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ARTIFICIAL INTELLIGENCE IN EDUCATION: TRENDS, OPPORTUNITIES AND PITFALLS FOR INSTITUTES OF HIGHER EDUCATION IN GHANA

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ABSTRACT:
The emergence of innovative technologies has an immense impact on the methods of teaching and learning. With the rapid development of artificial intelligence (AI) technology in recent years, using AI in education has become more and more apparent. This study first outlines the application of AI in the field of education, such as adaptive learning, teaching evaluation, virtual classroom, etc. And then analyses its impact on teaching and learning, which has a positive meaning for improving teachers' teaching levels and students' learning quality. Finally, it puts forward the challenges that AI applications may face in education in the future and provides references for AI to promote education reform.

1.0 INTRODUCTION

Artificial Intelligence (AI) is an emerging technology with immense potential to revolutionize higher education in Ghana. The use of artificial intelligence (AI) in higher education has grown significantly in the country over the past decade and is likely to continue to do so as AI capabilities improve and universities become more comfortable with adopting and integrating the technology into their academic and administrative processes. AI in higher education can provide many benefits, such as enhanced teaching and learning experiences for students, improved

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administrative efficiency for universities, and more accurate assessment of student learning outcomes. However, there are some potential pitfalls associated with AI in higher education that must be considered before universities can maximize the potential of this technology. Such potential pitfalls include privacy concerns, increased cost of implementation, and difficulty in finding qualified personnel to manage AI systems. In order to ensure that Ghanaian universities can make the most of AI in higher education, it is important for them to develop policies and procedures that address potential privacy concerns, and find ways to finance the implementation of AI systems while also ensuring that qualified personnel are available to manage the technology. Additionally, it is essential that universities have a clear understanding of the potential impacts of AI in higher education on teaching and learning experiences, as well as on administrative processes. Going forward, it is important to ensure that Ghanaian universities have access to the necessary resources and infrastructure that would allow them to make the most of AI in higher education.

This paper comprises the following: the background of the study, the statement of the problem, the purpose of the study, research questions, justification of the study, the significance of the study, the scope of the study and the expected outcome/results of the study.

1.1 Background

The use of technology in education dates back to the emergence of 1st generation computers and their subsequent updated versions[1]. Teachers were seen using computers in teaching, researching, and recording students' grades and in doing other things. Similarly, students, among other things, made use of computers in studying, researching, and solving problems. Also, computers have been used as an educational resource (analogous to a library or laboratory), as well as a means for maintaining databases of student information. [2] . The use of technology in education is far advanced with the emergence of artificial intelligence (AI); a system where machines are designed to mimic humans. Artificial Intelligence is "the science and engineering of making intelligent machines" or "a machine that behaves in a way that could be considered intelligent if it was a human being." [3].

This expression Artificial Intelligence (AI) was first coined by John McCarthy at the Dartmouth Artificial intelligence conference in 1956. Leading researchers from different disciplines converged to discuss topics on the abstraction of content from sensory inputs, the relationship of

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randomness to creative thinking, and others that developed the concept of "thinking machines". Most participants envisaged the possibility of computers having capabilities to mimic the intelligence of human beings, but their biggest question was how and when it would happen. Currently, Artificial Intelligence is developing and spreading over every part of the world at an alarming rate [4]. It plays an increasingly important role in our daily life. As the introduction of AI and Machine learning is catching on with many people, its use in different devices, applications, and services is becoming widespread [5]. Applications such as Google duplex (a chat agent that can carry out specific verbal tasks, such as making a reservation or appointment, over the phone) and FaceApp, which uses AI to identify persons that are tagged in other photos on Facebook are some AI applications and services. Other intelligent appliances such as autonomous vacuum cleaners are examples of AI applications. As indicated earlier, the use of AI in education cannot be overemphasized. Yuki and Sophia, the humanoid robot are examples of AI applications in education.

AI is broadly categorized into two domains: the weak or domain-specific, which focuses on specific problems; and the strong or general with the ability to perform general intelligent actions [6]. Stephen Hawking and other researchers have proposed that the use of strong AI may lead to chaos and destruction of mankind, and other AI researchers have propounded that the emergence of AI in education might displace teachers. In the context of this paper, we refer to AI as Soft AI since machines currently have not assumed the capabilities to perform general intelligent actions. Studies mainly in Developed Countries have concentrated on challenges in the disruption of AI in Education whiles, while the opportunities and benefits of AI in education have received infinitesimal attention. At present, with the development of global science and technology, AI technology has also been improved by leaps and bounds. AI technology is continuously updated and widely used in various fields [7]. It is an indisputable fact that AI has increasingly penetrated the educational environment and teaching process of schools. In the process of development, more and more people pay attention to the importance of this technology in the field of education. AI has been widely used in the education field and has shown substantial application advantages, which have a profound impact on the teaching process and classroom management [8], [9]. AI can continuously optimize and improve the learning environment, and stimulate the enthusiasm, initiative, and creativity of students [10], [11]. At the same time, it can significantly improve the classroom management level of teachers and ensure that classroom management is

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more reasonable and efficient [12], [13]. With the rapid development of modern science and technology, AI technology is also advancing. The research results in related fields have enabled AI to be further applied to the education field, and it has shown sound application effects, contributing to teaching reform. The application of AI in the field of education has realized the full integration of teaching and learning, and also provided an opportunity for the reform of teaching and learning.

1.2 Problem Statement

As an emerging technology, the Artificial Intelligence concept also has to face some challenges and risks when it is to be implemented in school education. Those challenges should be identified before applying AI to a particular educational area. First, it should be understood what AI tool should be implemented for where. Because the best AI solution that matches the required issue differs depending on the factors like geographical, social, political, etc. Those factors can affect the whole education system most of the time. For example, because of independence, every Sri Lankan government has been criticized for ruining the education system. Every time changes happen in government, there happens a change in policies of education with changes in school syllabus and other teachings, learning, and administration procedure. In this section, some challenges that AI has to face when applying to the school education system are going to be addressed.

Quantity does not mean quality: When people do certain activities multiple times, they ultimately become better at doing them. For that, when teachers are spending years teaching students. She will get better at her occupation daily and gain much experience. But AI-based tools like robots steam ahead with algorithms that are not influenced by the repetition of activities. So, their experience does not subject and make any better with the teaching process.

Stimulating technology addiction: The school has been traditionally a place where students have to take out their mobile phones and tablets and have to open old textbooks. With technology implemented within every class, students would not be able to conceive their future lives without it. Behalf of that, after a few decades, society will get plenty of technology-addicted and socially unadopted adults. All of this will happen because AI can stimulate technology addiction.

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The high cost of delivery: The major challenge with implementing AI in school education is planning and strategizing the budget of schools. Most of the time budget becomes very difficult to forecast. For an instance, if all schools can have a robot assistant, the calculation of power that it may consume will escalate. Then countries would have to finance a high budget for recovering expenses. And another negative point regarding this issue is that electrical power is not a renewable resource. Understanding which AI-based learning tools are available and how they can benefit the students is an essential part of overcoming this challenge.

Unemployment: Teaching is considered one of the largest professional branches- there are close to 85 million teachers worldwide: 9.4 million in pre-primary; 30.3 million in primary; 18.1 in lower secondary; 14.0 in upper secondary; 12.5 in tertiary education [14]; and over 20,000 teachers in Ghana alone. If all those teachers are replaced with AI robots or another system, there will occur unemployment. The situation that occurred during the industrial revolution is a better example of this. There were strikes and protests when people were replaced by machines having the same functions. Like it, teachers have the capability of starting movements and protests. So, this unemployment is a major challenge that can occur in the future.

Reducing the ability to multitask: If AI is applied to school education, humans will get more assistance from machines and it will shrink their abilities. Therefore, there is a risk that people will use machines not because it is more competent, but because they cannot do it using another method.

No alternative teaching methods: Teachers can grant some ways to solve a specific problem. If a student can use one approach, the teacher will come up with an alternative one. It develops the flexibility of students' minds. However, a robot will offer an accepted and accurate solution without alternative variants.

1.3 Research Questions

1. What are the challenges and benefits of adopting AI in education?
2. What are the relevant studies that seek to understand the current research focus and provide an in-depth understanding of AI technology in education to guide educators and researchers in designing new educational models?
3. What are the prospects of artificial intelligence in education?

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1.4 Justification

This study will be of importance in the accompanying areas:

1. It will be of help to stakeholders in identifying the benefits, and challenges that artificial intelligence (AI) adoption presents to the educational discipline.
2. The discoveries of this study work will likewise act as a reference for academic undertaking to instructors and understudies and help the public who might need to be aware of certain benefits and drawbacks (if any) of the utilization of artificial intelligence in education.
3. Findings and suggestions(recommendations) from this study will assist the stakeholders in the education discipline decide the sort of artificial intelligence to be taken on and assist them with recognizing explicit areas where artificial intelligence can be applied in our educational discipline.

1.5 Scope of the Study

This study is one of the few that provides an integrated overview of the opportunities, benefits, and challenges that Artificial intelligence (AI) adoption presents to the educational discipline, and complementing it with the Technological-Organizational-Environmental (TOE) theoretical framework as a lens for discussing the challenges and benefits of AI adoption in Education.

1.6 Expected Results of the study and Possible use

This study is supposed to deliver the accompanying results and conceivable benefits and challenges:

1. To be of help to stakeholders to identify opportunities, benefits, and challenges that artificial intelligence (AI) adoption presents to the educational discipline.
2. The findings of this study work will likewise act as a reference for academic undertaking to instructors and understudies and help the public who might need to be familiar with certain benefits and drawbacks (if any) of the utilization of artificial intelligence in education.
3. Findings and recommendations from this study will direct the stakeholders in different areas to decide the sort of artificial intelligence to be embraced and assist them with distinguishing explicit regions where artificial intelligence can be applied in education.

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2.0 Literature Review

At present, with the development of global science and technology, AI technology has also been improved by leaps and bounds. AI technology is continuously updated and widely used in various fields [7]. It is an indisputable fact that AI has increasingly penetrated the educational environment and teaching process of schools. In the process of development, more and more people pay attention to the importance of this technology in the field of education. AI has been widely used in the education field and has shown substantial application advantages, which have a profound impact on the teaching process and classroom management [8], [9]. AI can continuously optimize and improve the learning environment, and stimulate the enthusiasm, initiative, and creativity of students [10], [11]. At the same time, it can significantly improve the classroom management level of teachers and ensure that classroom management is more reasonable and efficient [12], [13]. With the rapid development of modern science and technology, AI technology is also advancing. The research results in related fields have enabled AI to be further applied to the education field, and it has shown sound application effects, contributing to teaching reform. The application of AI in the field of education has realized the full integration of teaching and learning, and also provided an opportunity for the reform of teaching and learning. This study comprehensively summarizes and analyzes the application of AI in education.

3. Methodology

3.1 Research Design

According to Asika in 2009, research plans are frequently alluded to as the construction of examinations pointed toward distinguishing factors and their connections to each other. In this review, the survey fills in as a valuable manual for the work of creating information for this review. The review research plan, through the administration of questionnaires, was utilized for the review.

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3.2 Area of the study

The study was conducted in Winneba, a town and the capital of Effutu Municipal District in the Central Region of South Ghana. Winneba is a small coastal city in southern Ghana. The number of inhabitants in the Winneba municipal area, as per the Ghana Statistical Service, is **55,331**.

3.3 Population of the study

The number of inhabitants in the review comprises occupants of Winneba on whether artificial intelligence does or doesn't help in the improvement of education.

3.4 Sample of the study

The basic random sampling method was utilized in choosing 100 respondents from the whole population of Greater Accra occupants. This was decided because of the monetary strength of the researcher combined with time limitations.

3.5 Instrument for data collection

These are the devices or strategies utilized in getting information from respondents. In this research, questionnaires and interviews are the exploration instruments utilized. The questionnaire is the fundamental examination instrument utilized for the review to assemble vital information from the sampled respondents. The questionnaire is the organized type and gives replies to the examination questions and speculations therein.

This instrument is partitioned and restricted into two segments; Section A and B. Section A deals with the individual information of the respondents, while Section B contains the research statement by the research question and hypothesis in the study. Choices or options are provided to every respondent to pick or tick one of the choices.

3.6 Reliability and Validity of instrument

Reliability quality means the exactness or accuracy of an estimating instrument, while validity implies the degree to which the exploration instrument estimates what it should quantify. The test-retest technique was utilized to decide the reliability and validity of the study. To have a substantial instrument, the inquiries in the questionnaire will be liberated from ambiguity (for example, the inquiries won't be excessively mind-boggling). To have a reliable instrument, the

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survey will be followed by a meeting with a sample of respondents to know their perspectives regarding the matter.

3.7 Data Analysis

Having assembled the information through the administration of a questionnaire, the gathered information will be coded, classified, and analyzed by the research questions and hypothesis.

To analyze the information gathered successfully and proficiently for simple administration and accuracy, the basic rate strategy was the analytical instrument used for this research project, and a sample size of 200 (100) will be addressed by 100 percent for simple analysis of the responses.

Likewise, the chi-square test will be utilized in the research work. The Chi-square test is a measurable procedure utilized in the testing of a hypothesis to either accept or dismiss an invalid theory. The measurable mean scores were used to analyze Likert's five-point questionnaire, while the recurrence of 10 units and basic rate were used to analyze the respondents' qualities. The models for calculating the mean are:

Mean (x)-fx

The formula for the chi-square is: Z2 = (oi-ei)2

Where Z2 = chi-squared

Oi = Number of the noticed case in classification i

Ei = Number of anticipated cases in classification i

K = Number of classifications; summation runs from 1:1 to 1:K

3.8 Data Presentation

The data presented beneath were accumulated during fieldwork:

Bio information of respondents

Table 1 gender of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid male	40	40.0	40.0	40
female	60	60.0	60.0	60
Total	100	100.0	100.0	100

Source: field review, August 2015.

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Table1 above shows the gender distribution of the respondents utilized for this study.

Out of the absolute number of 100 respondents, 40 respondents which address 40.0 percent of the populace are male.

60 which address 60.0 percent of the populace are female.

Table 2 age scope of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 15-20years	15	15.0	15.0	15.0
21-30years	6	6.0	6.0	21.0
31-40years	15	15.0	15.0	36.0
41-50years	30	30.0	30.0	66.0
51-60years	22	22.0	22.0	88.0
Above 60years	12	12.0	12.0	100.0
Total	100	100.0	100.0	

Source: field review, August 2015.

Table 2 above shows the age distribution of the respondents utilized for this study.

15 respondents who represent 15.0 percent of the populace are between 15-20 years.

6 respondents who represent 6.0 percent of the populace are between 21-30years.

15 respondents which represent 15.0 percent of the populace are between 31-40 years

30 respondents which represent 30.0 percent of the populace are between 41-50years.

22 respondents which represent 22.0 percent of the populace are between 51-60years.

12 respondents representing 12.0 percent are over 60years.

Table 3 Educational qualification of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid BECE	20	20.0	20.0	20
WASSCE/SSCE	35	35.0	35.0	35
HND/BSC	40	40.0	40.0	40
MSC/PHD	5	5.0	5.0	5
Total	100	100.0	100.0	100

Source: field review, August 2015.

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Table 3 above shows the academic qualification of the respondents utilized for this study.

20 respondents who represent 20.0 percent of the populace are BECE certificate holders.

35 respondents which represent 35.0 percent of the populace are WASSCE/SSCE holders.

40 respondents which represent 40.0 percent of the populace are HND/BSC holders.

5 respondents who represent 5.0 percent of the populace are MSC/Ph.D. holders.

Table 4 Marital status of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid single	45	45.0	45.0	45
married	38	38.0	38.0	38
divorced	10	10.0	10.0	10
widowed	7	7.0	7.0	7
Total	100	100.0	100.0	100

Source: field study, August 2015.

Table 4 above shows the marital status of the respondents utilized for this study.

45 respondents which represent 45.0 percent of the populace are single.

38 respondents which represent 38.0 percent of the populace are married.

10 respondents who represent 10.0 percent of the populace are separated.

7 respondents which represent 7.0 percent of the populace are bereft.

Tables in based on research questions

Table 5 Artificial intelligence has made education easy to access.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	62	62.0	62.0	62
Agree	13	13.0	13.0	13
Undecided	5	5.0	5.0	5
Disagree	10	10.0	10.0	10
Strongly Disagree	10	10.0	10.0	10
Total	100	100.0	100.0	100

Source: field study, August 2015.

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Table 5 shows the reactions of respondents that artificial intelligence has made education easy to access.

62 of the respondents representing 62.0 percent strongly agree that artificial intelligence has made education easy to access.

13 of the respondents representing 13.0 percent strongly agree that artificial intelligence has made education easy to access.

13 of the respondents representing 13.0 percent were uncertain.

10 of the respondents representing 10.0 percent disagree that artificial intelligence has made education easy to access.

10 of the respondents representing 10.0 percent strongly disagree that artificial intelligence has made education easy to access.

Table 6 Artificial intelligence has a larger number of benefits than negative marks in education.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	50	50.0	50.0	50
Agree	10	10.0	10.0	10
Undecided	5	5.0	5.0	5
Disagree	20	20.0	20.0	20
Strongly Disagree	15	15.0	15.0	15
Total	100	100.0	100.0	100

Source: field overview, August 2015.

Table 6 Artificial intelligence has a larger number of benefits than negatives in education in education.

50 of the respondents representing 50.0 percent strongly agree that artificial intelligence has a larger number of benefits than negatives in education.

10 of the respondents representing 10.0 percent agree that artificial intelligence has a greater number of benefits than negatives in education.

20 of the respondents representing 20.0 percent were uncertain.

20 of the respondents representing 20.0 percent disagree that artificial intelligence has a larger number of benefits than negatives in education.

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15 of the respondents representing 15.0 percent strongly disagree that artificial has a larger number of benefits than negatives in education.

Table 7 Artificial Intelligence has created extra space in instructional delivery in education.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	30	30.0	30.0	30
Agree	38	38.0	38.0	38
Undecided	10	10.0	10.0	10
Disagree	22	22.0	22.0	22
Total	100	100.0	100.0	100

Source: field study, August 2015.

Table 7 shows the reactions of respondents that artificial intelligence has created additional space in instructional delivery in education.

30 of the respondents representing 30.0 percent strongly agree that artificial intelligence has created additional space in instructional delivery in education.

38 of the respondents representing 38.0 percent agree that artificial intelligence has created additional space in instructional delivery in education.

10 of the respondents representing 10.0 percent were uncertain.

22 of the respondents representing 22.0 percent disagree that artificial intelligence has created additional space in instructional delivery in education.

Table 8 improvement in Ghana's education system is significant because of artificial intelligence.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	30	30.0	30.0	30
Agree	50	50.0	50.0	50
Disagree	15	15.0	15.0	15
Strongly Disagree	5	5.0	5.0	5
Total	100	100.0	100.0	100

Source: field study, August 2015.

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Table 8 shows the reactions of respondents that improvement in Ghana's education system is significant because of artificial intelligence.

30 of the respondents representing 30.0 percent strongly agree that improvement in Ghana's education system is significant because of artificial intelligence.

50 of the respondents representing 50.0 percent agree that improvement in Ghana's education system is significant because of artificial intelligence.

15 of the respondents representing 15.0 percent disagree that improvement in Ghana's education system is significant because of artificial intelligence.

5 of the respondents representing 5.0 percent strongly disagree differ that improvement in Ghana's education system is significant because of artificial intelligence.

Table 9 Artificial intelligence has assisted with expanding Ghana's education system in terms of access and quality.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	42	42.0	42.0	42
Agree	38	38.0	38.0	38
Undecided	10	10.0	10.0	10
Disagree	5	5.0	5.0	5
Strongly Disagree	5	5.0	5.0	5
Total	100	100.0	100.0	100

Source: field study, August 2015.

Table 9 shows the reactions of respondents that artificial intelligence has assisted with expanding Ghana's education system in terms of access and quality.

42 of the respondents representing 42.0 percent strongly agree that artificial intelligence has assisted with expanding Ghana's education in terms of access and quality.
38 of the respondents representing 38.0 percent agree that artificial intelligence has assisted with expanding Ghana's education in terms of access and quality.
10 of the respondents representing 10.0 percent are uncertain.
5 of the respondents representing 5.0 percent disagree that artificial intelligence has assisted with expanding Ghana's education in terms of access and quality.
5 of the respondents representing 5.0 percent strongly disagree that artificial intelligence has assisted with expanding Ghana's education in terms of access and quality.

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Table 10 absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Agree	35	35.0	35.0	35
Agree	35	35.0	35.0	35
Undecided	10	10.0	10.0	10
Disagree	10	10.0	10.0	10
Strongly Disagree	10	10.0	10.0	10
Total	100	100.0	100.0	100

Source: field study, August 2015.

Table 10 shows the reactions of respondents that the absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

35 of the respondents representing 35.0 percent strongly agree that the absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

35 of the respondents representing 35.0 percent agree that the absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

10 of the respondents representing 10.0 percent were uncertain.

10 of the respondents representing 10.0 percent disagree that the absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

10 of the respondents representing 10.0 percent strongly disagree that the absence of sufficient artificial intelligence may unfavorably influence the country's educational system.

3.8 Research hypotheses

H0: Artificial intelligence doesn't help human existence in any capacity

H1: Artificial intelligence benefits human existence.

Level of importance: 0.05

Decision Rule: reject H0 if the p-esteem is not exactly the degree of importance, accept H0 if otherwise.

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Table 11 Test Statistics

Artificial intelligence adoption benefits the educational system.

Chi-Square 111.900a

df 4

Asymp. Sig. .000

a. 0 cells (.0%) have expected frequencies under 5. The base expected cell recurrence is 20.0.

Conclusions given the choice rule:

Since the p-value (0.000) is less than the degree of importance (0.05), we reject the null hypothesis.

4.0 The Application of AI in Education (Trends)

In 2016, after AlphaGo defeated the world Go champion Lee Sedol [15] with a high score of 4:1 in the Go game, research on AI is attracting more and more attention from the world. More and more research on AI and education mainly focuses on applying AI technology to assist teaching, build a smart campus, and realize intelligent learning, teaching, and management. Image recognition technology, face recognition technology, adaptive learning, ng, and other AI technologies are applied to the education field, initiate a series of changes in the field of education, improve teachers' work efficiency [16] and students' learning experience [17]. In addition, AI technology and big data are combined to dig and analyze teaching data in-depth, it can also promote teaching reform and improve teaching quality [18]. Next, we will review the literature on the impact of AI on adaptive learning, teaching evaluation, virtual classroom, smart campus, and intelligent tutoring robots.

Adaptive learning

AI promotes the development of adaptive learning, in which data mining, intelligent teaching systems, learning analytics, and real-time analysis are applied in adaptive learning. Adaptive learning attempts to incorporate all aspects of testing, teaching, learning, and practice into the adaptive learning system to facilitate students' learning [19].

The adaptive learning system can collect student learning behavior data [17], plan the optimal learning path for students based on the analysis of student abilities, and complete the closed-loop learning process by pushing learning content as online teaching videos. Some problems

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encountered and are cannot be solved after class study, but the human-computer interaction technology provided by AI can assist teachers in answering questions for students online [20]. BYJU'S [21], and IBM Watson Education [22], which are relatively mature companies with adaptive learning systems, and teachers apply the systems in class to improve classroom teaching effects.

Assessment and Learning in Knowledge Spaces (ALEKS), a Web-based artificially intelligent assessment and learning system, is widely used in the USA. Yilmaz in 2018 investigated the effects of ALEKS on the math achievement of middle school students. Results of the analysis showed that ALEKS instruction had a statistically significant positive impact on students' end–of–year mathematics scores. However, Fang, Ren, Hu, & Graesser in 2019 conducted a meta-analysis to assess the effectiveness of ALEKS on learning, and their results revealed that ALEKS was as good, but not better than traditional classroom teaching, unless when ALEKS was used for shorter periods rather than longer periods. This research can better inform teachers using the ALEKS learning system to promote students learning.

Similar to ALEKS, BYJU, which is popular in India, is also a learning app for AI in teaching. BYJU fully integrates online lectures and exercises and combines teachers' explanations with animations to explain difficult-to-understand science concepts through animation scenarios to facilitate students' understanding. The gamified operation interface forms an entertaining teaching mode.

In addition, BYJU'S system can recommend courses according to students' abilities [23]. Sruthi & Mukherjee in 2020 found that BYJU's app has transformed Indian education scenarios by incorporating constructive teaching and learning methods. Most of the respondents said the app is interactive, comfortable, and practical. BYJUs also can promote deep conceptual understanding in students, and how BBYJUs promotes deep conceptual understanding has been analyzed in India.

However, the price may also prevent some students from using it. English learning has always been an essential part of education. In English courses, the number. of students is too large and teachers cannot conduct one-to-one oral training.

Speech recognition and semantic analysis technology are widely used in English teaching [24]; They can assist teachers and students in one-to-one oral practice, and correct students' wrong English pronunciation. Duolingo provides multilingual learning through the game mode,

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focusing on customized learning. Tsai in 2016 found that by learning with Duolingo, the autonomous learning ability of the learners was increased, in terms of their self-regulation on learning accessing time to learn, self-regulation on regularly finding more materials to learn, evaluating one's learning, adjusting learning strategies to have more effective learning. Zou in 2017 established a college English teaching platform and used AI to analyze the needs and knowledge of students. This platform can adjust teaching progress and content through AI algorithms. The results of the study show that the average score of students who use the platform to learn English is higher than those who do not use the platform, and it can improve students' autonomous learning ability and English ability. Bin & Mandal in 2019 also designed a college English-assisted teaching system based on AI technology, which is used in English teaching to improve the quality and effectiveness of English teaching.

Teaching Evaluation

AI technologies such as image recognition, prediction system, and computer vision provide convenience for teaching assessment. In the teaching process, the assessment of students is an essential part. In traditional teaching, it takes a long time for teachers to complete the assessment tasks, such as question preparation, scoring, performance evaluation, and test paper analysis. AI makes teaching evaluation methods more diverse, the evaluation process more scientific, and the evaluation results more accurate. AI technology not only can generate exam questions [25], but also can automatically correct assignments and test papers [26]. Correcting homework and test papers are routine tasks for teachers. Correcting time is long, tea and hers are prone to fatigue when correcting homework and test papers for a long time. Therefore, there will be some errors in correcting test papers after a long time. Image recognition technology helps teachers to free themselves from the heavy work of correcting homework and scoring [27], and the error rate is low. AI technology is applied to examination paper correction, and it can also detect blank papers and suspected identical papers, saving teachers' working time. FLYTE and New Oriental jointly launched RealSkill, aiming at better learning of IELTS and TOEFL via smart correction and oral practices. Students can learn IELTS and TOEFL through this Real Skill online platform, and the system can perform intelligent scoring, sentence-by-sentence correction, behavior analysis, essay-intensive lectures, and learning records to improve their test preparation level [28]. The American Educational Testing Service (ETS) designed and launched the E-rater [29],

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a tool the for automated evaluation of student essays. E-rater can accurately and efficiently evaluate students' composition, including structure, grammar, and overall score, not only improve the teacher's assessment efficiency but also guide students to improve their writing skills. ETS has also used AI technology in spoken English assessment and developed a Speech Rater engine to help users excel in spoken English assessment [30]. Except for the volumetric teaching evaluation, AI also provides a new way and perspective for schools and teachers to evaluate student physical education courses. Ge, Yin, & Feng in 2018 designed an AI-based college student sports autonomous learning system which is realized in the browser/server system architecture, the Visual Studio integrated open environment, and the SQL Server database under the Windows platform. This platform can help students conduct self-assessment tests, get learning feedback in time, help college students improve their exercise levels, and reduce teachers' teaching pressure. Yong in 2018 also designed a sports intelligence evaluation system based on an AI expert decision-making system, which is used in the evaluation of sports teaching. The research results affirm that the AI-based physical education evaluation system provides new development strategies for the application and development of modern sports technology, and also provides theoretical support and guidance for the further development of science education technology.

Virtual Classroom

The development of virtual reality (VR), augmented reality (AR), and hearing and sensing technologies are conducive to the reform of the teaching environment. Utilize ubiquitous computing technology to realize the integration of physical space and virtual space to create virtual classrooms and virtual laboratories [31].

Virtual classrooms use virtual technology to simulate teaching scenes that are difficult to explain, and natural phenomena or changes in things that cannot be observed or hard to observe in real life can be presented in a smart classroom to create a contextual learning environment for students. Multi-dimensional presentation of learning content, mobilizes students' vision, hearing, kinesthetic and other senses to participate, allowing students to feel a strong sense of reality, it makes abstract concepts and theories more intuitive and visualized, stimulating students' interest in learning, and improving teaching effects. The hybrid virtual classroom is very promising

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regarding flexibility in course attendance [32] since students can choose to come to campus or to attend the lecture at home.

Virtual simulation laboratory refers to the virtual reproduction of real experimental scenes through 3D modeling with the help of multimedia, simulation, and virtual reality technologies creating related software and hardware operating environments on the computer that can assist, partially replace, or even replace all the operating links of traditional experiments [33]. By constructing a highly simulated virtual experimental environment and experimental operating objects, and with the help of advanced somatosensory interactive equipment or virtual and real interaction, the experimenter can complete various experimental projects as if in a real environment [34]. There is no need to worry about the damage caused by experimental operation errors or missing some classic experiments due to experimental conditions. The experimental results obtained are equivalent to or even better than those obtained in the real environment.

Virtual experiments are based on a virtual experimental environment (platform simulation), focusing on the interaction of experimental operations and the simulation of experimental results [35]. Experiments in biology [36], physics [37], chemistry [38], and other courses [39] can be carried out in the virtual laboratory. The interactive operation of the virtual simulation laboratory helps to cultivate students' practical abilities. At the same time, the virtual experimental equipment also saves resource consumption and avoids experimental risks [40]. However, according to [41], although its motivating properties, learning science in VR may make learners' cognitive overload undistracted, resulting in poorer learning outcomes.

Intelligent Tutoring Robots

Tutoring robots are multi-disciplinary and cross-field scientific research involving education, computer science, automatic control, materials science, psychology, optics, and other fields. From the perspective of the development process of robots, the research and development of early robotics technology were mainly based on industrial robots [42]. With the popularization of robotics technology, the educational value of robots has also attracted increasing attention. The earliest educational robot came from the AI laboratory founded by Professor Papert of the Massachusetts Institute of Technology in the 1960s [43], and gradually became intelligent. Educational robots are specially developed for the education field, aiming at cultivating students' analytical ability, creativity, and practical ability. It has the characteristics of teaching

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applicability, interactivity, openness, and scalability [44]. Tutoring robots are equipped with a variety of AI technologies such as voice recognition technology, emotion recognition that analyzes expressions and tones, and bionic technology that can present beautiful joint technology similar to human actions, and has human-like listening, seeing, thinking, and communication capabilities [45].

Different intelligent tutoring robots have different functions, which can be mainly divided into 5 functions: robot-subject instruction, robot-assisted instruction, robot-managed instruction, robot-represented routine, and robot-directed instruction[46][47]reviewed the literature on educational robotics applications grounded in learning theory in tertiary education. They explored studies that the use of robots can benefit the learning of subjects and skills development. Most of the studies used robots to support computer science education. Tutoring robots are different from traditional passive learning methods, where robots first solve students' interest problems [48]. The teaching mode of robots can well stimulate students' interest in learning. For example, SoftBank's pepper robot [49] can provide teaching services to students at different stages of elementary school, middle school, and university, which is to cultivate students' interest in learning AI by playing. The tutoring robots of the Adaptive Systems Research Group of the University of Hertfordshire are known for assisting children with autism [50]. The research results show that children with autism are very active and positively respond to interaction with tutoring robots.

In recent years, with the advancement of AI technology, the development of robots has gradually become intelligent and humanized. Intelligent and humanized robot products will be more suitable for future education and teaching environment.

4.1 Impact or Benefits of AI in Education (Opportunities)

The continuous improvement of AI technology has been widely used in all walks of life, and the education field is no exception. AI simulates human listening (machine translation, speech recognition) [51], speaking (speech synthesis, human-computer dialogue) [52], watching (computer vision, image recognition, text recognition) [53], thinking (Theorem Proving) [54], learning (machine learning, intelligent adaptive learning) [55] and action (robot) [56]. In particular, AI technologies such as computer vision, natural language processing, and intelligent

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adaptive learning have changed traditional education and teaching [57], and have provided universities and teachers with new ideas for teaching reform.

1. One of the importance of AI in education is it plays a role in promoting personalized teaching and learning. AI has changed the way teachers teach and the way students learn. It can form a personalized learning plan according to the needs and learning situation of students [58], provide an immersive learning experience [59], and intelligent learning tracking to help students improve their learning ability and efficiency. AI can deeply evaluate students' daily and test performance based on big data and machine learning, and provide personalized teaching guidance for students' difficult knowledge and difficulties [60], shortening students' learning time [61] and improving learning efficiency [62]. Adaptive learning technology can help implement one-to-one personalized teaching between machines and students. Intelligent adaptive learning technology is an AI education technology that simulates the process of one-to-one teaching by teachers to students and gives the learning system personalized teaching capabilities The United States adaptive education started early, in the 1990s. It has excellent adaptive education companies such as Knewton [63], Cognitive Tutor [64], etc., in which the teaching content focuses on higher education. Compared to the United States, China's adaptive education development started late, and the technology is not as mature as in the United States. It has only developed rapidly in the last ten years. The education content of companies such as New Oriental and Yixue Education-Squirrel AI [65] that do better in intelligent adaptive education focuses on K12 Tutoring and English tutoring.

2. Another importance of AI in education is it can reduce the burden on teachers and make teachers more focused on humanistic care. Nowadays, much of the teacher’s time is spent on correcting homework and examination papers. These repetitive tasks occupy teachers' teaching and research time and teacher-student interaction time. Intelligent tutor systems [66], intelligent assessment systems [67], educational robots [68], and other AIs can help teachers solve many mechanically repeated daily tasks, such as correcting homework and correcting test papers, alleviating the pressure of teachers in various tasks, and freeing teachers from heavy knowledge transfer. AI technology can also enhance teachers’ abilities, help teachers provide students with personalized and precise teaching guidance [69] that they could not offer before, and

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significantly improve the efficiency of imparting knowledge. In addition, AI allows teachers to have more time and energy to communicate with students, allowing teachers to focus on the cultivation of students' morality and ability, and have more time and energy to focus on the overall physical and mental development of each student. To achieve student-centeredness and give more humane care to students, the role of teachers has also changed from disseminators of knowledge to facilitators of student learning.

3. The third importance of AI in education is it promotes the construction of smart campuses [70]. The appearance of AI technology has changed traditional education and teaching methods. Face recognition, text recognition, human body recognition, voice interaction, AR and other AI technologies provide technical support for the construction of smart campuses [71]. With the help of AI, campus management and services such as campus safety, classroom effect monitoring, and school attendance can be improved [72], giving students and teachers higher-quality teaching and learning experience, and reducing management costs. There are a large number of students living in the student hostel, and the management staff cannot fully identify the outsiders. Face recognition and human body recognition technology bring convenience to the management of dormitories [73]. Face recognition through AI can efficiently identify suspicious outsiders and improve the safety of the student hostel. In the classroom, through AI technologies such as face recognition, human body analysis, and image recognition, students' head-up frequency, frequency of mobile phone usage, and smile frequency are monitored and analyzed during class to obtain relevant data [74] so that teachers and parents can understand the students' classroom performance, which also enables teachers with deficiencies to improve their teaching methods in time. Besides monitoring the classroom effect, face recognition technology can also help teachers to check attendance, and output the attendance results through face recognition [75], so that teachers can know in time which students are not in class, therefore teacher can put more focus on them.

4. Fourthly, AI technology promotes the realization of education equity [76]. Different countries and regions have educational inequities due to economic development or geographical problems. AI technology can help break regional differences and reduce the inequality of educational resources between students in areas with scarce teaching resources and students in

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big cities due to geographical regions. By integrating the Internet and AI technology, remote personalized teaching can be provided [77]. For remote areas lacking teachers, one teacher can be used to conduct remote online teaching for students in multiple areas, provide opportunities for students to interact and learn with outstanding teachers, and realize resource sharing of high-quality teachers. At the same time, intelligent homework correction is carried out through AI [78], and teaching data is automatically generated, which solves the problem that teachers can't correct homework that students submitted from different areas. It also allows teachers in remote areas to focus more on students' personalized teaching, intelligent adaptive learning, and ability development. Through online and offline mixed teaching methods, the teaching level in areas with insufficient teaching resources can be improved, and the professional development of teachers in remote areas can also be improved.

5. Learning Management System (LMS) In this age of technology, one of the most important things is to stay up-to-date with advancements in education. One of these advancements is the use of Learning Management Systems. A learning management system provides a centralized, intuitive system for managing all of a school's online activities. These tools can be used for a variety of purposes, but they are often utilized to achieve the following:

- Assign coursework
- Communicate with students and parents
- Track student progress
- Generate reports on student performance

These systems allow all aspects of a course to be contained within one space, from lessons and assignments to assessments and grading. This means that teachers can provide feedback on any assignment or assessment at any time. Students have instant access to their grades without waiting until the end of a semester.

A lot of topics can be learned by using these LMS with AI software. A learner can get help by using an AI-powered intelligent digital tutor, which helps them with their problems and provides them with the correct answer to solve their problem. With Artificial Intelligence, one can even build a learning management system that can understand how students are thinking and help them learn better. There are now LMS systems that can help teachers in creating content, help parents in monitoring their child's progress in the system, and assess them with an AI engine.

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This has helped teachers reduce classroom management time, assisting parents in understanding their child's progress better and lessening teachers' workload. LMSs are an invaluable tool for both teachers and students alike.

4.2 Challenges of AI in education (Pitfalls)

While AI brings a series of educational benefits, it will also face some unprecedented challenges. Understanding the problems that may be encountered when AI is introduced into education will help people better prepare and improve the future application of AI in education. These challenges mainly lie in the following aspects:

1. First of all, it is necessary to ensure fairness when applying AI in education. With the development of AI, developing countries face the risk of exacerbating divisions in education through new technologies. Just as the digital divide has separated those who can access the Internet from those who cannot, the ever-widening algorithmic divide now threatens to deprive many educational opportunities provided by AI. Because most AI algorithms come from developed countries, the algorithms cannot fully consider the conditions of developing countries and cannot be directly applied [79]. The education sector must overcome significant obstacles such as lacking basic technology and infrastructure to create basic conditions for AI to improve learning.
2. Secondly, we need to pay attention to the ethical and safety issues arising from collecting, using, and disseminating data. AI has raised many ethical issues in terms of providing personalized advice to students, collecting personal data, data privacy, and the ownership of responsibilities and data feed algorithms [80]. Strengthening the supervision of AI technology and its products requires the public to discuss the ethics, responsibility, and safety involved.
3. Thirdly, it helps teachers prepare for AI-assisted teaching. Teachers must master new digital teaching skills to use AI to promote teaching reform appropriately. In addition, the developers of AI teaching products must understand the way teachers work and create a teaching product usage plan that is convenient for teachers to use.
4. Fourthly, the changes in learning styles have higher requirements for students' autonomous learning ability. Learning in the era of AI will be student-centered, and students are in the dominant position in learning activities [81], [82]. Students can generate personalized learning plans based on the intelligent teaching system, independently select learning content,

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arrange learning progress, and carry out group cooperative learning [83][84]. Individualized learning methods have higher requirements for students' self-regulation and self-management levels [85], [86], so teachers should also pay attention to the cultivation of students' independent learning ability in the teaching process.

5. Fifthly, more attention needs to be paid to student-student communication. If more and more students use AI platforms for learning, and the object of their communication machines, the student's social communication skills will become a problem. Students should promote mutual learning. To solve this problem, AI education projects can set up a distance education model that emphasizes socialization. Students can study online and interact with classmates in different camps and social activities.

In short, with the in-depth development of economic and technological globalization, the important role of AI technology in education has become increasingly prominent. And many countries have regarded the development of AI technology as a national priority. The main feature of the innovation in the AI-based education ecosystem is the precision, individualization, and adaptation of education services and management. In the process of building an innovative educational ecosystem, schools, teachers, and students are facing various challenges and problems brought about by AI. To solve these problems and realize the perfect connection between AI technology and education, teachers, students, and other education ecosystem members need to work together.

4.3 Summary

The findings of the study resulted from the implementation of the intervention strategies and detected by the observation and test instruments are together summarized as follows:

1. The use of artificial intelligence has made education easy to access.
2. The adoption of Artificial intelligence has a larger number of benefits than negative marks in education.
3. Artificial Intelligence has created extra space in instructional delivery in education.
4. The application of Artificial Intelligence has created extra space in instructional delivery education.
5. The improvement in Ghana’s education system is significant because of artificial intelligence, especially in the mix of covid.

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6. The adoption of Artificial intelligence has assisted with expanding Ghana's education system in terms of access and quality.
7. The absence of satisfactory artificial intelligence may unfavorably influence the country's educational system.

5.0 Conclusion

It can be concluded from the findings of the study that, with the development of AI technology, AI will be more and more used in the education field in the future. By analyzing the application of AI in education and the challenges faced by AI technology in education, people have an overall understanding of the situation of AI + education. And help teachers and students better face and use AI technology in the teaching and learning process, improve teachers' teaching quality and students' learning methods, and make students' learning styles more diversified and personalized.

6.0 Recommendation

Based on the strength of the main findings and conclusions drawn from the study, the researcher to identify the benefits and challenges that Artificial Intelligence (AI) adoption presents to the educational discipline came out with the following recommendations:

1. It is necessary to ensure fairness when applying AI in education.
2. We need to pay attention to the ethical and safety issues arising from collecting, using, and disseminating data.
3. The changes in learning styles have higher requirements for students' autonomous learning ability. Learning in the era of AI will be student-centered, and students are in the dominant position in learning activities.
4. Teachers must master new digital teaching skills to use AI to promote teaching reform appropriately. In addition, the developers of AI teaching products must understand the way teachers work and create a teaching product usage plan that is convenient for teachers to use.
5. More attention needs to be paid to student-student communication. If more and more students use AI platforms for learning, and the object of their communication machines, the student's social communication skills will become a problem.

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7.0 Suggestions for Further Research

This research was concluded at Winneba in the Central Region of Ghana and it is not representative enough for the whole region in particular and the country at large. I, therefore, recommend that it would be of the greatest importance that a similar study is conducted in the whole region and other parts of the country so that valid generalizations can be made.

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