

# Transformation of Instructional Process: A Review of Artificial Intelligence in Higher Institutions

**Victoria A. Uwah**

Department of Computer Science  
Akwa Ibom State College of Education, Afaha Nsit  
&

**Emmanuel P. Ododo**

Department of Industrial Education, Computer Education Unit  
University of Uyo, Nigeria

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## Abstract

*AI has become an integral part of modern life, and its development has affected every aspect of our lives. There are many countries that require the implementation of intelligent education. However, how artificial intelligence can help improve the teaching and learning process is still not yet clear. The rapid emergence and evolution of educational technology has revolutionized various aspects of teaching and learning. Higher education is no longer limited by the limitations of time and resources. This paper talks about various aspects of artificial intelligence that are related to teaching and learning reform. With a view to promoting the use of artificial intelligence in education, it is proposed that schools establish frameworks that will allow their students to benefit from the technology.*

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**Keywords:** instruction, artificial intelligence, institution

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## Introduction

Improvements in technology innovations coupled with intelligent machines with high computing capabilities are basically associated with higher education. With this developments, new opportunities and challenges in higher education teaching and learning are revealed. The developments in the field of artificial intelligence has the capability to make higher education dynamic effectively in the core design of the institution.

Artificial intelligence is one of the most prominent modern applications of information systems as a field of modern knowledge that is interested in studying and understanding the nature of human intelligence and its simulations to create a new generation of smart computers that can be programmed to accomplish many of the tasks that need a high ability of inference, deduction and perception, which are qualities that people enjoy. It is included in the list of smart behaviors.

Artificial intelligence (AI) is becoming more increasingly part of our daily lives. This is why the government and schools are paying more and more attention to the development of artificial intelligence in education (Malik, Tayal, and Vij 2019). Artificial intelligence has not only necessitated changes in schools' teaching methods, learning methods, campus environment, and curriculum, but the entire education industry is also undergoing changes through AI (Karsenti 2019). From the cradle of education, the basic education to higher education and adult education, schools are increasingly transforming with AI technology. These systems can help people learn better and achieve their learning goals (Hinojo-Lucena, Aznar-Díaz, and Cáceres-Reche, and Romero-Rodríguez 2019).

Artificial intelligence applications are important in all field of life, but AI applications are more important for higher institution like universities, as universities today are no longer limited to education, but rather is now an essential part of the system of sustainable development in societies (Morín, 2018). The mission of higher institutions today exceeded the traditional function of preserving heritage, identity and education. Rather, higher institutions today are required to keep pace with technological development by creating new methods of education and teaching.

Artificial intelligence technology is believed to play an important role in promoting the reformation of teaching and learning in higher institutions. It bring new intelligent teaching tools to higher institutions, form new instructional modes, and promote innovation in teaching evaluation methods and teaching management methods. Educators are actively changing the way of thinking, exploring new forms of combinations between artificial intelligence and teaching, promoting the deep integration of technology and teaching, and the innovative development of education and teaching (Guo and Xiao 2019). Transformation of instructional process in higher institution would break the time and space restrictions in traditional education, thus form a superhighway of information, promote fair processes in education, and make education and teaching more interesting and reasonable (Zhang, Zhang, and Li

2019). Students are able to develop according to their own potential, whereas teachers' repetitive workload will be replaced by artificial intelligence systems, and the campus environment will become more intelligent (Fu 2019). The current review study aims to analyze transformation of instructional process with AI in Higher Institutions. This conceptual review paper groups articles according to concepts and themes of integrating AI into education.

### **Development and Application of AI in Higher Institution**

Artificial intelligence (AI) is defined as tools or instruments used extensively in different cities or campuses all over the world. These tools or instruments include some technologies like smart phones, internet, search engines, different apps, and household appliances (Wu Yonghe et al., 2017).

With the development of artificial intelligence technology, modern education are combining more technologies such as intelligent robots, speech semantic recognition, image recognition, Augmented Reality/Virtual Reality, machine learning, adaptive learning algorithms, quantum computing, block chain and so on. These technologies are collectively referred to as intelligent technologies. These technologies have begun and continue to accelerate in association with the higher institution.

Wu, Liu, and Ma, (2017) noted that technologies that relate to artificial intelligence and education include machine learning, deep learning, natural language processing, neural networks, learning computing, image recognition. Mou (2017) asserts that artificial intelligence uses two bottom layers (that is machine learning and deep learning) and three layer services (that is physical service-oriented voice recognition and emotional computing technologies, content-oriented natural language processing technology, and behavioural service-oriented adaptive learning technology) to support personalised learning (Mou, 2017). The introduction of five types of artificial intelligence technologies such as intelligent recognition, natural language understanding, learning analysis, virtual reality, and education robots can help the traditional digital intelligent teaching system achieve functional upgrades

(Chen, He, and Zhong 2018). The continuous introduction of various artificial intelligence teaching products would transform the higher institution ecology.

Education and teaching products that are based on artificial intelligence technology provide artificial intelligence education technology, tools and related services to higher institutions and lecturers.

In higher institution, the goals of education can be better achieved and managed by artificial intelligence (AI). By using AI instructors can analyze students in a class and recognize who is a slow learner to understand the topics (Ma, and Keng, 2018). If student has some weaknesses in some areas or he/she fails to understand few topics consequently AI analysis would showcase this report to lecturer or parents then appropriate action can be taken by lecturer to scaffold learning.

Artificial Intelligence has the potential to draw attention to which topics of courses need to be improved, since lecturers might not always be cognizant of gaps in their educational materials which can lead to students' confusion (Groff, 2013). Classes can be tailored according to students' profile and students' interests can be stimulated by exposing them to various content and courses. Moreover, AI can assist lecturers in terms of homework (McArthur, Lewis and Bishary, 2005).

Lecturers with the ability to employ technology for their teaching strategy can gain the advantages of automatic data created from students' engagement because these digital information systems are prone to store and process huge amounts of information quickly in a short time. Apart from these specialized algorithms, these systems could identify the level of students' engagement and make sense of their behavioral patterns that appear in a teacher's class and could inform these results to the teacher. The application of this technology assist lecturers to manage their classes appropriately and they can spend less time on paperwork and spend more time on obtaining invaluable insights from AI tools to deliver higher quality research-informed instruction.

With AI systems in academic lecture halls, classrooms, laboratories and interactive study places in colleges, institutes or other educational institutions, there will be no

need for the teacher to repeat the explanation of a certain topic or a part of it and spend more time with students to understand that part; the student can now achieve that easily with AI without embarrassment or waste of time. With AI, teachers can quit grading to spend more time with students. Lecturers suffered because of the time wasted in the grading process adopted for a long time in traditional exams, computer tests and others (McArthur, Lewis and Bishary, 2005). AI systems supplied with instant translations and subtitles will empower new generation students to go beyond all the world bounds. AI will eliminate the classrooms' walls to allow students to share knowledge and participate in different learning global environments (Boulay, 2016). It can motivate learners and lecturers to be more engaged in the learning and teaching process.

### **AI and Higher Institution Transformation**

#### **Artificial Intelligence Automate Grading in Higher Institution**

Grading homework and tests usually takes a significant amount of time. This time could be used to work on professional development, interact with students and prepare for class. As AI might not truly replace human grading, it's about to replace human grading. AI automated grading is able to grade nearly fill-in-the-blank and all kinds of multiple choice testing. However, essay-grading software is still in its early stages yet and it will be improved over the coming years.

#### **Students Receive Supplementary Support from AI Tutors**

It is obvious that human tutors can teach some subjects that machines are not able to teach; however, students will be tutored by Artificial intelligence machines. Currently, there are some tutoring programs which are based on artificial intelligence to help students through writing, basic mathematics, and other subjects. These AI programs can instruct students only basics subjects; however, these machines aren't perfect to teach high-order thinking and creativity to students. With the rapid advancement of technology, advanced tutoring systems might not be an unattainable dream.

#### **AI programs Give Students and Lecturers a Constructive Feedback**

AI has the potential to provide feedback to lecturers and students about the success of the course. Some schools employ AI systems to track and monitor students' progress and to notify professors if there is an issue with students' performance. Moreover, these AI systems provide students with the appropriate support and provide professors with feedback to improve the instruction in the related subject matter.

### **AI Change the Role of Teachers**

AI is able to take charge of various tasks such as grading, giving constructive feedback on students' performance. Furthermore, they even might be a substitute for teaching. They could be programmed to provide knowledge, to ask questions and find information for very basic course materials. However, in several cases of application of AI in higher institution, AI has shifted the role of the teacher to a facilitator. Teachers can integrate AI lessons as supplementary materials to assist weak students and provide hands-on experiences in the form of human interaction for students.

### **AI Makes the Process of Trial-and-Error Learning Less Intimidating**

AI systems have been designed to assist students in the process of learning, in this context, trial and error process is much less intimidating to students. Since AI systems provide students with fairly judgment-free environment of learning, moreover, as AI tutors can suggest solutions to students' performance. Indeed, AI is considered as an optimum system for learning, because AI itself frequently learn through a trial-and-error method.

Generally, AI systems may change the way students learn, and assist them to develop basic skills. In fact, recently artificial intelligence is about to change fundamentally the process of learning in higher institution. AI programs are substituting particular types of classroom instruction by providing support for students to learn from anywhere in the world at any time.

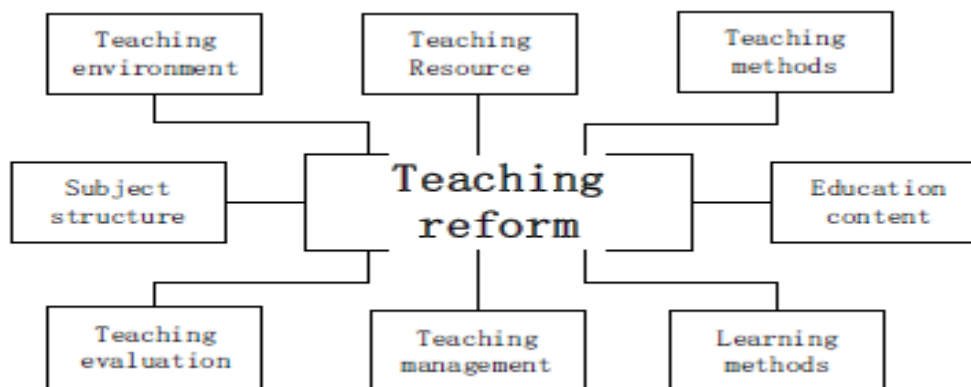
To add to the above, in future, AI system could replace lecturers in some subjects. Currently, some instructional programs are equipped with AI, scaffolding students

to learn basic skills. However, as AI program developers are advancing, AI will more likely provide students with extensive range of services. AI systems provide this level of insight to not only save time, but also can provide teachers with more details which may not be obvious or possible for teachers to identify them.

Lecture room AI systems have a high capability to analyze multiple sources of data and compare those data to known patterns. They can recognize the source for problems and also give guidance to lecturers to achieve more consistent outcomes across various classes.

### **Transformation of Instructional Process**

Transformation of instructional process in higher institutions Artificial intelligence are seen in several areas such as teaching resources and teaching environment, teaching and learning methods, teaching management and teaching evaluation, reformation of subject's structure and system and reformation of educational content, as shown in the figure below



Areas of Instructional process transformation (source: Liua, Saleh and Huang, 2021)

#### **(i) Teaching resources and teaching environment**

The foundation of teaching reformation is the change in the environment. This refers to the various aspects of teaching that are responsible for transforming the way we learn and teaching (Hill and Hannafin 2001). Due to the development of intelligent technology, many companies have developed various kinds of teaching and learning tools, such as intelligent platforms, teaching robots, etc. With the introduction of

intelligent devices, the classrooms have become more intelligent. Teachers and assistants will be integrated into the learning process.

With the development of artificial intelligent technology, learning resources have become more accessible to students and teachers. Through the process of semantic annotation, learning resources can be divided into various forms. When an intelligent learning environment senses the needs of its users, it can automatically push learning resources according to their needs (Zhu and Wang 2019). This method can help minimize the time spent searching for materials and increase the effectiveness of the learning environment.

With the help of artificial intelligence, schools can create learning environments that are conducive for deep learning. Through intelligent perception, AI can provide a better learning environment for students. The use of technology in teaching helps improve the efficiency of teaching activities and enable students to learn effectively.

## **(ii) Teaching and learning methods**

After the introduction of artificial intelligence in education, various changes in teaching have occurred (Yu and Hu 2019). For instance, teachers can use AI to prepare lessons, design learning programs, and improve student learning. Big data and artificial intelligence technology can help teachers improve their teaching methods and achieve more precise and intelligent teaching. It can also help them solve their students' learning problems in real time. It can provide them with more time to communicate with their students and make more effective use of their teaching time.

AI can help teachers transform their roles. They will no longer be bound by the knowledge transfer model and promote the knowledge construction model. In the near future, the work of teachers will no longer focus on teaching. Instead, it will be focused on developing teachers' core literacy and national identity.

The goal of establishing an intelligent environment is to help students improve their learning by creating a supportive learning environment that encourages them to learn

and improve themselves. This paper aims to create learning tasks that help students improve their knowledge and develop intelligent companionship (Li 2019).

### **(iii) Teaching Management and Teaching Evaluation.**

The increasing number of data points that can be collected about the teaching and learning process has made it more accessible. This data should be used to improve the efficiency of the teaching and learning process (Ahmad, Bakar, and Ahmad 2018).

Through the use of artificial intelligence, various tasks related to the management of teaching can be intelligently managed. These task include academic management, student enrollment, course management, teacher training, scientific research management (SRMM), financial management, human resources and energy management, etc (Park et al. 2019). The intelligent platforms will help schools greatly improve their efficiency and reduce manual procedures. They can also monitor and analyze data collected by their users, improve the management of information, and provide better services to their customers. In the era of artificial intelligence, the teaching style of students should be flexible and adjust according to their learning needs. This can be done through the use of technology and various other tools. Schools evaluate students by their mastery level, hours of study, and exam marks. It is up to the student to decide when and how long they should study (Wang and Hu 2019).

Evaluation of teaching is an important aspect of learning. It has been identified as one of the most promising areas of artificial intelligence in the near future (Savin-Baden et al. 2019). At present, artificial intelligence technology has also spawned many intelligent diagnostic industries. Currently, the evaluation of teachers is carried out through the use of artificial intelligence technology. Through deep learning and machine learning, it can analyze and improve the teaching quality. In addition, diversity in evaluation encourages more objective assessments and helps teachers improve. This is also beneficial for students as it helps them improve their learning

(Guerrero and Wiley 2019). The platform quickly and accurately forms a diagnostic report for each student, and it provides personalized learning resources and strategies to help each student reach their potential. It also allows users to customize their learning style and develop their own rulers. This makes the evaluation more scientific, objective and timely.

#### **(iv) Reformation of the Subject System**

AI has the potential to improve the training of talent in schools. The most notable example is the restructuring of higher education. AI will have a significant positive impact on the subjects' professional settings and development. Artificial intelligence can lead the social and industrial revolution. It can also change the subject system of universities. In the US, artificial intelligence is a new branch of science that focuses on developing theories and improving processes related to human intelligence. There are over 300 universities that offer graduate programs in this field (Zhang and Dafoe 2019). Stanford University is known for its computer theory, hardware, software, and databases. Its undergraduate program in artificial intelligence is regarded as one of the most comprehensive in the world. (Yang, Gu, and Qian 2019). In June 2018, TsingHua University established an AI research institution. This achievement is part of the university's continuous process of developing a world-class educational system (Chen 2018). In 2019, a number of universities in China started offering undergraduate programs in engineering robots (Chen 2019). The professional courses aim to develop students' knowledge and skills in the areas of artificial intelligence, robotic systems, and human-computer interaction. There are also various directories of artificial intelligence majors in college. This trend shows that artificial intelligence is starting to make its way into the mainstream. The rise of artificial intelligence has affected some traditional professions and subjects. Further development of artificial intelligence will gradually blur the boundaries between current and future subjects, and the professions of these individuals will be reoriented.

#### **(v) Reformation of Educational Content**

The educational content of a school is the embodiment of its educational objectives. It is inevitable that the artificial intelligence of schools will affect the content of the school (Li and Zheng 2019). As artificial intelligence becomes more prevalent in our daily lives, it is very important that the school's curriculum includes this subject area. This course aims to introduce students to the various facets of artificial intelligence. It also allows them to develop their own artificial intelligence. This discipline requires students to develop comprehensive talents, as the content of their subjects does not align with their comprehensive capabilities.

This process involves breaking down the barriers between various subjects and learning content. It is also beneficial for the students' overall development.

In the intelligent era, education is more about developing individual talents instead of just teaching. In the future, classes will be broken down and customized educational content will be introduced according to the needs of the students.

Through the intelligent machines' ability to store and retrieve knowledge, it is possible to acquire new knowledge easily. This will be the main theme of the education content in schools. Instead of focusing on how to memoriate students, they will now develop students' practical abilities in real life situations.

## **Conclusion**

In this study, the use of AI in teaching and learning environments has been studied. It has been concluded that the process of teaching and learning can be changed through the use of AI. AI-powered systems can help improve the efficiency of education by developing specialized programs designed to meet the needs of individual students. AI is a feature that enables educational establishments to provide additional support to their students. Programs that use AI technology allow people to share their experiences and knowledge with others.

AI systems are becoming more prevalent in our lives. They have changed the way we interact with information. With the increasing number of integrated technology platforms, students may have a wide variety of ways to find information. AI systems help improve the study skills of people by identifying areas that require improvement. They can also help narrow the overall gaps in educational courses.

It helps to ensure that every student builds the same conceptual foundations. Instead of waiting for the teacher to explain the concept, students get instant feedback that will help them understand it in the future. AI systems can help students improve their learning by allowing them to try and learn in a rule-free environment. They can also reduce the fear of learning by helping students overcome their doubts. AI systems are also ideal for supporting learning because they can collect and analyze data through a variety of methods. They can also change the way schools select their students.

### **Recommendations for Academic Institutions in the Era of Artificial Intelligence.**

With the increasing popularity of artificial intelligence, schools will explore the various aspects of education in the new era of intelligence. It is very important that schools have the right team of teachers to prepare for the intelligent era. With the help of artificial intelligence, teachers can improve their teaching and learning abilities. This can be done through a variety of training exercises and programs. Fair education is a top priority for schools. Improvement of standards will help ensure that students are getting the best education possible.

The era of intelligence will make it possible for people with limited means to acquire knowledge. This will allow them to become more effective and secure in their lives. At the same time, schools should promote the inclusive use of intelligent technology in order to improve the education system.

The evolution of schools will involve new requirements for governance systems, academic standards, and data security, as well as the need for new technological innovations. The rise of the intelligent era will bring new challenges and requirements for schools. The creation of AI and the increasing amount of data will blur the boundaries between space and humans. Schools should be aware of the various security risks that artificial intelligence technology can bring. These issues should be addressed by implementing a set of security measures that are designed to minimize risks and ensure the proper development and operation of AI.

Schools should promote the mutual development of artificial intelligence and school education. They should also support educational institutions and AI industry leading enterprises. Schools should also establish long-term investment strategies to support the development of artificial intelligence. It is also necessary to establish the proper framework and standards for the development of intelligent education and artificial intelligence.

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