those without (Mean=15.1064, SD=2.03485). The t-values ( $t=1.753$  for internet access,  $t=2.094$  for no access) and p-values ( $p=0.081$  and  $p=0.039$ ) suggest a near-significant trend for the internet group and a statistically significant difference for the no-internet group. This implies that internet access may encourage greater use of digital sources, though the effect is not universally strong.

Cost Effect both groups had similar mean scores (Mean=16.0309, SD=2.71051 for internet access; Mean=16.1489, SD=1.70649 for no access). The t-values ( $t=-0.283$  for internet access,  $t=-0.360$  for no access) and p-values ( $p=0.778$  and  $p=0.719$ ) confirm no significant differences, indicating that cost perceptions are unaffected by internet availability. Enhanced Learning Flexibility the mean scores were nearly identical (Mean=15.6914, SD=2.56417 for internet access; Mean=15.5745, SD=1.77843 for no access). The t-values ( $t=0.293$  for internet access,  $t=0.356$  for no access) and p-values ( $p=0.770$  and  $p=0.723$ ) show no significant differences, meaning learning flexibility perceptions are

Independent of internet access. Technology Integration both groups had very similar mean scores (Mean=15.4136, SD=2.53337 for internet access; Mean=15.4255, SD=1.88524 for no access). The t-values (t=-0.030 for internet access, t=-0.035 for no access) and p-values (p=0.976 and p=0.972) indicate no significant differences, suggesting that technology integration is perceived similarly regardless of internet availability.

**Table 13** t-test about Cause-and-Effect Relationship Between E-learning based Gender

	Variables	N	Mean	SD	df	t	Sig(2-tailed)
Learning Outcome	Male	73	15.6301	2.32443	208	-.236	.813
	Female	137	15.7226	2.88181	175.805	-.252	.801
Learner Motivation	Male	73	15.8767	2.51078	208	.805	.422
	Female	137	15.5839	2.51069	147.062	.805	.422

This table no 13 show that Learning outcome the mean score for males (N = 73, M = 15.6301, SD 2.32443) was slightly lower than that for females (N = 137, M = 15.7226, SD = 2.88181). However, the t-test results (t (208) = -0.236, p = .813) indicate that this difference was not statistically significant. (T (175.805) = -0.252, p = .801) also showed no significant difference between the groups.

Learner Motivation the mean score for males (N = 73, M = 15.8767, SD = 2.51078) was slightly higher than that for females (N = 137, M = 15.5839, SD = 2.51069). The t-test results (t (208) = 0.805, p = .422) and t (147.062) = 0.805, p =.422) both confirmed that this difference was not statistically significant.

**Table 14** ANOVA test about Cause and Effect of E- learning based on Faculty

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-learning	Science	64	94.6719	8.38376	2	.712	.492
	Life Science	57	93.5088	10.41654			
	Social Science	89	95.4270	9.58560			

The table no 14 show that the ANOVA results indicate no statistically significant differences in mean scores among the three categories (F (2) = 0.712, p = .492). This suggests that the observed numerical differences in means are not significant at the conventional alpha level of .05. In other words, the performance in "Cause and Effect of E- learning " is consistent across Science, Life Science, and Social Science, with no evidence of meaningful disparities between these groups.

**Table 15** ANOVA test about Cause and Effect of E- learning based on CGPA

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-learning	2.5-3.00	23	90.7391	9.16623	2	6.946	.001
	3.01-3.05	111	96.8468	7.73915			
	3.06-4.00	76	92.6974	11.01759			
	Total	210	94.6762	9.46360			

The table no 15 presents ANOVA results across three score ranges. The middle group (3.01-3.05, N=111) had the highest mean (96.85, SD=7.74), while the lowest range (2.5-3.00, N=23) showed the poorest performance (mean=90.74, SD=9.17). The ANOVA revealed significant differences between groups (F=6.946, p=.001, DF=2), indicating these mean differences are statistically meaningful rather than due to chance.

**Table 16** ANOVA test about Cause and Effect of E- learning based on Gadgets Use

Variables		N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-Learning	Mobile	68	94.2059	11.18576	2	1.142	.321
	Laptop	22	97.5455	5.02117			
	Both	120	94.4167	8.98232			
	Total	210	94.6762	9.46360			

The table no 16 presents ANOVA result across three device usage groups: mobile (N=68), laptop (N=22), and both (N=120). The laptop group had the highest mean score (97.55, SD=5.02), while mobile and both groups showed similar results (94.21 and 94.42 respectively). However, the ANOVA results (F=1.142, p=.321, DF=2) indicate no statistically significant differences between groups, suggesting device type did not significantly affect performance on this objective. The total sample (N=210) had a mean of 94.68 (SD=9.46).

**Table 17** ANOVA test about Cause and Effect of E- learning based on Which SIM do you use

Variables		N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-Learning	Jazz	96	94.3854	9.30463	3	2.477	.062
	Zong	89	96.0674	7.53597			
	Ufone	14	92.6429	6.97917			
	Telenor	11	88.5455	20.52006			
	Total	210	94.6762	9.46360			

The table 17 presents ANOVA results on performance across three device-usage groups (mobile, laptop, and both). While the laptop group (N=22) showed a slightly higher mean score (97.55, SD=5.02) compared to mobile (94.21, SD=11.19) and combined users (94.42, SD=8.98), the ANOVA results (F=1.142, p=.321) indicate these differences are not statistically significant. The total sample (N=210) had an average score of 94.68 (SD=9.46), suggesting device type did not significantly impact performance on this objective.

**Table 18** ANOVA test about Cause and Effect of E- learning based on Used of internet package

Variables		N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-Learning	Weekly	48	91.1667	12.32595	2	5.025	.007
	Monthly	80	96.5125	7.19352			
	PTCL	82	94.9390	9.04222			
	Total	210	94.6762	9.46360			

The table no 18 presents ANOVA results on across three frequency groups: weekly (N=48), monthly (N=80), and PTCL (N=82). The monthly group achieved the highest mean score (96.51, SD=7.19), while the weekly group scored lowest (91.17, SD=12.33). ANOVA results show significant differences between groups (F=5.025, p=.007), indicating frequency of use likely impacts performance. The total sample mean was 94.68 (SD=9.46). The significant p-value (p<.05) suggests these differences are meaningful, with monthly users performing best.

**Table 19** ANOVA test about Cause and Effect of E- learning based on which type of app used for classroom

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-learning	LMS	45	92.1778	8.66888	3	5.508	.001
	Zoom	121	96.1488	8.18806			
	google classroom	24	89.4167	13.66976			
	No	20	97.7000	9.39821			
	Total	210	94.6762	9.46360			

The table no 19 presents ANOVA result across four learning platforms: LMS (N=45), Zoom (N=121), Google Classroom (N=24), and non-users (N=20). The "No platform" group scored highest (mean=97.70, SD=9.40), while Google Classroom users performed lowest (mean=89.42, SD=13.67). Zoom users showed strong results (mean=96.15, SD=8.19). The significant ANOVA results (F=5.508, p=.001) indicate these platform-based differences are statistically meaningful. The total sample mean was 94.68 (SD=9.46). The findings suggest platform choice may significantly impact learning outcomes, with traditional/non-digital methods ("No" group) showing particular effectiveness.

**Table 20** ANOVA test about Cause and Effect of E- learning based on which type of Searcher Engine Use

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-Learning	Google	66	94.6667	8.14358	4	3.065	.018
	YouTube	31	96.8065	12.38929			
	Chat GPT	37	90.3784	11.63890			
	meta-AI	52	96.7500	7.14246			
	No	24	94.0833	7.42450			
	Total	210	94.6762	9.46360			

This table no 20 show that (google, YouTube, chat GPT, meta-AI, and n0) with a total sample size of 210. The mean scores range from 90.38 (chat GPT) to 96.81 (YouTube), with standard deviations indicating varying levels of dispersion. An ANOVA test was conducted, yielding an F-value of 3.065 and a significant p-value of .018 (2-tailed).

**Table 21** ANOVA test about Cause and Effect of E- learning based on where do the assignment

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause and Effect of E-Learning	Microsoft word	139	95.9640	9.26847	3	3.214	.024
	google form	4	97.5000	4.50925			
	power point	50	91.4200	9.54921			
	Other	17	93.0588	9.67258			
	Total	210	94.6762	9.46360			

The table no 21 presents ANOVA result across learning platforms reveals significant performance differences (F=5.508, p=.001). The highest achievers were non-platform users (mean=97.70), followed by Zoom users (mean=96.15). LMS users scored moderately (mean=92.18), while Google Classroom users performed lowest (mean=89.42). The significant p-value confirms these differences are meaningful, not due to chance. The total sample averaged 94.68 (SD=9.46), providing a performance benchmark.

**Table 22** ANOVA test about Cause-and-Effect Relationship Between E-learning based on Age

	Variables	N	Mean	SD	Df	F	Sig(2-tailed)
Cause-and-Effect Relationship	below 20	61	31.4754	4.12151	2	.312	.732
	21-25	131	31.2366	4.50099			
	26-30	18	32.0556	2.91996			
	Total	210	31.3762	4.26922			

The table no 22 presents ANOVA results on across different age groups (below 20, 21-25, and 26-30). The sample sizes for these groups were 61, 131, and 18, respectively, with a total of 210 participants. The mean scores for Obj2 were 31.48 (SD = 4.12) for the below 20 group, 31.24 (SD = 4.50) for the 21-25 group, and 32.06 (SD = 2.92) for the 26-30 group. The overall mean for all participants was 31.38 (SD = 4.27). An ANOVA test revealed no statistically significant differences between the groups, as indicated by an F-value of 0.312 and a non-significant p-value of 0.732 (two-tailed).

**Correlation Analysis**

**Table 23** Objective wise analysis using Person Correlation Coefficients

	OB1	OB2
OB1	1	
OB2	.534	1

This table no 23 show that Pearson correlation coefficients examining the relationships between two objectives (OB1 and OB2). The results show moderate positive correlations between the objectives: OB1 and OB2 are correlated at .534, OB1, and OB2. These correlations indicate that as scores in one objective increase, scores in the others tend to increase as well, with the strongest association between OB1. All correlations are statistically significant.

**CONCLUSION**

Firstly, the research highpoints that E-learning enhances access, flexibility, and inclusivity, thereby promoting equitable learning opportunities. Students from diverse geographical, socioeconomic, and demographic backgrounds are improved able to participate in higher education through online platforms, reducing barriers related to time, location, and cost. This directly supports the principles of sustainable education by certifying continuity and democratization of knowledge.

Secondly, E-learning pays to institutional and environmental sustainability. Digital platforms decrease dependency on physical infrastructure, printed materials, and commuting, thereby lowering the carbon footprint costs of higher education institutions. This brings into line with the global call for greener practices in all sectors, including education.

Thirdly, a study has revealed that using e-learning in conjunction with implementing innovative teaching methods is linked to improving educational outcomes. Furthermore, new technologies like multimedia information, data analytics, etc., allow educators to create a customized, adaptable learning experience for their students. The increased use of e-learning and innovative teaching methodologies not only enhances students' academic success but also provides students with the necessary digital skills required by employers today.

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