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INTEGRATING ARTIFICIAL INTELLIGENCE IN EDUCATIONAL SETTINGS.A STUDY ON ITS IMPACT AND EFFECTIVENESS

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Abstract
Artificial intelligence (AI) has the potential to revolutionize the way we learn and teach, making it more personalized, engaging, and efficient. AI in education refers to the use of artificial intelligence technologies, such as machine learning and natural language processing, to enhance the learning experience. It involves the use of algorithms that analyze data, identify patterns, and make predictions, enabling educators to personalize learning for each student. The potential benefits of using AI in education are significant. Personalized learning, one of the most significant advantages of AI in education, can lead to better student outcomes, as students can learn at their own pace and in a way that suits their learning style. Research objective is, To investigate the impact of Artificial intelligence integration on student learning outcomes in educational settings. Quantitative and survey method was used for this research. Study was delimited to only university of Education Vehari campus and Faisalabad. Only five departments were selected randamly All 2184 students who were studying at university of Education in BS English, BS Mathematics, BS Botany, BS IT,BS Zoology was the population of this study. For the purpose of sampling 15 students randomly selected from each department total 150 number of students were the samples of this study. Questionnaire was used as an instrument for the current study comprised upon 20 questions on 5 point- Likert scale. Instrument was validation with the opinions of experts. Date was collected personally by the researcher and with the help of friends. Data was analyzed with the help of SPSS software. Study's conclusions are Artificial intelligence-based tools enhance student engagement in learning. Artificial intelligence-powered adaptive assessments improve student outcomes, Artificial intelligence integration increases teacher productivity. Artificial intelligence-based virtual assistants support student learning.

INTRODUCTION

Artificial intelligence (AI) is transforming education by personalizing learning, enhancing engagement, and improving efficiency. Utilizing machine learning and natural language processing, AI examines data to discern trends, facilitating customized learning experiences that address the specific requirements and personalities of individual students. This leads to better student outcomes, increased accessibility, and data-driven decision-making. AI-powered tools also provide real-time feedback, adaptive learning, and intelligent tutoring, ultimately creating more effective and engaging learning environments.

Artificial intelligence (AI) has garnered significant attention and investment, with some comparing its impact to major historical inventions. Claims about AI's potential, such as sentience, have sparked debate. Nonetheless, the technology has drawn substantial investment, with $94 billion spent in 2021 alone, and prompted policy statements from organizations like the European Commission, OECD, and UNESCO, highlighting the need for both promotion and regulation.

With discussions focusing on both applying AI to enhance learning and teaching AI literacy. As the post-industrial economy relies on knowledge creation and innovation, interest in AI's potential to transform education is growing. Beyond automating tasks, AI could augment human cognition in learning, offering transformative possibilities. This has sparked policy debates and research into how AI can be effectively utilized in educational settings.

Research and development in Artificial Intelligence for Education (AIED) has evolved significantly, shifting from a primarily computer science-driven field to one that now also attracts substantial commercial interest. With over thirty AIED corporations globally having secured multi-million-dollar funding, the market is projected to surge to over $20 billion within five years. This rapid growth may leave educators questioning whether AIED represents a meaningful advancement or just another attempt to integrate technology into classrooms, potentially

overwhelming them with promises of revolutionary change.
Rooted in cognitive science, these systems simulate human-like tutoring, providing real-time feedback and guidance to enhance learning experiences. By adapting to each learner's pace, style, and abilities, ITS enable more effective and efficient learning, potentially transforming education through scalable and interactive solutions.
This framework emphasizes finding chains of operations that bridge the gap between the problem and solution, fostering effective problem-solving skills. Polya's work remains relevant in education and cognitive science, informing strategies for teaching problem-solving and critical thinking.
An example of advanced artificial intelligence-assisted technology repurposed for education is the suite of collaborative tools, including Google Docs and Google Sheets (Google, 2022), as well as similar offerings from organizations like Tencent (Tencent, 2022). Moreover, social networking platforms like WhatsApp (WhatsApp, 2022) and WeChat (WeChat, 2022), along with content sharing platforms such as YouTube (YouTube, 2022) and TikTok (TikTok, 2022), are increasingly utilized to enhance student learning, a trend that was expedited during the COVID-19 school closures.
Additionally, various other artificial intelligence-assisted technologies are being repurposed for educational purposes, such as activity trackers (e.g., Moki, 2022), though evidence regarding their effectiveness in supporting teaching or learning is generally limited.
A rapidly expanding array of commercially available artificial intelligence-assisted educational applications can be found in the major app stores. Raises concerns about their potential to diminish foreign language learning in educational settings. Similarly, sophisticated artificial intelligence-assisted mathematics applications, like Photomath (Photomath, 2022), evoke apprehension regarding their impact on mathematics education. The apprehensions reflect the issues raised with the integration of calculators in educational settings approximately fifty years prior: if a tool can perform tasks such as long division, language translation, or equation solving automatically, it may lead to the conclusion that children need not acquire these skills, potentially jeopardizing the learning process (Watters, 2015).
Although the majority of discourse regarding the ethics of AIED and learning analytics predominantly addresses data-related issues (such as biases, privacy, and data ownership) and the methodologies of data analysis (including fairness, transparency, and trustworthiness), the ethical considerations of AIED extend beyond mere inquiries into data and computational methods. In summary, examining the ethics of AIED data and computations is essential yet inadequate (Holmes et al., 2021). The ethics of AIED must also consider the ethics of education. This prompts significant inquiries regarding pedagogy (Is the prevalent instruction pedagogy in AIED ethically justified?), assessments (What criteria should be evaluated and by what methods?), knowledge (What constitutes knowledge?), and agency of students and teachers (Who should wield authority?). Holmes and Porayska-Pomsta, 2023.
While the overarching ethical issues surrounding Artificial Intelligence are extensively discussed, education plays crucial social functions and seeks human growth, rendering the associated ethical dilemmas extremely complex both theoretically and practically. Consequently, it has been proposed that a robust ethical framework for AIED should be established, utilizing learning and human development as foundational elements (Tuomi, 2023). This implies that ethical frameworks for broad artificial intelligence must clearly articulate their underlying concepts of progress and development.
Evidence supporting the beneficial effects of AIED utilization is crucial for policy formulation and the ethical application of artificial intelligence. Investment of time and, for instance, educator effort necessitates adequate explanation. Numerous articles in the International Journal of Artificial Intelligence in Education demonstrate that academic academics have extensively investigated the efficacy of diverse AIED systems. A multitude of these papers has been consolidated in various meta-analyses and meta-meta-analyses (e.g., Kulik & Fletcher, 2016; Ma et al., 2014). Du Boulay concludes that AIED systems outperform human teachers in big classroom settings, as evidenced by several metareviews and analyses. When compared to individual human educators, they do slightly worse. Adequate implementation of technological solutions in the classroom should not be judged just by the results of post-tests. page 80 (du Boulay, 2016).

Statement of the problem
Integrating artificial intelligence in educational settings. A study on its impact and effectiveness
Research Objective
1. To examine the effects of Artificial Intelligence integration on student learning outcomes.
Research Question
1. What is the effect of integrating artificial intelligence on student learning outcomes?
Research Methodology
Quantitative and Survey method was used for this research
Population
The population of this study was consist of all students enrolled in the University of Education in
The following programs: BS English, BS Mathematics, BS Botany, BS IT, and BS Zoology.

S/R NO	Name of Department	No. of Students in Vehari Campus	No. of Students in Faisalabad Campus
1	BS English	301	173
2	BS Mathematics	237	121
3	BS Botany	279	65
4	BS IT	360	193
5	BS Zoology	292	163
Total		1469	715
		184	

Sampling

Random sampling was used we were taken 15 from BS English, 15 from BS Mathematics, 15 from BS Botany, 15 from BS Zoology ,15 from BS IT, total 150 students will be sampling of this study.

S/R NO	Name of Department	No. of taken Students in Vehari Campus	No. of taken Students in Faisalabad Campus
1	BS English	15	15
2	BS Mathematics	15	15
3	BS Botany	15	15
4	BS IT	15	15
5	BS Zoology	15	15
Total		75	75
		150	

Study Instrument

The questionnaire served as the instrument for the present study. It was consist of 20 questions utilizing a 5-Point Likert Scale.

Research Methodology

A quantitative study approach was employed, utilizing the survey method for data collection.

Data Collection

Data was collected personally by the researcher with assistance from friends.

Table 4.1: Artificial intelligence-based tools enhance student engagement in learning.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	6%	17%	3.495	34.607	0.974	3.29-3.70
Agree	53%	56%				
Undecided	32%	19%				
Disagree	0%	7%				
Strongly Disagree	9%	2%				

The t-test results show a significant difference in students' perceptions regarding the involvement of professional

bodies in the course preparation process at Vehari campus and Faisalabad campus. With a t-value of 34.607 and a p-value of 0.000, the results confirm that the difference between the two groups is statistically significant. The mean difference of 3.495, with a confidence interval between 3.29 and 3.70, indicates a small but meaningful variation. While 53% of Faisalabad campus students and 56% of Vehari campus students believe Artificial intelligence-based tools enhance student engagement in learning. , the statistical analysis suggests that students from both campuses have similar views on Artificial intelligence-based tools enhance student engagement in learning.

Table 4.2: Artificial intelligence-powered adaptive assessments improve student outcomes.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	6%	15%	3.613	33.079	1.053	3.40-3.83
Agree	47%	41%				
Undecided	35%	32%				
Disagree	6%	7%				
Strongly Disagree	6%	5%				

- The t-test results reveal a significant difference in students' perceptions of Artificial intelligence-powered adaptive assessments improve student outcomes.. With a t-value of 33.079 and a p-value of 0.000, the difference is statistically significant. The mean difference of 3.613, with a confidence interval ranging from 3.40 to 3.83, indicates that 47% of Faisalabad campus students agree Artificial intelligence-powered adaptive assessments improve student outcomes, compared to 41% of Vehari campus students as shown in table 4.2. This suggests that Faisalabad campus have a stronger sense of Artificial intelligence-powered adaptive assessments improve student out comes. Compared to their Vehari campus counterparts. The data highlights the contrast in views, with Faisalabad campus students showing greater agreement regarding Artificial intelligence-powered adaptive assessments improve student outcomes.
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Table 4.3: Artificial intelligence integration increases teacher productivity.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	11%	14%	3.742	42.668	0.846	3.57-3.92
Agree	68%	47%				
Undecided	12%	20%				
Disagree	6%	8%				
Strongly Disagree	13%	9%				

The t-test results show a significant difference in students' perceptions of the clarity of promotion requirements between Faisalabad and Vehari campus. The t-value of 42.668 and the p-value of 0.000 indicate that this difference is statistically significant. The mean difference of 3.742, with a confidence interval between 3.57 and 3.92, reveals that 68% of students in the Faisalabad campus agree that Artificial intelligence integration increases teacher productivity. Compared to 54% in the vehari campus.

Table 4.4: Artificial intelligence-based virtual assistants support student learning.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	6%	14%	3.667	40.929	0.864	3.49-3.84
Agree	71%	63%				
Undecided	18%	10%				
Disagree	6%	10%				
Strongly Disagree	0%	14%				

The t-test results reveal a significant difference in students' views on the availability of mentorship between Faisalabad and Vehari campus. With a t-value of 40.929 and a p-value of 0.000, the difference is statistically significant. The mean difference of 3.667, with a confidence interval ranging from 3.49 to 3.84, shows that 71% of Faisalabad campus students agree that Artificial intelligence-based virtual assistants support student learning. Compared to 63% in the Vehari campus. This indicates that students at Faisalabad universities have a more positive perception of Artificial intelligence-based virtual assistants support student learning.at Vehari campus .

Table 4.5: Artificial intelligence-powered gasification enhances student motivation

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	6%	14%	3.903	37.615	1.001	3.70-4.11
Agree	65%	54%				
Undecided	24%	19%				
Disagree	6%	10%				
Strongly Disagree	0%	3%				

The t-test results reveal a significant difference in students' perceptions of the availability of professional development opportunities between Faisalabad and Vehari campus The t-value of 37.615 and the p-value of 0.000 confirm that the difference is statistically significant. The mean difference of 3.903, with a confidence interval between 3.70 and 4.11, shows that 65% of students at Faisalabad believe Artificial intelligence-powered gasification enhances student motivation, compared to 54% at Vehari campus . This indicates that students at Faisalabad campus universities have a more favorable view of the Artificial intelligence-powered gasification enhances student motivation than those at Vehari. The data clearly reflects the differing perceptions of between the two campuses given in table 4.5.

Table 4.6: Artificial intelligence-driven intelligent tutoring systems improve student understanding.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	29%	27%	4.161	47.897	0.838	3.99-4.33

Agree	53%	46%				
Undecided	9%	15%				
Disagree	9%	7%				
Strongly Disagree	0%	5%				

Table 4.6 presents the responses of students from Vehari campus and Faisalabad campus concerning the Artificial intelligence-driven intelligent tutoring systems improve student understanding.. The findings indicate no significant difference in the perceptions of students from both campuses regarding this matter. A total of 53% of students in the Faisalabad campus and 47% in the Vehari campus agreed that Artificial intelligence-driven intelligent tutoring systems improve student understanding. Statistical analysis further supports this observation, with a mean difference of 4.161 ($t = 47.897$, $df = 92$, $p = 0.000$) and a confidence interval ranging from 3.99 to 4.33, indicating a significant result.

Table 4.7: Artificial intelligence integration reduces teacher workload.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	53%	27%	3.419	29.800	1.107	3.19-3.65
Agree	38%	56%				
Undecided	6%	10%				
Disagree	3%	5%				
Strongly Disagree	0%	2%				

The responses of students from Vehari campus and Faisalabad campus regarding their participation are presented in Table 4.8. According to the findings, 56% of students from Vehari campus and 38% from Faisalabad institutions agreed that Artificial intelligence integration reduces teacher workload.. The results indicate a notable difference in perceptions between students of Vehari campus and Faisalabad campus, favoring Vehari campus students. However, despite these differences, students from both campuses generally hold a positive view Artificial intelligence integration reduces teacher workload.. The sample t-test analysis, with a t-value of 29.800 and a significance level of 0.000, confirms the statistical significance of the findings. The mean difference of 3.419, with a 95% confidence interval ranging from 3.19 to 3.65, further emphasizes the variation in students' perceptions.

Table 4.8: Artificial intelligence-based learning platforms promote personalized learning.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	6%	12%	3.656	36.682	0.961	3.46-3.85
Agree	56%	47%				
Undecided	29%	19%				
Disagree	9%	5%				
Strongly Disagree	0%	17%				

The table presents the responses of students from Vehari campus and Faisalabad campus regarding Artificial intelligence-based learning platforms promote personalized learning.. The results indicate that there is no significant difference in perceptions between the two groups. A total of 47% of students from Faisalabad institutions and 56% from Vehari campus believe that Artificial intelligence-based learning platforms promote personalized learning. The t-test analysis supports this observation, with a t-value of 36.682 and a p-value of 0.000, indicating statistical significance. The mean difference is 3.656, with a 95% confidence interval ranging from 3.46 to 3.85. These findings suggest that both Faisalabad and Vehari campus students perceive a similar Artificial intelligence-based learning platforms promote personalized learning.

Table 4.9: Artificial intelligence-driven educational chat bots facilitate student-teacher interaction.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly	6%	12%	3.355	31.143	1.039	3.14-3.86

Agree						
Agree	76%	59%				
Undecided	6%	14%				
Disagree	12%	7%				
Strongly Disagree	0%	8%				

The responses of students regarding the Artificial intelligence-driven educational chat bots facilitate student-teacher interaction. Table 4.9. The data reveals that 76% of students from Faisalabad agreed with the statement, while 59% of students from Vehari campus shared the same view. This indicates a significant difference in perceptions, with students from Faisalabad institutions being more favorable toward Artificial intelligence-driven educational chat bots facilitate student-teacher interaction compared to those in Vehari campus . The t-test analysis further supports this finding, with a t-value of 31.143 (df = 92) and a significance level of 0.000, confirming the difference as statistically significant. The mean difference of 3.355 falls within the 95% confidence interval of 3.14 to 3.57, further reinforcing the conclusion.

Table 4.10: Artificial intelligence integration improves student academic performance.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	8%	9%	3.163	29.531	1.180	3.37-3.86
Agree	49%	38%				
Undecided	17%	38%				
Disagree	15%	12%				
Strongly Disagree	8%	3%				

The t-test results reveal a significant difference in students' opinions about Artificial intelligence integration improves student academic performance. between Faisalabad and Vehari campus. The t-value of 29.531 and the p-value of 0.000 confirm that the difference is statistically significant. The mean difference of 3.613, with a confidence interval between 3.37 and 3.86, shows that 49% of students at Faisalabad agree Artificial intelligence integration improves student academic performance, compared to 38% in the Vehari campus.

Table 4.11: Artificial intelligence-based tools enhance teacher instructional effectiveness.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	18%	17%	3.882	45.711	0.819	3.71-4.05
Agree	65%	53%				
Undecided	9%	3%				
Disagree	6%	14%				
Strongly Disagree	3%	14%				

The t-test results reveal a significant difference in students' views on Artificial intelligence-based tools enhance teacher instructional effectiveness. between Faisalabad and Vehari campus. The t-value of 45.711 and the p-value of 0.000 indicate that the difference is statistically significant. The mean difference of 3.882, with a confidence interval between 3.71 and 4.05, shows that 65% of students from Vehari campus agreed with the statement, while 53% of students from Faisalabad agreed. This suggests that students in the Faisalabad campus are more likely to believe Artificial intelligence-based tools enhance teacher instructional effectiveness., reflecting a clear difference in perceptions between the two campuses.

Table 4.12: Artificial intelligence-powered learning analytics inform data driven decision-making.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	21%	12%	3.742	43.331	0.833	3.57-3.91
Agree	68%	68%				

Undecided	3%	15%				
Disagree	6%	2%				
Strongly Disagree	3%	3%				

The results show that students from both Faisalabad and Vehari campus have similar views on the Artificial intelligence-powered learning analytics inform data driven decision-making.
The t-value of 43.331 and the p-value of 0.000 indicate that this difference is statistically significant. The mean difference of 3.742, with a 95% confidence interval between 3.57 and 3.91, shows that approximately 68% of students from both Vehari campus and Faisalabad campus agreed that Artificial intelligence-powered learning analytics inform data driven decision-making.

Table 4.13: Artificial intelligence integration increases student accessibility.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	15%	10%	4.043	68.747	0.569	3.93-4.16
Agree	56%	64%				
Undecided	24%	15%				
Disagree	0%	10%				
Strongly Disagree	6%	0%				

The results show that students from both Faisalabad and Vehari universities have similar views on Artificial intelligence integration increases student accessibility.. The t-value of 68.474 and the p-value of 0.000 indicate a statistically significant difference. The mean difference of 4.043, with a 95% confidence interval between 3.93 and 4.16, reveals that 66% of students in Faisalabad and 64% in Vehari campus agree that Artificial intelligence integration increases student accessibility.. This suggests that students in both campuses have similar perceptions of the Artificial intelligence integration increases student accessibility.

Table 4.14: Artificial intelligence-based virtual learning environments promote collaborative learning.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	12%	19%	3.753	45.072	0.803	3.59-3.92
Agree	79%	71%				
Undecided	6%	8%				
Disagree	3%	2%				
Strongly Disagree	0%	0%				

The findings indicate that students from both Faisalabad and Vehari have different perceptions about Artificial intelligence-based virtual learning environments promote collaborative learning.. The t-test results show a statistically significant difference, with a t-value of 45.072 and a p-value of 0.000. The mean difference of 3.753, with a 95% confidence interval ranging from 3.59 to 3.92, suggests that 79% of students in Vehari and 71% in Faisalabad believe that Artificial intelligence-based virtual learning environments promote collaborative learning. This shows that students in Vehari campus are more likely to view Artificial intelligence-based virtual learning environments promote collaborative learning. than their counterparts in Faisalabad campus institutions. The graphical representation is given below.

Table 4.15: Artificial intelligence integration is hindered by technical difficulties.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	3%	12%	3.699	48.596	0.734	3.22-3.68
Agree	76%	60%				

Undecided	12%	12%				
Disagree	9%	7%				
Strongly Disagree	0%	3%				

The results show that students from Faisalabad and Vehari have different views on the Artificial intelligence integration is hindered by technical difficulties.. The t-test results indicate a statistically significant difference, with a t-value of 48.596 and a p-value of 0.000. The mean difference of 3.699, with a 95% confidence interval ranging from 3.55 to 3.85, reveals that 60% of students in Vehari campus and 76% in Faisalabad institutions agreed Artificial intelligence integration is hindered by technical difficulties.

Table 4.16: Teachers lack training in Artificial intelligence-based tool implementation.

Response		Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree		6%	12%	3.452	29.768	1.118	3.22-3.68
Agree		59%	56%				
Undecided		29%	25%				
Disagree		6%	7%				
Strongly Disagree		0%	0%				

The results indicate that students from both Faisalabad and Vehari universities have similar views on the Teachers lack training in Artificial intelligence-based tool implementation. The t-test analysis reveals a statistically significant difference, with a t-value of 29.768 and a p-value of 0.000. The mean difference of 3.452, with a 95% confidence interval ranging from 3.22 to 3.68, shows that 56% of students in Vehari campus and 59% of students in Faisalabad campus agreed that Teachers lack training in Artificial intelligence-based tool implementation.

Table 4.17: Artificial intelligence-driven learning analytics inform effective teaching practices

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	12%	14%	3.473	36.103	0.928	3.28-3.66
Agree	44%	59%				
Undecided	24%	7%				
Disagree	24%	12%				
Strongly Disagree	0%	10%				

The findings indicate significant differences in the perceptions of students from Faisalabad and Vehari regarding the Artificial intelligence-driven learning analytics inform effective teaching practices. The t-test results show a statistically significant difference, with a t-value of 36.103 and a p-value of 0.000. The mean difference of 3.473, with a 95% confidence interval ranging from 3.28 to 3.66, reveals that 44% of students in Faisalabad campus and 59% in Vehari campus believe Artificial intelligence-driven learning analytics inform effective teaching practices. This shows that students at Vehari Artificial intelligence-driven learning analytics inform effective teaching practices compared to those at Faisalabad universities.

Table 4.18: Artificial intelligence-driven decision-making raises ethical concerns.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)

Strongly Agree	15%	14%	3.516	33.329	1.017	3.31-3.73
Agree	44%	49%				
Undecided	18%	14%				
Disagree	21%	20%				
Strongly Disagree	0%	2%				

The results indicate that there is a small difference in students' views on the Artificial intelligence-driven decision-making raises ethical concerns of both Faisalabad and Vehari. The t-test analysis shows a statistically significant difference, with a t-value of 33.329 and a p-value of 0.000. The mean difference of 3.516, with a 95% confidence interval ranging from 3.31 to 3.73, reveals that 49% of students in Vehari campus and 44% in Faisalabad agree that Artificial intelligence-driven decision-making raises ethical concerns. The data suggests that both Faisalabad and Vehari academic members have similar perceptions Artificial intelligence-driven decision-making raises ethical concerns.

Table 4.19: Artificial intelligence integration is limited by data quality issues.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	15%	12%	3.839	48.967	0.756	3.68-3.99
Agree	74%	61%				
Undecided	9%	17%				
Disagree	0%	8%				
Strongly Disagree	0%	2%				

The results show that students from Faisalabad and Vehari have differing opinions on the Artificial intelligence integration is limited by data quality issues.. The t-test analysis reveals a statistically significant difference, with a t-value of 48.967 and a p-value of 0.000. The mean difference of 3.839, with a 95% confidence interval ranging from 3.68 to 3.99, indicates that 74% of students in Faisalabad campus and 61% in Vehari campus agree that Artificial intelligence integration is limited by data quality issues. This suggests that students at Faisalabad universities have a more favorable view of the Artificial intelligence integration is limited by data quality issues compared to their counterparts at Vehari.

Table 4.20: Artificial intelligence-based tools are too expensive for widespread adoption.

Response	Faisalabad campus (%)	Vehari campus(%)	Mean Difference	t-value	Std. Deviation	Confidence Interval (Min-Max)
Strongly Agree	12%	8%	3.731	43.733	0.823	3.56-3.90
Agree	76%	58%				
Undecided	6%	25%				
Disagree	0%	7%				
Strongly Disagree	6%	2%				

The results reveal a significant difference in the perceptions of students at Faisalabad and Vehari regarding Artificial intelligence-based tools are too expensive for widespread adoption.. The t-test analysis shows a statistically significant difference, with a t-value of 43.733 and a p-value of 0.000. The mean difference of 3.731, with a 95% confidence interval ranging from 3.56 to 3.90, shows that 76% of students at Faisalabad and 58% at Vehari campus agree that Artificial intelligence-based tools are too expensive for widespread adoption. This indicates that students at Faisalabad have a more favorable opinion of the Artificial intelligence-based tools are too expensive for widespread adoption in their institutions compared to those at Vehari universities.

Findings

This section presented the findings of the study and discussed them in relation to the research objectives and questions.

- The t-test results show a significant difference in students' perceptions regarding the involvement of professional bodies in the course preparation process at Vehari campus and Faisalabad campus. With a t-value

of 34.607 and a p-value of 0.000, the results confirm that the difference between the two groups is statistically significant. The mean difference of 3.495, with a confidence interval between 3.29 and 3.70, indicates a small but meaningful variation. While 53% of Faisalabad campus students and 56% of Vehari campus students believe Artificial intelligence-based tools enhance student engagement in learning. , the statistical analysis suggests that students from both campuses have similar views on Artificial intelligence-based tools enhance student engagement in learning. (Table 4.1).

- The t-test results reveal a significant difference in students' perceptions of Artificial intelligence-powered adaptive assessments improve student outcomes.. With a t-value of 33.079 and a p-value of 0.000, the difference is statistically significant. The mean difference of 3.613, with a confidence interval ranging from 3.40 to 3.83, indicates that 47% of Faisalabad campus students agree Artificial intelligence-powered adaptive assessments improve student outcomes, compared to 41% of Vehari campus students as shown in table 4.2. This suggests that Faisalabad campus have a stronger sense of Artificial intelligence-powered adaptive assessments improve student out comes. Compared to their Vehari campus counterparts. The data highlights the contrast in views, with Faisalabad campus students showing greater agreement regarding Artificial intelligence-powered adaptive assessments improve student outcomes (Table 4.2).
- The t-test results show a significant difference in students' perceptions of the clarity of promotion requirements between Faisalabad and Vehari campus. The t-value of 42.668 and the p-value of 0.000 indicate that this difference is statistically significant. The mean difference of 3.742, with a confidence interval between 3.57 and 3.92, reveals that 68% of students in the Faisalabad campus agree that Artificial intelligence integration increases teacher productivity. Compared to 54% in the vehari campus (Table 4.3).
- The t-test results reveal a significant difference in students' views on the availability of mentorship between Faisalabad and Vehari campus. With a t-value of 40.929 and a p-value of 0.000, the difference is statistically significant. The mean difference of 3.667, with a confidence interval ranging from 3.49 to 3.84, shows that 71% of Faisalabad campus students agree that Artificial intelligence-based virtual assistants support student learning. Compared to 63% in the Vehari campus. This indicates that students at Faisalabad universities have a more positive perception of Artificial intelligence-based virtual assistants support student learning.at Vehari campus (Table 4.4).
- The t-test results reveal a significant difference in students' perceptions of the availability of professional development opportunities between Faisalabad and Vehari campus The t-value of 37.615 and the p-value of 0.000 confirm that the difference is statistically significant. The mean difference of 3.903, with a confidence interval between 3.70 and 4.11, shows that 65% of students at Faisalabad believe Artificial intelligence-powered gasification enhances student motivation, compared to 54% at Vehari campus . This indicates that students at Faisalabad campus universities have a more favorable view of the Artificial intelligence-powered gasification enhances student motivation than those at Vehari (Table 4.5)
- Table 4.6 presents the responses of students from Vehari campus and Faisalabad campus concerning the Artificial intelligence-driven intelligent tutoring systems improve student understanding.. The findings indicate no significant difference in the perceptions of students from both campuses regarding this matter. A total of 53% of students in the Faisalabad campus and 47% in the Vehari campus agreed that Artificial intelligence-driven intelligent tutoring systems improve student understanding. Statistical analysis further supports this observation, with a mean difference of 4.161 ($t = 47.897$, $df = 92$, $p = 0.000$) and a confidence interval ranging from 3.99 to 4.33, indicating a significant result. (Table 4.6).
- The responses of students from Vehari campus and Faisalabad campus regarding their participation are presented in Table 4.8. According to the findings, 56% of students from Vehari campus and 38% from Faisalabad institutions agreed that Artificial intelligence integration reduces teacher workload.. The results indicate a notable difference in perceptions between students of Vehari campus and Faisalabad campus, favoring Vehari campus students. However, despite these differences, students from both campuses generally hold a positive view Artificial intelligence integration reduces teacher workload.. The sample t-test analysis, with a t-value of 29.800 and a significance level of 0.000, confirms the statistical significance of the findings. The mean difference of 3.419, with a 95% confidence interval ranging from 3.19 to 3.65, further emphasizes the variation in students perceptions. (Table 4.7).
- The table presents the responses of students from Vehari campus and Faisalabad campus regarding Artificial intelligence-based learning platforms promote personalized learning.. The results indicate that there is no significant difference in perceptions between the two groups. A total of 47% of students from Faisalabad institutions and 56% from Vehari campus believe that Artificial intelligence-based learning platforms promote personalized learning. The t-test analysis supports this observation, with a t-value of 36.682 and a p-value of 0.000, indicating statistical significance. The mean difference is 3.656, with a 95% confidence interval ranging from 3.46 to 3.85. (Table 4.8).
- The data reveals that 76% of students from Faisalabad agreed with the statement, while 59% of students from Vehari campus shared the same view. This indicates a significant difference in perceptions, with students from Faisalabad institutions being more favorable toward Artificial intelligence-driven educational chat bots facilitate student-teacher interaction compared to those in Vehari campus . The t-test analysis further supports this finding, with a t-value of 31.143 ($df = 92$) and a significance level of 0.000, confirming the difference as statistically significant. The mean difference of 3.355 falls within the 95% confidence interval of 3.14 to 3.57,

further reinforcing the conclusion (Table 4.9).

- The t-test results reveal a significant difference in students' opinions about Artificial intelligence integration improves student academic performance. between Faisalabad and Vehari campus. The t-value of 29.531 and the p-value of 0.000 confirm that the difference is statistically significant. The mean difference of 3.613, with a confidence interval between 3.37 and 3.86, shows that 49% of students at Faisalabad agree Artificial intelligence integration improves student academic performance, compared to 38% in the Vehari campus. (Table 4.10).
- The t-test results reveal a significant difference in students' views on Artificial intelligence-based tools enhance teacher instructional effectiveness. between Faisalabad and Vehari campus. The t-value of 45.711 and the p-value of 0.000 indicate that the difference is statistically significant. The mean difference of 3.882, with a confidence interval between 3.71 and 4.05, shows that 65% of students from Vehari campus agreed with the statement, while 53% of students from Faisalabad agreed. This suggests that students in the Faisalabad campus are more likely to believe Artificial intelligence-based tools enhance teacher instructional effectiveness., reflecting a clear difference in perceptions between the two campuses. (Table 4.11).
- The results show that students from both Faisalabad and Vehari campus have similar views on the Artificial intelligence-powered learning analytics inform data driven decision-making.
- The t-value of 43.331 and the p-value of 0.000 indicate that this difference is statistically significant. The mean difference of 3.742, with a 95% confidence interval between 3.57 and 3.91, shows that approximately 68% of students from both Vehari campus and Faisalabad campus agreed that Artificial intelligence-powered learning analytics inform data driven decision-making. (Table 4.12).
- The results show that students from both Faisalabad and Vehari universities have similar views on Artificial intelligence integration increases student accessibility.. The t-value of 68.474 and the p-value of 0.000 indicate a statistically significant difference. The mean difference of 4.043, with a 95% confidence interval between 3.93 and 4.16, reveals that 66% of students in Faisalabad and 64% in Vehari campus agree that Artificial intelligence integration increases student accessibility (Table 4.13).
- The findings indicate that students from both Faisalabad and Vehari have different perceptions about Artificial intelligence-based virtual learning environments promote collaborative learning.. The t-test results show a statistically significant difference, with a t-value of 45.072 and a p-value of 0.000. The mean difference of 3.753, with a 95% confidence interval ranging from 3.59 to 3.92, suggests that 79% of students in Vehari and 71% in Faisalabad believe that Artificial intelligence-based virtual learning environments promote collaborative learning. (Table 4.14).
- The results show that students from Faisalabad and Vehari have different views on the Artificial intelligence integration is hindered by technical difficulties.. The t-test results indicate a statistically significant difference, with a t-value of 48.596 and a p-value of 0.000. The mean difference of 3.699, with a 95% confidence interval ranging from 3.55 to 3.85, reveals that 60% of students in Vehari campus and 76% in Faisalabad institutions agreed Artificial intelligence integration is hindered by technical difficulties. (Table 4.15).
- The results indicate that students from both Faisalabad and Vehari universities have similar views on the Teachers lack training in Artificial intelligence-based tool implementation. The t-test analysis reveals a statistically significant difference, with a t-value of 29.768 and a p-value of 0.000. The mean difference of 3.452, with a 95% confidence interval ranging from 3.22 to 3.68, shows that 56% of students in Vehari campus and 59% of students in Faisalabad campus agreed that Teachers lack training in Artificial intelligence-based tool implementation (Table 4.16).
- The findings indicate significant differences in the perceptions of students from Faisalabad and Vehari regarding the Artificial intelligence-driven learning analytics inform effective teaching practices. The t-test results show a statistically significant difference, with a t-value of 36.103 and a p-value of 0.000. The mean difference of 3.473, with a 95% confidence interval ranging from 3.28 to 3.66, reveals that 44% of students in Faisalabad campus and 59% in Vehari campus believe Artificial intelligence-driven learning analytics inform effective teaching practices. (Table 4.17).
- The results indicate that there is a small difference in students' views on the Artificial intelligence-driven decision-making raises ethical concerns of both Faisalabad and Vehari. The t-test analysis shows a statistically significant difference, with a t-value of 33.329 and a p-value of 0.000. The mean difference of 3.516, with a 95% confidence interval ranging from 3.31 to 3.73, reveals that 49% of students in Vehari campus and 44% in Faisalabad agree that Artificial intelligence-driven decision-making raises ethical concerns.(Table 4.18).
- The results show that students from Faisalabad and Vehari have differing opinions on the Artificial intelligence integration is limited by data quality issues.. The t-test analysis reveals a statistically significant difference, with a t-value of 48.967 and a p-value of 0.000. The mean difference of 3.839, with a 95% confidence interval ranging from 3.68 to 3.99, indicates that 74% of students in Faisalabad campus and 61% in Vehari campus agree that Artificial intelligence integration is limited by data quality issues (Table 4.19).
- The results reveal a significant difference in the perceptions of students at Faisalabad and Vehari regarding Artificial intelligence-based tools are too expensive for widespread adoption.. The t-test analysis shows a statistically significant difference, with a t-value of 43.733 and a p-value of 0.000. The mean difference of 3.731, with a 95% confidence interval ranging from 3.56 to 3.90, shows that 76% of students at Faisalabad and 58% at Vehari campus agree that Artificial intelligence-based tools are too expensive for widespread adoption. (Table

4.20).

CONCLUSION

Here are the conclusions based on the findings of the current study.

- Artificial intelligence-based tools enhance student engagement in learning.
- Artificial intelligence-powered adaptive assessments improve student outcomes.
- Artificial intelligence integration increases teacher productivity.
- Artificial intelligence-based virtual assistants support student learning.
- Artificial intelligence-powered gasification enhances student motivation.
- Artificial intelligence-driven intelligent tutoring systems improve student understanding.
- Artificial intelligence integration reduces teacher workload.
- Artificial intelligence-based learning platforms promote personalized learning.
- Artificial intelligence-driven educational chat bots facilitate student-teacher interaction.
- Artificial intelligence integration improves student academic performance.
- Artificial intelligence-based tools enhance teacher instructional effectiveness.
- Artificial intelligence-powered learning analytics inform data driven decision-making.
- Artificial intelligence integration increases student accessibility.
- Artificial intelligence-based virtual learning environments promote collaborative learning.
- Artificial intelligence integration is hindered by technical difficulties.
- Teachers lack training in Artificial intelligence-based tool implementation.
- Artificial intelligence-driven learning analytics inform effective teaching practices.
- Artificial intelligence-driven decision-making raises ethical concerns.
- Artificial intelligence integration is limited by data quality issues.
- Artificial intelligence-based tools are too expensive for widespread adoption.

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