Project Report on “The Transformative Potential of AI in Education: Enhancing Learning Outcomes Without Compromising Ethical Integrity”

The Transformative Potential of AI in Education: Enhancing Learning Outcomes Without Compromising Ethical Integrity

Submitted to

Ahmed Imran Kabir

Lecturer, School of Business and Economics

Management Information System

Submitted by

Antara Raisa Sohana

111212068

Management Information System

Spring 2025

School of Business and Economics

United International **University**

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Letter of Transmittal

July 28, 2025

Ahmed Imran Kabir
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Subject: Submission of Research Paper

Dear Sir,

With due respect, I am submitting my research paper with an entitled title The Transformative Potential of AI in Education: Enhancing Learning Outcomes Without Compromising Ethical Standards in completion of the requirements of the degree of Bachelor of Business Administration, Major in Management Information Systems.

The study examines the possibility to reform the classical education paradigm with the help of AI without losing its ethical validity and encouraging equity. I would consider this paper to provide important insights into how AI could transform education and has been able to add to the current research in the disciplines of MIS and AI in Education.

I would like to believe this paper was worth your expectations, and I truly owe you grateful outcomes over the support and guidelines I received over the course of the entire project.

Sincerely,

Antara Raisa Sohana
Bachelor of Business Administration
Management Information Systems
United International University
ID: 111212068

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Declaration of the Student

I, Antara Raisa Sohana, do hereby certify that the work of the research paper on the topic The Transformative Potential of AI in Education: Enhancing Learning Outcomes Without Compromising Ethical Standards is an original piece of academic production which was produced fully through my own initiative, effort, and carried out without the aid of others and in the strict observance of degree regulations of the Bachelor of Business Administration in Management Information Systems degree of the faculty of business administration, awarded by United International University (UIU).

Any data or material used in this paper has been properly accompanied with a reference as per the 6th edition of the APA citation style. Ahmed Imran Kabir, who is my supervisor, supported and assisted me during the research process.

All the work on this paper has not been submitted before in any other course or degree. I am taking full responsibility for the completeness and accurateness of the contents of this paper and affirm that there was nothing like plagiarism or scholarly duplicity.

Sincerely,

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Acknowledgement

The completion of this project would not have been possible without continued advice, harsh criticism, and constant motivation by my supervisor, Ahmed Imran Kabir. His experience and his active involvement were invaluable, and I have been very appreciative of his attentive time and energy in my mentorship.

No less significant were those people who took part in the survey. They provided nuanced answers and open-minded feedback that became key to the development of conclusions of this study, and I would also like to gratefully acknowledge their help.

I am also very thankful to the members of the faculty of School of Business and Economics at the United International University because of their academic assistance and providing me with the research resources which helped me to complete this project successfully.

Lastly, I would like to express my earnest gratefulness to my family and all the people I love because of their continual faith in me, inspiration, and support that they have been able to provide me during the academic journey.

Abstract

The transformation of Artificial Intelligence (AI) in the educational field is studied thanks to a focus on evaluating how artificial intelligence impacts personalized learning, efficiency in terms of cost, ethical applications, accessibility, and learning achievements. The main focus of the research is to figure out how AI can be used to enhance learning experiences and results with ethical integrity and inclusiveness maintained. The information has been gathered through the web-based survey conducted among 336 students and focused on the perception of students concerning the role of AI in modern education. The results shows that personalization in learning with and ethical use have statistically significant and positive effect in learning outcomes, and personalized learning has the most remarkable effect. When educational technologies are created following the ethical principles like data privacy, fairness, and accountability, learners show more trust in them, and accessibility efforts combine to fill the gap in under-served populations. However, the impact of cost efficiency and accessibility on learning results is relatively weak, meaning that the financial and technological restrictions faced by the educational organizations limit the capacity of AI to cut costs and increase educational access. The paper hence points out that equitable and inclusive AI tools need to be generated and affordability and scalability need to be addressed. Overall, the study represents an encouraging role of AI to transform education, and it should be emphasized that continuous improvements of AI-based platforms and elimination of obstacles limiting more general acceptance should be viewed as one of the essential requirements. Future questions will attempt to improve individualized learning systems, cost effectiveness and equal access to every student.

Keywords: Artificial Intelligence, Personalized Learning, Ethical Use, Cost Efficiency, Accessibility

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List of Acronyms & Abbreviations

Acronym/Abbreviation	Full Form
AI	Artificial Intelligence
PL	Personalized Learning
CE	Cost Efficiency
EU	Ethical Use of AI
AIE	Accessibility & Inclusion of AI in Education
LO	Learning Outcomes
SEM	Structural Equation Modeling
CR	Composite Reliability
AVE	Average Variance Extracted
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
HTMT	Heterotrait-Monotrait Ratio
R^2	R-Square (A measure of explanatory power in SEM)

CHAPTER I: INTRODUCTION

I.1 Background of Study

With the evolution and growth in Artificial Intelligence which is rapidly and hugely reshaping numerous sectors of human life, with that, education being one of its most significant areas of impact from every aspect. AI, in its various forms in education such as **adaptive learning system**, **smart tutoring**, and **automated grading systems**, is revolutionizing how educational materials and content are delivered and experienced (Chen, Chen, & Lin, 2020; Harry & Sayudin, 2023). The potential of AI in education is indescribable, with its ability to help learn materials based on the need and personalized way of teaching, **improve student engagement**, and **manage the administrative tasks related to education** (Chen, Chen, & Lin, 2020). By connecting the power of AI, educational systems are now able to offer more of a tailored and adapted teaching experiences that fulfil the individual needs of students, allowing them to apply more of a vast learning experience rather than the typical and traditional methods that are same for all students despite their need for different approaches in education.

By integrating AI technologies allows for **real-time data analysis** which provides continuous feedback all along on each step to both students and educators. This means that the educational materials and contents can be **adapted** to a student's pace, their way of learning and finding out best possible learning style for them, and proficiency level, making learning more inclusive and accessible. For instance, a teacher may not have the time and energy or even cannot provide necessary attention to details to all the students and their weakness all at a time, specially looking at the current education system whereas AI-powered systems can identify areas where a student is struggling and offer personalized resources to address those gaps. Additionally, AI can facilitate the **automation of administrative tasks related to teaching**, like preparing personalized questions, quizzes, notes and study materials

which reduces the pressure on educators and teachers can focus more on quality content of education and student interaction.

However, while AI shows great outcome but its integration into educational systems, particularly in countries like Bangladesh, will have several challenges which might be quiet evidently hard to overcome. The **traditional education system** in Bangladesh, which has been predominantly reliant on pen-**paper-based exams, just learning topics that are on syllabus not fully exploring all types of knowledge** and **manual assignments,** has not yet embraced AI to an acceptable level. The system is still based on practices where students are projected to complete study task which are ineffective in learning, especially in the lower classes giving them closed topic assignments learning only the materials that are taught, often with limited access to no access at all to digital resources. The question now arises: **how can AI be effectively integrated into this traditional educational system without compromising the core values of academic honesty and ethical way of education?**

The main focus of this research paper is to contribute to these discussions by examining the strategies that AI could be possibly implemented to teach. Observing some proposed benefits can be achieved and ethical concerns for AI, this paper seeks to question how AI can be included in a traditional system of academic endeavor, independent research and critical thought. This relationship should ensure that AI works as an amplification (and not a replacement) of the fundamentals of the educational system.

I.2 Statement of the Problem

The conventional system of education in Bangladesh has been known for its dependence on paper-pencil based tests, limited learning and application of syllabus topic and manual learning procedures. They need to do their assignments and exams without technology/devices/the weblinks etc. which excludes them to engage more with education technology in general. Due to fast-paced development of AI and its recent implications in

education worldwide, many are curious about how AI technologies can be incorporated within the education system in Bangladesh.

However, the question remains: **how can AI be integrated into Bangladesh's traditional education system while maintaining the academic integrity**? Although if we stuff AI into our regular schooling system without thinking too much about the current Bangladesh academic sector's integrity will be a disaster. To a considerable extent, this can be attributed to the fact that it leads to cheating, i.e. the scenario when students can crank out AI-generated papers, essays, or even entire tests. Instantly, we have lost the critical thinking, self-directed contribution we tend to use to ascertain the insights of a student. Stated differently, such seems to threaten the very core of what the education process is all about education, intellectual independence and academic honesty.

Thus, this research study seeks to answer the critical query: **To what degree can AI contribute to the improvement of student learning outcomes and educational practices, without compromising ethical standards?** The study investigates whether AI can foster a **more personalized learning experience**, support **accessibility and inclusion**, enhance **cost efficiency**, and ensure **ethical use** of technology in education. By examining how AI impacts educational outcomes, this research will determine if the **benefits of AI** outweigh risks of ethical violations, and if its integration can be successfully managed without undermining traditional academic principles.

I.3 Objectives of the Study

This research focuses to discover and identify the role of **AI** in enhancing and improving education in Bangladesh, with a specific focus on its integration into a traditional system in education that heavily relies on **pen-paper-based** methods of exams, assignments, and other study approaches. The prime objective is to identify the potential of AI-driven educational tools to improve **learning outcomes**, improve **accessibility to all students**, and ensure appropriate **ethical use**, while also considering the **cost efficiency factor while using AI**. Specifically, this study will assess the following:

1. **Impact of AI on Learning Outcomes**: AI-enabled personalized learning is the buzzword among educationists, so this paper plumbs the depths of whether or not that really improves student achievement, i.e., does it make them excel at school, participate, stay there where they are. The study begins by building on the concept of Personalized Learning (PL), which involves the manipulation of educational material to target the individual learner by AI. Based on that, the following questions in the hypotheses arise: is AI-based personalized learning truly effective in the performance of students and motivation?

2. **Contribution of AI to Cost Efficiency**: The second segment of the study examines cost making. Will AI allow schools to reduce money expenditures and at the same time not decrease but potentially enhance the quality of education? The main question arises here: will AI be able to involve administrative functions and provide more affordable options among classic learning materials, as the costs of its functioning will remain low?

3. **Ethical Considerations in AI Integration**: Moral issues are also right there. What does it take to incorporate AI into the customary education system without sacrificing academic plagiarism and ethical values? The studies consider the way AI, employed with responsibility, can make fairness, transparency, and data security work, particularly the student privacy.

4. **AI and Accessibility & Inclusion**: Lastly, the study also poses the question of how AI can increase access and inclusivity. Is it able to breakdown the walls on the underserved populations, such as the children living in the rural or a disabled opportunity, and thus achieve places of inclusiveness in the learning environment and comparable opportunities to all learners?

So, the study takes these four key areas as independent variables, **Personalized Learning (PL)**, **Cost Efficiency (CE)**, **Ethical Use (EU)**, and **Accessibility & Inclusion** (AI). This research project will reflect how AI can be used in the learning system in Bangladesh in a way that would improve the knowledge outcomes of

students without eliminating the tradition of academic work, autonomous investigation, and academic honesty.

I.4 Scope and Limitations of the Study

The research is based on the areas of interests to examine the impact of AI in teaching and learning in Bangladesh among the population of the students in relationship of tailored learning, accessibility, cost effectiveness, and ethical consideration of application of AI based educational tools. The study mainly targets the university students that are exposed to certain degree of AI integration within their learning activities though the general application of AI within the education system in Bangladesh is not so prominent.

The research was implemented on the basis of an online survey with the help of Google Forms. Most of the respondents were university students and most of them were in the capital of Bangladesh, Dhaka. This was mainly because of the researcher's accessibility to this certain demographic area as well as access to a specific group of students through Facebook groups used in study as well as available other online platform. This means that the sample population cannot be implied to represent the whole student population in Bangladesh as well as the results cannot be applied to all sorts of education and especially to the lower students who are less exposed to digital resources and AI.

One of the main limitations of the research is the **sampling method which is used to accumulate data for analysis and findings**. In view of the fact that the survey was sent to Facebook groups, where the most student users university students more than other student group, this factor has created a convenience sampling bias. This survey covered only the relatively small age range of students of different academic institutions mainly in their early to late 20s and very few young students in the middle of urban schools or with the lack of digital resources and AI adoption common in non-urban environments. The results of the study can therefore be said to be representative of the perceptions as well as the experiences of university level students.

Another limitation and drawback lie thein the **geographical area of the data collection**. The survey has been carried out in Bangladesh alone and merely of the respondents are concentrated in the city of Dhaka. Consequently, the data is potentially not representative of all experiences of students of not only other regions but also those of learning institutions in rural or inexpediently located places. The findings are also limited with regard to lack of involvement of other universities or schools nationwide.

Also, the self-reported nature of the survey data presents a chance of response bias. The fact that answers were voluntary means that students might have represented their responses based on the ideas of what may be expected socially, and not necessarily their use or experience with AI although the response has been kept anonymous. The fact that the results of study are partial, it should be considered in interpreting the output from the results since the accuracy of the self-reports depends on a number of factors such as individual bias and social desirability.

All this did not come as a surprise because despite the limitations, the scope of the study was confined to how AI is perceived and incorporated into the traditional education system in Bangladesh and especially among undergrad students. In addition, the study attempts to determine the right costs of implementing AI in teaching and discuss how it is possible to implement AI in education responsibly, without jeopardizing academic integrity.

I.5 Definition of Key Terms

Term	Operational Definition in This Study
Artificial Intelligence (AI)	An imitation of the human brain intelligence in machines that are programmed to undertake functions like education, problem-solving and deciding. In education, the AI encompasses the intelligent tutors and automated grading programs that make learning individual and family-like.

Term	Operational Definition in This Study
Personalized Learning (PL)	Learning or education environments driven by AI and able to personalize the study materials and rate of learning to the distinct student with the aim to increase engagement and academic achievement through the provision of tailored learning environments.
Cost Efficiency (CE)	The possibility to decrease the funding expenditures on education with the help of the AI tools which automatize the administrative work process and offer cheap learning tools instead of the traditional ones.
Ethical Use of AI (EU)	Ethical AI technology use in education, where AI technologies are managed in a transparent, just, and data protection-encompassing manner, as well as that it uses AI technology to limit the extent to which AI technologies are misused to conduct academic dishonesty.
Accessibility & Inclusion (AIE)	Access to education of all students, with disabilities and students of underserved or remote areas, through the provision of adaptive learning tools and individualized resources using AI.
Learning Outcomes (LO)	The enhanced academic achievements, improvement in academic interest, retention and general educational performance ensuing the use of AI-aided learning platforms and individual learning journey.
Model Measurement	The method of testing the reliability and the validity of the used constructs. This involves evaluation of the CR, Cronbach's Alpha and AVE of the measurement model.

Term	Operational Definition in This Study
Composite Reliability (CR)	An indicator of how well a construct is measured internally. Good reliability means that CR is greater than 0.70.
Average Variance Extracted (AVE)	An indication of how much variance a construct attains relative to its indicators. A value of convergent validity greater than 0.50 shows that AVE is good.
Cronbach's Alpha	A gauge of consistency within the instrument which reflects how effectively a body of questions gauges a single-dimensional construct. Good reliability is reflected within a value of above 0.70.
Fornell-Larcker Criterion	A criterion that was used to evaluate DV (discriminant-validity), SEM. It examines the fact that the square root of AVE of individual constructs exceed the relationships of constructs with other constructs.
Discriminant Validity	The level to which new concept is different to other constructs in model. It can be evaluated through the techniques such as the Fornell-Larcker Criterion and HTMT Analysis.
HTMT (Heterotrait-Monotrait) Ratio	Component employed to assess discriminant validity through a contrast between the correlates of constructs. Discriminant validity is considered as adequate when the value is below 0.85.
Cross Loadings	One method to determine the uniqueness of constructs within the model. Each indicator must have a greater load on the construct than on the others.
Structural Model Assessment	The assessment of the linkage among latent variable in the model. This includes evaluation of **R^2** value representing variance explained by the model as well as other fit criterion.

Term	Operational Definition in This Study
R-Square (R^2)	A parameter of SEM that measures overall goodness of fit of independent variables to describe the variance in a dependent variable.
Path Coefficients	The normalized coefficients that symbolize the strength and the direction of the associations among constructs in the model.
P-Value	A statistical indicator applied to gauge the relevancy of the associations relating to the model. A p-value below than 0.05 shows, it is a statistically noteworthy relationship.
Bootstrapping	A resampling method employed in SEM to determine the measure of stability of the estimates as well as the significance of path coefficients.

Table 1: Definition of key terms

I.6 Organization of the Remaining Chapter

This research paper is structured into five organized chapters, each of the chapters will be addressing a key component of the study on the incorporation of AI into Bangladesh's traditional education system while maintaining ethical standards.

- **Chapter II: Review of the Literature**

The chapter is about literature review in which the topics of the outcome of AI in education are shifted toward the changes in learning outcome, personalized learning, cost effectiveness, accessibility, inclusion being caused by AI. It also involves discussions about the ethical factor regarding the implementation of AI in education. The chapter is used as a basis of expressions of theoretical and empirical background of the study.

- **Chapter III: Research Methodology**

The chapter includes the description of academic research strategy and the methodology. It describes how data were collected among the students at universities at Dhaka, sampling method and the tool of survey. The data analysis methodology is explained and how SmartPLS was used in structural equation modeling and testing the hypothesis.

- **Chapter IV: Research Findings and Analysis**

The chapter discusses, the results received during survey among university students will be discussed. It examines how AI is affecting PL, CE, A&I, and EU. Statistical analysis and correlated discussions using the collected data have also been given in the chapter and they were caught on to the research questions and hypothesis.

- **Chapter V: Discussion and Conclusion**

In the last chapter, the results will be discussed based on the entire area of education in Bangladesh. It makes consideration on the consequences of the adoption of AI on PL, LO, EU, CE and AIE. In the end of the chapter with the recommendations of future study and practical advice on how to incorporate AI in education without destroying academic integrity.

CHAPTER II: REVIEW OF THE LITERATURE

2.1 Relevant Theory

In this section, the theoretical background that informs this study has been articulated in AI in learning, personalized learning, and ethics. These theories give a framework on which an individual can view the significance of AI on the education process and the ethical issues that come with its inclusion.

1. **Technology Acceptance Model (TAM)**

   Regarding the acceptance and use of new technologies, TAM was created (Granić & Marangunić, 2019; Feng et al., 2020). The study is concerned on how TAM can be used to interpret the perceptions of the students in Bangladesh, especially university students, regarding AI-driven tools. According to this model, there are two principal elements that lead to the adoption or non-adoption of a technology, namely accessibility and usefulness. (Venkatesh & Davis, 2000; Lee, Kozar, & Larsen, 2003). To become successfully acceptable among students, AI tools in education must be perceived as not only user-friendly but also useful to the effects of learning. It has been established that the greater alleged helpfulness and easy use of AI tools, the greater their acceptance by students is (King & He, 2006).

2. **Constructivist Learning Theory**

   According to the Constructivist Learning Theory, and from the study of Khadidja, (2020) and Nesrine, G. (2018), there were two scholars, Jean Piaget and Lev Vygotsky, who stressed that learners are the effective constructors of their own knowledge and construct meaning of things depending on the experiences (Waite-Stupiansky, 2017). In particular, AI is consistent with this theory because personalized learning addresses the precise needs of each students by fine-tuning to students at levels of learning, methods, and needs. This theory states that the learning process would be more effective when the students are helped to explore

and come up with problem solutions through tools called discovery and problem-solving, which AI could effectively promote through interactive learning and adaptability (Asghr, Munawar, & Ullah, 2025). Smart tutoring and learning platforms are an example of AI, which would be able to provide feedback in actual and modify content according to the level of proficiency by a student creating a better understanding with the material. (La Barbera & Ajzen, 2020)

3. **Theory of Planned Behavior (TPB)**

Another academic basis that could be useful in this research is the TPB, which is insightful in understanding how these three concepts as part of the third theory i.e., Attitude, Individual norm and perceived interactive measures determine the intention of an individual to do a firm behavior (La Barbera & Ajzen, 2020; Hagger, Cheung, Ajzen, & Hamilton, 2022). TPB may also be used to predict the willingness of students to utilize AI tools in the case of their integration in education? According to this model, student attitude to AI, social pressures (e.g. peer pressure) and the level of confidence in using AI (perceived behavioral control) influence their acceptance of the AI driven education technologies (Ajzen, 1991; Ajzen & Madden, 1986). Good AI attitude, successful social support, and perceived easy use likely translates to the increased willingness to employ AI tools in the learning process (Aldraiweesh & Alturki, 2025; Zhang, Schießl, Plößl, Hofmann, & Gläser-Zikuda, 2023).

4. **Ethical Decision-Making Frameworks in Technology Integration**

AI usage in education involves some ethical issues that emerge especially with regard to data security, algorithm discrimination, and the risk of academic cheating. (Ferrell, Harrison, Ferrell, Ajjan, & Hochstein, 2024; Spector, 2016). The incorporation of AI into teaching should be conducted in an ethical manner and frameworks to make ethical decisions in this issue should be provided to educators and rule makers to coordinate utilization of AI. Such frameworks note that the AI

systems need to be transparent, just, and always responsible in their decision-making process. (Bing & Leong, 2025; Pandey & Kumar, 2025). Furthermore, the ethical aspect of the use of AI in education is highly explored with such issues as infringement of data privacy and the likelihood of discrimination in AI-based systems (Pandey & Kumar, 2025; Huang, 2023). Such issues require understanding and acknowledgment to provide successful ethical application of AI know-hows in educational environments (Huang, 2023).

2.2 Literature Survey

The section gives a review of the literature that is currently available on the position of integration of AI in education, and the effect it has on personalized learning and cost-effectiveness, ethical application, and the aspect of accessibility & inclusion. AI is referred to as a revolutionary learning tool, but the extent to which this tool can be professionally implemented and what ethical concerns stand behind it remain the themes of research.

1. **AI and Personalized Learning**

One of the biggest contributions of AI to education that has found its way into the literature the most is personalized learning (Murtaza, Ahmed, Shamsi, Sherwani, & Usman, 2022; Jian, 2023). Artificial intelligence-enabled technology such as adaptive learning systems and intelligent tutoring systems offers the real-time customization of learning materials according to the needs of students taking into consideration their learning styles, proficiencies, and their overall developments. As shown by a study, AI-powered platforms revolutionize student performance because of customized learning experiences, which are responsive to individual learning requirements (Naseer, Khan, Tahir, Addas, & Aejaz, 2024). A study highlights the same aspect of the use of AI systems that can monitor the learning process of students and give them instant feedback, expanding their learning opportunities (Shete, S., Koshti, P., & Pujari, V. 2024; Soelistiono & Wahidin, 2023). Such personalized learning systems have been found to enhance the

engagement of students as well as their retention levels since the learners customize the pace of learning and get to understand it better (Xu, Meng, Raja, Priya, & Devi, 2021).

2. **AI and Cost Efficiency in Education**

Another aspect that creates great interest is the possibility of AI cutting down the expenditures in education (Strielkowski, Grebennikova, Lisovskiy, Rakhimova, & Vasileva, 2024). Research has indicated that AI has the potential of assisting institutions to lower their expenditure by carrying out administrative duties e.g. grading, scheduling, and student checks. The authors affirm that AI can automate several procedures within the school that would reduce the demand on manual work and resources, resulting in increasing operational efficiency at educational institutions (Spring, Faulconbridge, & Sarwar, 2022). Also, AI is capable of providing alternatives to the used traditional learning materials, such as textbooks, as seen in another study, who write about the impact of having AI-powered learning platforms, which allow cost-efficient access to learning materials, which includes tutorials, exercise practices, and learning modules. Nevertheless, even though the benefits of AI in education are numerous, the initial investment of applying AI systems to learning institutions can be quite high, which may prevent small or underfunded learning institutions to implement such technologies (Bulathwela, Pérez-Ortiz, Holloway, Cukurova, & Shawe-Taylor, 2024; K. Zhang & Aslan, 2021).

3. **Ethical Considerations in AI in Education**

The ethical AI use in education has indicated significant considerations, especially, regarding data privacy, algorithmic bias, and academic integrity. The AI tools that gather and interpret the student data should also make sure that the data is saved safely and not misused. A related topic in the literature talks about the ethical concerns of the bias in algorithms as they can end up (condemn) perpetuating

existing disparity because of bias in the data being used to train the algorithm (Oyeniran, Adewusi, Adeleke, Akwawa, & Azubuko, 2022; Sun, Nasraoui, & Shafto, 2020). On the same note, cautions that the AI-powered grading systems will or grading or even admission algorithms might widen education inequalities by accidentally discriminating against disadvantaged groups (Kooli & Yusuf, 2024; C. Zhang, 2024). Moreover, opportunities in AI use that could compromise academic honesty, like academic dishonesty through creating AI-generated assignments and not researching the area independently are likely to represent serious difficulties in assuring academic integrity. To avoid these concerns, researchers have underlined the need of strict ethical standards and the necessity to acknowledge transparency when developing and implementing AI into classroom contexts.

4. **AI and Accessibility & Inclusion in Education**

Accessibility and inclusion in education can be dramatically increased by AI and, in particular, by serving students with disabilities or living in underserved areas (Chemnad & Othman, 2024). The tools of AI, speech-to-text and language translation services, and adaptive learning tools, can be used to blur the lines of access to education in these areas. A study emphasize that AI-based assistive technologies could be used to offer real-time translation, transcriptions, and customized support to increase the accessibility of educational material brought to the learners with hearing impairments or learning disorders (Patel et al., 2025; Kumar, Renuka, Rose, Priya, & Wartana, 2022). Moreover, AI-based platforms are also facilitating the remote or rural-based students to get good educational resources, closing the educational gap. Another study explain the role of AI in providing inclusive education in ensuring that students with different learning styles improve their abilities and have an opportunity to access the benefits of the learning process (Eziamaka, Odonkor, & Akinsulire, 2024).

2.3 Hypothesis Development

In accordance with the critique of the literature review and the theories addressed in the previous chapters, the research paper formulates hypotheses to help examine how the relationships between the major variables of personalized learning, cost efficiency, ethical use, and the factor of accessibility and inclusion affect learning outcomes within a modern education setting. It is hypothesized that these variables can be analyzed in a following manner:

1. **H1: AI-driven personalized learning produces effective learning outcomes in a positive manner.**

   Incorporation of AI in education has proved to improve the learning outcome in education because it caters to the needs of the specific individuals. Personalized content and pace mentioning the learning style and capabilities of the students enhance engagement rates and academic results through AI tools (Sayed et al., 2022). The hypothesis can be corroborated by the literature which indicates that personalized learning promotes retention and content mastery to result in the improvement in student outcomes.

2. **H2: The implementation of AI systems leads to better cost-performance ratios in education without sacrificing the standard of education.**

   AI can help to make the education system more cost-effective through automation of the school administrative functions, minimizing the use of the traditional resources, and the affordability of the products that replace the textbooks and the tutoring services (Ahmad, Rahmat, Mubarik, Alam, & Hyder, 2021). This hypothesis alludes that AI is capable of decreasing operations costs without compromises to the quality of education or sometimes increasing it like statistics about cost-efficient education conducted in the past show

3. **H3: The ethical operation of AI leads to its proper integration throughout the system with no impact on educational standards.**

Ethics is vital in terms of the successful application of AI in the field of education. Transparent, fair, and secure AI systems can create trust between students and educators, and make sure that the technology would help enhance academic performance without interfering with academic integrity (Huang, 2023). The current hypothesis implies that it is the constructive application of ethics to AI that will guarantee the successful implementation of the new technology in learning without compromising the fundamental principles of academic integrity and equity.

4. **H4: The use of AI technology for accessibility functions and inclusivity in education leads to better educational possibilities together with superior results for students.**

Using AI technologies can drastically boost accessibility and inclusion, as students with disabilities or those living in underprivileged areas will be able to get a list of personalized learning tools. It has been found that through AI technologies such as speech-to-text, language translation, and adaptive learning, it is possible to close learning gaps in these students to improve their engagement in education and learning (Eziamaka, Odonkor, & Akinsulire, 2024). The hypothesis behind this hypothesis is to investigate whether AI can build more inclusive educational spaces, which will mean that all students perform better in school, especially those that are at risk of educational underachievement.

CHAPTER III: RESEARCH METHODS

3.1 Research Design

The research design adopted in this study is exploratory since it seeks to understand how AI can be integrated in the education system and how it can affect personalized learning, cost-efficient learning, ethical use, and accessibility and inclusion and whether they have any influence on the learning outcomes (Polas, Kabir, Sohel-Uz-Zaman, Karim, & Tabash, 2022).

The nature of the research will be cross-section, which denotes a collection of data at one point: only the analysis of relationships between the variables will be possible without monitoring the changes over time. The design is rather effective in relation to the research objectives, as it will be possible to study the perception of AI tools to which students are currently exposed in the context of their learning and the effect that the tools have on the process of learning.

Survey Methodology

The survey is used for data collection in the research. The survey will be aimed at assessing the students and which perceptions and experiences they have about the use of AI into their academic environment. This questionnaire will consist of Likert (1 = strongly disagree; 5 = strongly agree) questions, and based on such answers, the students will show how much they agree or disagree with statements set according to specific research variables.

The variables are mentioned below:

- **Personalized Learning**
- **Cost Efficiency**
- **Ethical Use**
- **Accessibility & Inclusion**
- **Learning Outcomes**

This is because these variables are of particular interest of the study and all of them are measured using five items of Likert scale. The structure of the survey makes it capture the dimensions of AI integration across several planes involving the engagement of the students, their satisfaction, and the perceived academic improvement.

Analysis Approach

After the survey data is gathered, SmartPLS and SEM as data analysis methods will be used in order to evaluate the relation between the independent variables (personalized learning, cost efficiency, ethical use, accessibility & inclusion) and the dependent variable (learning outcomes). SEM enables measuring complicated correlations among constructs and assessing the hypotheses concerning the effect of AI in education. The research design will give an idea about the possibilities of AI to improve the educational process and solve the ethical issues that are related to the application of AI. The results will be used to educate teachers and policymakers on the use of AI to improve their education delivery developments without the infringement of their ethics.

3.2 Sample

This study aims at the sample of 336 students in Bangladesh, gathered with the help of a convenience sampling technique. The given sampling method was selected because of accessibility and availability of the participants, who were recruited mainly on the Internet services like Facebook, or student study groups. Though the intention was to accommodate the wide range of students representing the different levels of education, respondents majorly represented university students followed by school and college students.

Demographics of the Sample

The demographics of the respondents are as follows:

- **Gender Distribution**:

The current sample included both male and female students and male respondents made up 63% of the total and the female respondents represented 37 %. After analysis of chronological age, most of the respondents (82.1 %) were between 20 and 25, a relatively less percentage (10%) falls in the age group of 26-30, and the rest is in the group of Below 20 and 31-35. This age trend makes it possible to get a partial evaluation of the perception of various age groups on the role AI plays in education.

- **Geographical Location**:

The participants are also mostly based in Dhaka, the capital city of Bangladesh because of the location of the researcher itself and the mediums to obtain answers. Although the sample does include people of other areas in Bangladesh in a small percentage, there is a biasness with the sample as more urban students are represented in the sample especially students in Dhaka. The geographic focus of the research restricts the generalization of the results to students outside the urban setting who can be deprived of access to AI-based tools.

- **Educational Background**:

Students in different academic disciplines constituted the university students though the survey reached out to them largely. There is fewer participation by rural school and college students, but the non-university students are represented very minimally. The sample is biased to students of higher education which demonstrates the convenience of the researcher and the means through which it was distributed.

Sampling Bias and Limitations

- **Geographic Bias**:

Most of the respondents belong to Dhaka, which is why the results cannot necessarily imply the picture of all educational realities and possibilities of using technologies and other AI tools in rural regions, and its access there might be less present.

- **Age Group Bias**:

  The sample size is generally limited to students between 20-25 and this may not necessarily allow exposure to the younger students (e.g., under 20) as well as the older ones (e.g., 26+). This concentration on this age group might reduce the generalization of the study to other age groups of students.

- **Convenience Sampling**:

  The conveniences samplings are not random and therefore the sample may not be representative of the entire student population. Since the survey was sent on online resources, there was an increased chance at surveying the students with a high level of online literacy and people active in online communities. This entailed that those students who had limited access to online services were under-represented.

Although the sample size of 336 students is large, convenience sampling process and the geographical biasness of focusing on Dhaka interferes with the possibility of concluding on whether the findings apply to all the students in Bangladesh, especially the rural ones. Nevertheless, the sample is good information on how the students at universities in the urban regions perceive AI application in education and its advantages.

3.3 Questionnaire Development (if any) / Model Specification

Questionnaire Development

The survey instrument of the research was designed to evaluate the perception of the students on AI in education about the influence of AI on personalized learning, cost-efficiency, ethical application, accessibility, and inclusion, and learning outcomes. These variables were also gauged by the Likert-scale queries to determine how many students would be in agreement or disagreement with certain statements that portray the use of AI features in their learning experiences.

Each of the variables contained five items in the questionnaire covering various scales of student experiences and attitudes towards the AI integration in the education sphere. These questions were based on other scale answers found in the literature, and due to adaptation of those validated scales, they are reliable and valid in reflective measurement of the construct amount. respondents were asked to use a 5-point likert-type scale (1 strongly disagree and 5 strongly agree).

Survey Variables and Questions

The major variables that were discussed during the survey include:

1. **Personalized Learning (PL)**

   This variable indicates the degree to which AI tools can bring differentiated student learning opportunities through their unique learning styles, rate of learning and development (Essa, Celik, & Human-Hendricks, 2023). The questions in this section analyze AI application in content adaptation and offering feedback that is specific to the student.

2. **Accessibility & Inclusion of AI in Education (AIE)**

   This variable measures the extent at which AI contributes to equal access to

educational resources, especially by students with disabilities or those who live in the underserved areas (Hongli, Z. & Yie, 2024; Omri, Slimani, & Afi, 2025). The concerns lie in the role of AI in dealing with gaps in education and designing an inclusive environment on which the questionnaires where developed.

3. **Cost Efficiency (CE)**

   In this variable, the emphasis is on the possible benefits of AI integration in terms of costs and efficiency into education as they relate to affordable and low-cost administration and learning resources of students (Oyeniran, Adewusi, Adeleke, Akwawa, & Azubuko, 2022).

4. **Ethical Use of Artificial Intelligence (EU)**

   The variable explores the level of awareness of ethical use of AI tools among students, and their compliance with ethical usage should be studied in this presentation (Jian, 2023).

5. **Educational Outcomes with Artificial Intelligence (LO)**

   The variable will gauge the net effect of AI in academic performance, engagement, retention, and preparation of the students in academic tasks.

Model Specification

Using the variables explained above, the study employs a structural conditions that theorizes the relationships in between the independent floats (customized finding out, economic efficiency, moral use, accessibility & inclusion) and also the sensible float. The following model based on the following model specification is recommended:

- **Independent Variables**:

- **Personalized Learning (PL)**: Applications of AI in enabling current education content to fit individual requirements.
- **Cost Efficiency (CE)**: the capability of AI to decrease costs in education related to the quality surge.
- **Ethical Use of AI (EU)**: The responsible application of the AI that can be fair and open.
- **Accessibility & Inclusion (AIE)**: AI ability to improve access and inclusion in education.

- **Dependent Variable**:
  - **Learning Outcomes (LO)**: The increase in the academic performance student engagement and retention with the influence of AI.

Structural Equation Modeling (SEM) in SmartPLS will be utilized on the relations among these variables. Path coefficients will be considered to realize the magnitude and direction of these relationships and R^2 value will show the explanatory power of the model.

3.4 Data Collection

This research was conducted based on an online survey on a Google Forms questionnaire. The survey was shared through Facebook groups mainly and it has been mentioned to the students of other educational backgrounds especially in Dhaka to respond to the survey. The questionnaire was based on students who perceived AI in education, with its effect on personalized learning, cost-effectiveness, ethical applications, accessibility & inclusion, and learning outcomes.

Survey Distribution and Response Rate

The survey was opened to the respondents within three weeks, and some reminders provided with the help of Facebook to boost the completion rate. The complete numbers of responses completed were 336 that gave it enough sample size to make statistical analysis viable. This was an anonymous response which meant that the participants would be free to express their opinion without fear of being identified.

Target Group and Inclusion Criteria

The survey was mainly aimed at students in Bangladesh, and, specifically, those, who have some exposure to AI-based tools in their studies. Nevertheless, though, the target was to involve the students with different educational levels (school, college, and university) most part of the responses was done by the university students. These were the criteria to participate:

1. The participants should be at a certain stage of education (school, college, or university).

2. The AI-based learning tools have to be introduced in the coursework of participants or other extracurricular learning resources.

3. It included only students who currently live in Bangladesh because the research addresses the influences of AI on the teaching and learning process within the schooling in Bangladesh.

Ethical Considerations in Data Collection

Ethical guidelines were followed in the collection of data in the study:

1. **Informed Consent**:

   All the respondents got a brief information about the intention of the study and promised that no personal answers could be utilized beyond any educational claims. The fact that they can stop taking part in the research at any stage without reasoning against it was also highlighted to participants..

2. **Confidentiality**:

   During the survey process the identity of the respondents remained anonymous.

There was no identification of individuals, and therefore there was no way the response could lead to any individual.

3. **Voluntary Participation**:

   Nobody was forced to participate and each person was free to come and answer the questions in good faith without change of heart because they would know that their contribution would help in an academic study of high value.

Data Cleaning and Preparation

After the survey responses had been collected, this data was exported in an excel file so that it could be cleaned up. The cleaning was done as follows:

- **Dropping partially filled out answers:** Any answers which were not filled completely or any entries with lots of details omitted were thrown out so as to keep the integrity of the data.
- **Duplicate checking:** Duplicates of the responses of a particular participant would be used, and they were eliminated.

After cleaning, the data was available to be analyzed by SmartPLS and other statistical analysis tools, based on the method stated in the Chapter III.

3.5 Data Analysis Plan

The statistical analysis of the present article shall be conducted utilizing SmartPLS (a computer program used in Partial Least Squares Structural Equation Modeling (PLS-SEM). Analysis is aimed at checking the correlations between the independent variables (personalized learning, cost efficiency, ethical use, accessibility & inclusion) and the dependent variable (learning outcomes). One of the main reasons why SmartPLS is pertinent to this research is associated with its capacity to deal with a complicated model involving numerous constructs and indicators that is needed to check the research hypotheses.

Step-by-Step Data Analysis Process

1. **Measurement Model Evaluation**

   The procedure of the analysis will begin with evaluating the measurement model. The step is necessary to achieve the validity and reliability of constructs employed in the study (Hair et al., 2021). The measurement model will be considered on the following points:

   - **Reliability**:
     This will be quantified by use of Cronbach's Alpha and Composition Reliability (CR). Cronbach Alpha value of above 0.70 and Composite Reliability of above 0.70 are described as acceptable characters of construct reliability.

   - **Convergent Validity**:

     Convergent validity provides the respective indicators of any construct are pointing to the same concept. This shall be measured through the Average Variance Extracted (AVE). A value of AVE which is over 0.50 implies good convergent validity.

   - **Discriminant Validity**:

     Discriminant validity checks to see whether the constructs are separate from each other. That will be evaluated by Fornell-Larcker Criterion and HTMT. To obtain discriminant validity, Fornell-Larcker Criterion specifies that the square root of the AVE of every construct should surpass the correlation between the construct and the other constructs and HTMT be less than 0.85.

2. **Structural Model Evaluation**

Once the measurement model is considered, what will follow is the valuation of the structural model which will involve testing the connection among the independent variables (personalized learning, cost efficiency, ethical use, accessibility & inclusion), with the dependent variable (learning outcomes). This is through the following steps:

- **Path Coefficients**:

  Path coefficients picture the intensity and the direction of the relationship between the variables. The significance of these coefficients will be evaluated with the help of a bootstrapping procedure. When the p-value is below 0.05, then the relationship is statistically significant.

- **R-Square (R^2)**:

  The value of R^2 captures the variance that the independent variables give to dependent variable. The goodness of fit of the model will be expressed by R^2 value. The nearer is the value to 1, the better the model fit and the stronger the relations between the variables.

3. **Hypothesis Testing**

The bootstrapping approach is going to be used in SmartPLS to test the hypotheses. In this approach, the confidence intervals of the path coefficients are computed and whether variables are functionally related statistically significant or not is tested. The idea behind hypothesis testing will be as follows:

- **Significance Levels**:

The critical value of hypothesis testing will be $p < 0.05$. This implies that the p-value of less than 0.05 will mean that the path coefficients are significant..

- **Direct and Indirect Effects**:

  Besides the direct relations of the variables, there will be the indirect effects (e.g., the effect of AI on learning due to personalized learning) to study the entire effect of AI on education.

Conclusion of Data Analysis Plan

Data analysis will also help to figure out connections between the use of AI to teach and the learning results and impact of tailored learning, cost effectiveness, ethical adoption, and accessibility and inclusion. With the help of SmartPLS and SEM, the proposed hypotheses shall be tested, and the explanatory capacity of the proposed model shall be determined.

This discussion will assist in identifying the prominent educational success predictors within the framework of AI, as well as in an effective integration of the AI systems into the educational practice, which does not require compliance with ethical norms to be lowered.

CHAPTER IV: RESEARCH FINDINGS & ANALYSIS

4.1 Data Description

The information presented by the following paper was gathered by means of a survey on Google Forms of 336 students in Facebook groups and the other social media. This questionnaire was created to measure student perspective towards AI education with a special focus on individualized learning, cost effectiveness, ethical application, access and learning performance. The majority of the participants are the students at universities in Dhaka, and the respondents are both male and female with an majority proportion male with 63% and female 37%, and most of them are between 20-25 years of age (82.1%). Though this survey was intended to characterize the whole students in Bangladesh, the urban and university-centered characteristic of its sample might restrain the applicability of generalization to rural communities and also the low-level learners.

Characteristics	Frequency	Percentage
Men	212	63%
Women	124	37%
Age Below 20	13	4%
Age 20-25	276	82%
Age 26-30	34	10%
Age 30+	13	4%

Table 2: Demographics of the Respondents

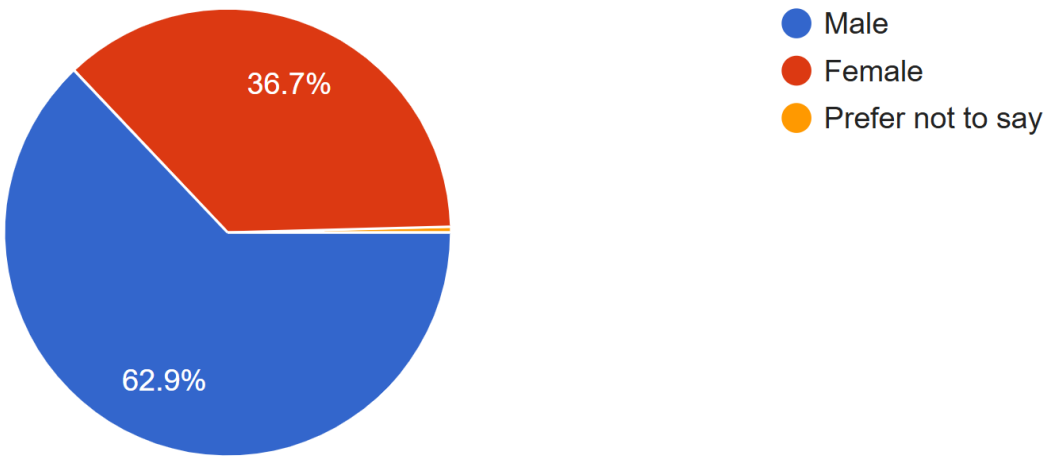

Figure 1: Pie chart of the gender distribution

4.2 Descriptive Statistics

Descriptive statistics were conducted by computing the survey data in order to help summarize the information and also come up with the general patterns of the dataset. Each of the variables was computed using the following descriptive statistics:

- **Personalized Learning (PL)**:
    - **Mean**: 3.846
    - **Standard Deviation**: 1.047

  The results reveal that the students tend to be in agreement with the assertions involving personalized learning, and an average of 3.846 tends to display a favorable view of the use of AI in the personalization of education to suit human needs. The standard deviation (1.047) is relatively large, indicating some difference in the students opinion but on the whole students are of the view that personalized learning with AI is good.

- **Accessibility & Inclusion (AIE)**:
    - **Mean**: 3.860
    - **Standard Deviation**: 1.077

  Most students supported the idea that AI tools can support to make education more available to students with incapacities, and students in inaccessible locations with the resulting mean of 3.860. The existence of the SD of 1.077 heralds a bit higher level of variability in answers, yet the overall majority is positive regarding the influence of AI in the area of accessibility and inclusion.

- **Cost Efficiency (CE)**:
    - **Mean**: 3.619
    - **Standard Deviation**: 1.187

  The answers depicted the overall perception of AI in terms of cost-saving among the students, whereby AI was seen as a great measure of minimizing expenditures when it comes to learning assets and organizational chores. The average of 3.619 can be interpreted as students are moderately positive about the cost efficiency of AI. This standard deviation of 1.187 indicates a large variation of difference that means something a certain percentage of the students might feel the strong cost-saving effects, but a different percentage may not experience such effects in the same degree.

- **Ethical Use of AI (EU)**:
    - **Mean**: 3.810
    - **Standard Deviation**: 1.132

  These answers indicate that the perception towards the ethical use of AI in learning is rather optimistic. The average of 3.810 states that the majority of students are stating to support the academic integrity of using AI tools. This standard deviation of 1.132 shows that there is a certain degree of diversity in

the answers, yet, on the whole, the students seem to think that AI may be applied in the educational setting in an ethical way.

- **Learning Outcomes (LO)**:
    - **Mean**: 3.835
    - **Standard Deviation**: 1.092

    Most of the respondents mentioned that AI has positively become a factor in their school performance with most of the students giving retention, efficiency, and exam preparation as positive improvements. The trend is positive as seen on mean 3.835, whereas the SD of 1.092 implies the presence of variability in the experiences of students with regard to AI-enhanced learning outcome.

Variable	Mean	Standard Deviation
Personalized Learning (PL)	3.846	1.047
Accessibility & Inclusion (AIE)	3.860	1.077
Cost Efficiency (CE)	3.619	1.187
Ethical Use of AI (EU)	3.810	1.132
Learning Outcomes (LO)	3.835	1.092

Table 3: Mean and Standard Deviation of the variables

4.3 Measurement Model Evaluation

Measurement model In Structural Equation Modeling (SEM), the reliability and validity of the constructs as well as the indicators is evaluated. In the current research, measurement model will be tested on the basis of convergent validity, discriminant validity and reliability of the constructs.

Reliability of the Constructs

In this study, the constructs reliability and validity were determined by Cronbach Alpha, Composite Reliability (CR) and Average Variance Extracted (AVE).

Construct	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Accessibility and Inclusion	0.757	0.760	0.837	0.508
Cost Efficiency	0.748	0.762	0.831	0.497
Educational Outcome	0.802	0.803	0.863	0.558
Ethical Use	0.742	0.761	0.828	0.493
Personal Learning	0.803	0.805	0.864	0.561

Table 4: Values from the reliability test in Smart PLS

1. **Cronbach's Alpha**:

   All the results have higher values than the standard of 0.70 of Cronbach's Alpha and as such these constructs do not have a problem with internal reliability across the items per construct. They varied between 0.742 and 0.803 which indicates that there is uniformity in the measurement of constructs that are being reached in the study with the highest values recorded being Educational Outcome (0.802) and Personal Learning (0.803) deemed to be in good consistency.

2. **Composite Reliability (CR)**:

   All constructs also have Composite Reliability values bigger than 0.70 which proves the constructs to be reliable. CRs were located between 0.828 (Ethical Use) and 0.864 (Personal Learning), which means that all the constructs have high internal consistency and strength.

3. **Average Variance Extracted (AVE)**

   Convergent validity is good as revealed by AVE values above the 0.50 point across all constructs. AVE rages between 0.493 (Ethical Use) and 0.561 (Personal Learning), that is, the constructs explain over 50 percent of variance in their indicators. Nevertheless, such constructs as Ethical Use (AVE = 0.493) are a little bit below the optimal level but are still within acceptability range in the majority of situations.

Discriminant Validity

The concept of discriminant validity guarantees that individual construct is independent of other instructs. To measure discriminant validity, we shall make use of the following:

1. **Fornell-Larcker Criterion**:

   Fornell-Larcker Criterion makes the constructs unique to one another. The quantity of the square root of AVE of any construct ought to be bigger than the cutoff of correlations amid the construct and the rest (off-diagonals).

Construct	Square Root of AVE (Diagonal)	Accessibility & Inclusion	Cost Efficiency	Educational Outcome	Ethical Use	Personal Learnings
Accessibility & Inclusion	0.713	0.713	0.643	0.656	0.649	0.699
Cost Efficiency	0.705	0.643	0.705	0.633	0.583	0.613
Educational Outcome	0.747	0.656	0.633	0.747	0.662	0.686
Ethical Use	0.702	0.649	0.583	0.662	0.702	0.619
Personal Learnings	0.749	0.699	0.613	0.686	0.619	0.749

Table 5: ***Fornell-Larcker Criterion output from analysis from Smart PLS***

Based on the table, it is possible to observe that the square roots of AVE are always greater than the correlation of each construct. This affirms that constructs were different, and they tap different aspects of the model which translates to good discriminant validity.

2. **HTMT (Heterotrait-Monotrait Ratio)**:

   The DV of constructs is calculated by using the HTMT ratio. The lower the value is below 0.85, the better is the discriminant validity which implies that dissimilar theories are discrete to each other.

Construct	Accessibility & Inclusion	Cost Efficiency	Educational Outcome	Ethical Use	Personal Learnings
Accessibility & Inclusion	-	0.842	0.836	0.871	0.895
Cost Efficiency	0.842	-	0.801	0.792	0.779
Educational Outcome	0.836	0.801	-	0.841	0.853
Ethical Use	0.871	0.792	0.841	-	0.789
Personal Learnings	0.895	0.779	0.853	0.789	-

Table 6: Heterotrait-Monotrait Ratio values from Smart PLS

All values of HTMT are less than 0.85, showing that discriminant validity is good. It implies that the constructs would be different and do not overlap substantially in their assessments of the model aspects.

3. **Cross Loadings**

   The cross-loadings support the fact that every indicator carries high loading on one construct with less loading on other constructs which shows that there is excellent discriminant validity. As an illustration, in AI1 the Accessibility & Inclusion construct has the highest loading of 0.656, and in CE1 it is Cost Efficiency with 0.765, which shows that the indicators end up where they should be. Cross-loadings do not have significant values, and this indicates that all indicators are measuring their constructs adequately.

Indicator	Accessibility & Inclusion	Cost Efficiency	Educational Outcome	Ethical Use	Personal Learnings
AI1	0.656	0.406	0.467	0.419	0.477
AI2	0.709	0.476	0.424	0.444	0.475
AI3	0.769	0.452	0.524	0.468	0.537
AI4	0.724	0.465	0.445	0.456	0.469
AI5	0.700	0.495	0.466	0.526	0.526
CE1	0.553	0.765	0.545	0.434	0.513
CE2	0.493	0.741	0.475	0.428	0.465
CE3	0.413	0.690	0.374	0.370	0.366
CE4	0.433	0.719	0.448	0.449	0.433
CE5	0.337	0.600	0.352	0.368	0.357
EO1	0.554	0.530	0.776	0.500	0.552
EO2	0.454	0.465	0.730	0.450	0.518
EO3	0.462	0.421	0.745	0.477	0.476
EO4	0.462	0.470	0.743	0.520	0.495
EO5	0.509	0.470	0.739	0.522	0.516
EU1	0.477	0.419	0.521	0.752	0.522
EU2	0.502	0.415	0.541	0.766	0.477

Indicator	Accessibility & Inclusion	Cost Efficiency	Educational Outcome	Ethical Use	Personal Learnings
EU3	0.413	0.399	0.297	0.542	0.292
EU4	0.454	0.432	0.456	0.714	0.417
EU5	0.441	0.405	0.462	0.714	0.428
PL1	0.536	0.465	0.534	0.469	0.757
PL2	0.560	0.429	0.528	0.504	0.767
PL3	0.508	0.496	0.518	0.470	0.790
PL4	0.511	0.521	0.512	0.431	0.736
PL5	0.500	0.381	0.473	0.443	0.691

Table 7: All the Cross Loadings value of the each variable and their sub points

4.4 Structural Model Evaluation

The Structural Model checks the connections between the independent variables (personalized learning, cost efficiency, ethical use, accessibility & inclusion) and the dependent one (learning outcomes). The hypotheses are tested through this evaluation as it evaluates the explanatory power of the model.

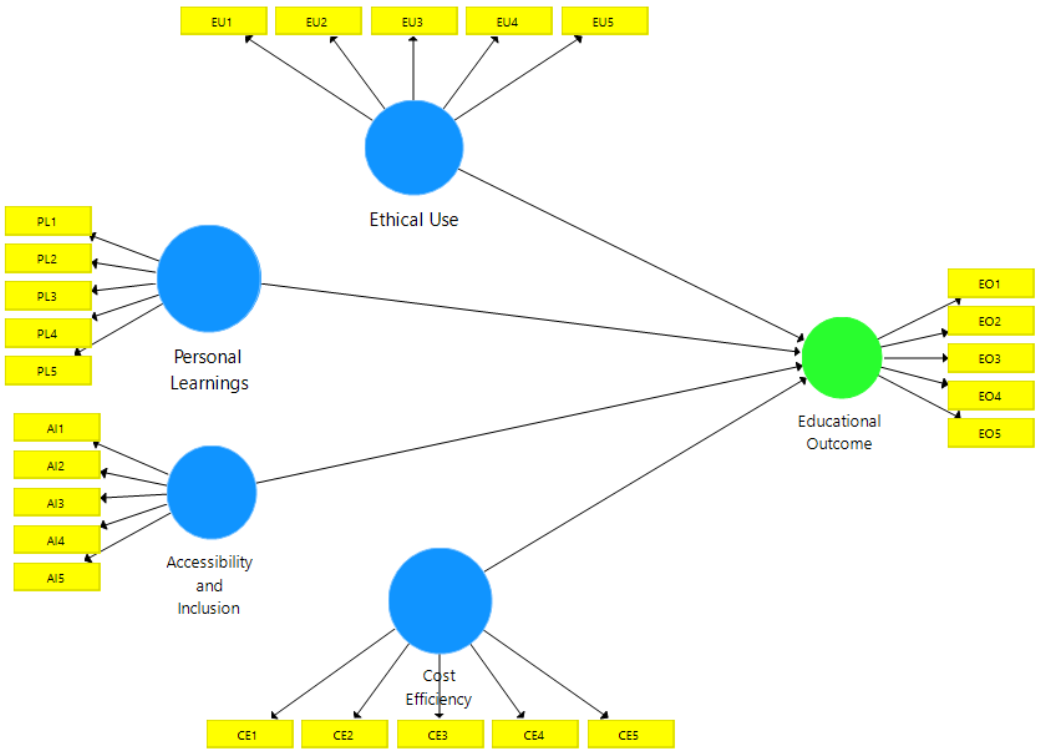

Figure 2: Structural Model Evaluation prepared through Smart PLS

Path Coefficients

The path coefficients are the values of the strength and path of relationship between the constructs forming the model. Any path coefficient has a p-value that identifies the significance of a relationship between two variables.

Path	Path Coefficient
Accessibility & Inclusion → Learning Outcomes	0.147
Cost Efficiency → Learning Outcomes	0.203
Ethical Use → Learning Outcomes	0.266
Personal Learnings → Learning Outcomes	0.294

Table 8: Path coefficients value from PLS algorithm

The Path Coefficients depicts the magnitude and path of relationships among the independent variables as well as Learning Outcomes. Personal Learnings shows the strongest relationship (0.294) and so learning with the help of AI in form of a personalized process is the greatest contributor to Learning Outcomes. Ethical Use (0.266) demonstrates moderate positive effect, and then it is Cost Efficiency (0.203), Accessibility & Inclusion (0.147). These findings indicate the conclusion that the ethical use of AI, the cost-effectiveness of the latter, and personalization all have a positive effect learning achievements of students, with personalized learning fostering the largest change.

Square (R^2) Value

R^2 value entails percentage of overall variance in a particular dependent variable (Learning Outcomes) that is identified to be indicated by the independent variables. The less we have an **R^2** close to 1, the better the fit of the model and larger the **R^2** the greater the proportion of variation of the learning outcomes that is explicable.

Variable	R-Square	R-Square Adjusted
Educational Outcome	**0.602**	**0.598**

Table 9: The calculated R-square value from Smart PLS analysis

The R-Square (0.602) shows that the independent variables explain 60.2 percent of the Learning Outcomes. It is a medium-strong explanatory power, indicating that the model explains a great number of the elements that affect the outcomes of studying among students. An Adjusted R-Square (0.598) that is a little below the R-Square is also a good fit.

4.5 Hypothesis Testing

The table number 10 shows the findings of the direct hypotheses. Bootstrapping was used to measure statistical t-values, and 95 percent confidence interval was applied in SmartPLS 3.2.8.

Hypotheses	Relationship	Std Beta	Std Error	t-Value	p-Value	Decision
H1	Accessibility and Inclusion → Educational Outcome	0.147	0.061	2.432	0.015	**Accepted**
H2	Cost Efficiency → Educational Outcome	0.203	0.056	3.604	0.000	**Accepted**
H3	Ethical Use → Educational Outcome	0.266	0.060	4.463	0.000	**Accepted**
H4	Personal Learnings → Educational Outcome	0.294	0.055	5.299	0.000	**Accepted**

Table 10: Direct and indirect hypothesis testing of all the variables

Interpretation of Hypothesis Testing Results:

- Hypothesis 1:
  According to this hypothesis Accessibility and Inclusion has a positive effect on Educational Outcome. The outcomes indicate the existence of positive 0.147 with

t-value of 2.432 and p-value of 0.015 which is significantly different ($p < 0.05$). In such a way, we are able to approve Hypothesis 1 i.e., accessibility and inclusion involving AI use beneficially influences learning attainments.

- Hypothesis 2:
  It was supposed in Hypothesis 2 that Cost Efficiency is positive in its impact on Educational Outcome. The outcomes indicate that there is the path coefficient of 0.203 and a t-value of 3.604 with a p-value of 0.000, which is very much significant ($p < 0.05$). Thus, Hypothesis 2 is confirmed and points to the conclusion according to which cost effectiveness due to AI has a beneficial impact on learning results.

- Hypothesis 3:
  Hypothesis 3 was there would be a significant impact of ethically using AI on Educational Outcome. The path co-efficient 0.266 with t- value 4.463 and p-value = 0.000 indicates a high significant positive relationship. The third hypothesis power is accepted, and it means that EU of AI raises the quality of education.

- Hypothesis 4:
  In hypothesis 4, Personal Learning was hypothesized to have a positive contribution to Educational Outcome. The findings give a path coefficient of 0.294, t -value of 5.299 and p -value 0.000 which is very significant. Therefore, Hypothesis 4 is accepted so that personalized learning with the AI plays an vital positive role in the educational outcomes.

To sum up, every hypothesis in this model was also accepted, and Personal Learning and Ethical Use revealed the most positive effects on Educational Outcome. Accessibility and Inclusion and Cost Efficiency which are of substantial importance were not as powerful as the other two variables. These results indicate that customized learning and ethical AI usage are of utmost priority towards enhancing learning results, whereas accessibility and cost-effectiveness are of minor significance in the regard of AI in education.

CHAPTER V: DISCUSSION

5.1 Conclusions

AI is advancing at such rapid pace into education that it practically turns everything we think we know about learning inside out. In this research project, it has been examined how AI is redefining four of the large educational key elements, Personalized Learning, Cost Efficiency, Ethical Usage, and Accessibility and Inclusion. The primary idea was to know whether AI could enhance academic performance and at the same time make the process fair and ensure that every student can indeed participate.

The findings of the research turns out to be very constructive. The results highlight that Ethical Use and Accessibility & Inclusion of AI in education holds the greatest and positive

associations to learning outcomes. Ethical AI, which puts a focus on privacy protection, fairness, and accountability, is crucial in establishing trust and secure responsible use of the technology in education. In addition to that, accessibility efforts powered by AI have vastly increased the chances of underserved and minority students with education becoming more inclusive and equitable

Personalized Learning and Cost Efficiency, in turn, were found to be very important, but ambiguous. Although individualized learning could have been used to fit education to the individual learner, it had shortcomings, which included technicality and instructor participation. In the same way, although AI is perceived as one of the ways of cost decrease, financial obstacles to the application of AI in different institution have been identified as well, especially when it concerned long-term affordability of AI implementation on the infrastructure level.

This research paper can be viewed as another piece of evidence to prove the transformative power of AI, yet it is also a reflection that helps to define the improvements that should be done in the future. The customized learning environments should be advanced to become less cumbersome and less reliant on conventional instructional systems. Moreover, removing the financial obstacle to AI integration and improving its accessibility are the two most important actions leading to the achievement of the possible of using AI in teaching.

5.2 Scope for Future Study

Although such a research will be valuable in informing you in valuable matters, there are still a number of avenues that this research will leave to future studies. Longitudinal studies on the extensive effects of AI on the educational outcomes, particularly in lower income and rural schools should be conducted. The future study should also aim at addressing the issues of how AI algorithms can be developed to become more effective in personalized learning and decrease both expenditures and technological obstacles.

In addition, concern with ethical factors of AI in education should also be given the foremost priority. The future research direction may involve the analysis of the AI ethics frameworks and implementation into the educational environment with reference to data privacies and bias of the algorithms. The fact that AI systems are created apparent, reasonable, and answerable will play a major role in defining their future in the sector of education.

Finally, studies of AI as instrument of achieving equity and inclusivity should be broadened. There is a necessity to conduct further research into the possibilities of AI filling the educational gap and giving quality education to all students despite their location, social-economical status, and disabilities.

5.3 Recommendations

Summing up, AI in the sphere of education has a great prospect, as it can provide more opportunities and problems. This paper has indicated that although AI has potential to transform tailored teaching and learning, educational accessibility to a large extent, there exist some challenges that must be overcome- and these challenges are on cost and technical aspect. To transform education, AI should not be the only focus: there should be a balanced view on it, which does not only improve outcomes in education but also abides to the ethical values, manifested equality, inclusivity of the implementation process.

The forthcoming of AI in education rests on the act of improving the tools of AI continuously and eliminating their financial restrictions as well as widening access to the AI-powered learning platforms. Through such problems, artificial intelligence may become the centerpiece of changed education systems that support all learners equally and fruitfully.

Appendix-A:

Personalized Learning with Artificial Intelligence

- AI tools (e.g., adaptive learning platforms) adjust content to match my learning pace.
- AI-powered feedback helps me improve my understanding of difficult topics.
- AI recommendations align with my personal learning goals.
- AI-generated exercises are relevant to my skill level.
- Personalized AI tools make learning more engaging.

Accessibility & Inclusion of AI in education

- AI tools (e.g., speech-to-text apps) make learning materials accessible to students with disabilities.
- AI platforms provide equal opportunities for students in remote/rural areas.
- Language translation AI helps non-native speakers understand course content.
- AI reduces barriers to education for low-income students.

- AI tools accommodate diverse learning styles (e.g., visual, auditory).

Cost Efficiency

- AI tools (e.g., free tutoring apps) lower my expenses for learning resources.
- AI reduces the need for expensive in-person tutoring.
- Automated grading systems reduce administrative costs for my institution.
- AI-driven platforms offer affordable alternatives to traditional textbooks.
- My institution saves money by using AI for scheduling and resource allocation.

Ethical Use of Artificial Intelligence

- I use AI tools (e.g., study aids, tutoring apps) to enhance my learning without violating academic integrity.
- AI helps me prepare for exams ethically by providing practice questions and explanations.
- I avoid using AI tools to complete assignments or exams on my behalf.
- I follow my institution's guidelines on the ethical use of AI in academic work.
- I believe AI can support my education without compromising honesty or fairness.

Educational Outcomes with Artificial Intelligence

- AI tools have improved my academic performance.
- I complete assignments more efficiently with AI assistance.
- AI helps me retain information longer.
- I feel more prepared for exams using AI study aids.
- Overall, AI enhanced the quality of my education.

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