

# Activating the Use of Artificial Intelligence Techniques in Higher Education

By

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## Abstract

The use of artificial intelligence techniques in higher education is one of the things that may lead to excellence in education.

Many educational activities could be automated to help students forming discussion groups to discuss educational topics as well as obtaining additional support through these techniques. .

In this study, the application of artificial intelligence techniques and their impact on the performance of educational institutions is tested. Accordingly, a questionnaire was distributed to two groups of private institutes accredited by the Ministry of Higher Education. Experimental group applying these technologies in education and a governing group that does not apply these technologies in education.

The study examined the extent to which students receive the additional support necessary to complete the educational process by the use of or without using artificial intelligence techniques, as well as their impact on the performance levels of students, and the suitability of those applications with educational needs by using or without using artificial intelligence techniques.

In the end, it was found that the use of these techniques was accompanied by support for effective learning processes, as well as the results of their use enhanced the educational experiences of students.

**Keywords:** Artificial Intelligence, Higher Education Institutions, Excellence in Education.

## 1. Introduction:

The artificial intelligence applications topic in higher education has become an exciting topic these days, which calls us to increase interest in learning about the methods necessary to deal with this technology

and benefit from it in a faster and cheaper way and at the same time avoiding exposure to many potential risks. These applications play an important role in the following:

- 1- Following the educational process by reviewing the attendance and absence of students with smart student monitoring and control systems
- 2- Good use of available resources to support the educational process.
- 3- Follow up the risks that can occur when using the applications of artificial intelligence in education in the cloud computing environment.
- 4- Study the environmental factors that can affect the use of artificial intelligence applications in education. Accordingly, the contents of the research will include the following main dimensions as related to:

1. Applications of Artificial Intelligence in Higher Education,
2. The use of Artificial Intelligence applications and tools in higher education
3. The role of Artificial Intelligence applications in developing education

Thereafter, this work is followed by the research methodology, as related to problem, objectives, importance, research method and design, as well as the research Hypotheses and their testing. It concludes with the main results and recommendations deduced from analysis.

## 2. Artificial Intelligence's Main Dimensions in Higher Education:

### 2.1 The First Dimension: The Applications of Artificial Intelligence in Higher Education

Intelligent education in its general concept, which is constantly being developed by providing education

that leads to access to personal learning, through which many benefits can be provided to students, including that an educational service is provided in a different person according to different forms of learning like human teachers, so smart learning systems are able to understand The type of learning offered to students, as well as machine learning and the search for learning resources found on networks, as well as enabling teachers in higher education institutions to increase the size of their classrooms and allow access to a minimum of educational needs according to the individual patterns of each student.

The creation of smart content from digital directives to various learning sources in light of specific educational interfaces that can be integrated at all levels, which leads to cooperation in the light of the surrounding environment and benefit from learning in the labor market.

Companies are creating platforms for smart digital content supported with the delivery of this content and practice exercises and feedback to evaluate educational content.

- **The basic concepts of applications of artificial intelligence in higher education:**

facing many developments in educational technology, the applications of artificial intelligence are among the means that can achieve high competition between educational institutions, which makes them an important option for achieving interaction between students and teachers, which leads to support their cognitive skills, and these applications also play an important role in Achieving excellence in education.

But these applications face many obstacles, including:

- 1- There are many legislations that hinder the generalization of the use of these applications
- 2- The absence of real competition between educational institutions.
- 3- The weak administrative structure in educational institutions.
- 4- Not absorbing the basic infrastructure of this technology.
- 5- Its limited role of leadership in educational institutions.

- **General concepts of Smart content:**

Smart or Intelligent content provides many advantages for those who prepare educational content, and it plays an essential role in the classroom.

The course is well organized by using smart content (Vytautas Štuikys, Jun 28, 2018), and there are many skills that can be provided to students using smart content.

Intelligent content provides more opportunity for peer-to-peer cooperation, and it was also easier for students to absorb the lesson in an intelligent content environment.

The role of the teacher is not unlike the traditional methods, as it provides smart educational content for students and helps students take advantage of all the possibilities available in it.

Smart content also provides capabilities to encourage effective learning. And activating participatory thinking among students, and it can also provide realistic examples and effective learning with a better view.

It is necessary to study how smart content can be designed and redesigned and how it can be used in institutions of higher education. Smart educational content can provide general and comprehensive educational content and achieve functional requirements and provide the necessary mechanism through the re-use of smart educational content. Also, students can interact with smart content through several destinations A look which includes the vision from the teacher to the student and from the teacher to the designer and systems developer, as well as from the teacher to the researcher and developer of these systems.

- **Intelligent Tutoring Systems:**

Intelligent Tutoring systems are computer-based applications using artificial intelligence applications to help students (Roger Nkambou, Aug 27, 2010) learn in an interactive way as well as they are smart in which knowledge is processed and the educational capabilities and needs of each student are identified and following-up students in order to work in a more effective way.

- **Virtual Facilitators and Learning Environments:**

It means common tools in building, supporting and maintaining guidance based on human experiences and facilities for use in many educational settings

It has become among the essentials necessary to continue support for the educational process and provide many of the advantages found in modern learning systems and based on applications of artificial intelligence in order to ensure the provision of more interaction and a comparative learning environment.

There are several types of educational environments that can be used, including:

There are several types of educational environments that can be used, including:

- 1- Collaborative projects between students and under the supervision of teachers.
- 2- Learning societies
- 3- Virtual games and mobile applications

#### 4- News platforms.

In order to support the educational environment, (Wright, Sep 30, 2014) all previous educational environments can be used and take advantage of these tools to support the educational process. There are many circumstances accompanying the continuation of support for educational materials through e-learning, including what is related to students' learning environments or their willingness to accept technologies based on artificial intelligence or even the developers of Artificial intelligence tools in the educational process, where adequate support for the educational environment can be guaranteed by meeting the needs of users of the system

When assessing learning environments and virtual facilities, social norms and the extent of interaction with students must be taken into account. There are many things that must be taken into account when building learning societies, whether by facilitators or teachers, and that play an important role in the educational environment, such as:

1. learning without natural classrooms
2. Relying on classroom imaginative study that can be a difficult task and most students fear it. They do not think that they can learn without a mentor
3. the need for flexibility in the educational environment to provide a wide range of educational materials for students
4. the flexibility of entry and experiences Benefit from all educational courses.

but it is difficult for students to interact with them or expose their educational capabilities to teachers who evaluate them at the end of each semester

#### 2.2 The Second Dimension: The Use of Artificial Intelligence Applications and Tools in Higher Education:

Innovative tools and mechanisms can be used to activate the applications of artificial intelligence in educational development, enabling the following:

- **Help systems:**

Helping the student to study (Sucar, Oct 31, 2011) by the use of Help systems that answer questions the students ask and are not subject to a specific curriculum or model of what a student needs to learn and can deal with the student when he asks questions. These systems depend on the specifications of teachers, the student community, and the work environment in which they work, by studying matters related to the work environment that lead to assistance Students on study that can develop different skills for teachers and teaching training, as well as provide permanent

teacher education and feedback through leaders.

These systems depend (Press, 1998) on the characteristics of teachers and include the following:

1. Demographic characteristics, including age, gender, and years of experience
2. Education obtained by the teacher
3. Job experiences
4. The educative level of the teacher includes self-learning of the topics in which students need help

- **Book Tag exchange and loaning to students:**

It means the systems (Shane, 2019) for providing educational resources to students in its various forms. These systems depend on the following:

1. Management policies
  2. Autonomy
  3. Private sources of books and educational resources
- These factors can affect student further learning

- **Add courses, declarations, and assignments (Courses)**

These systems include systems (George Rzevski, Dec 6, 2012) for providing educational curricula with all their contents and following up students' access to them, and the following are done:

- 1- Divide the programs into educational curricula pertaining to each course.
- 2- Providing clarity and speed in reaching educational curricula and their contents.
- 3- Providing the ability to choose different subjects for the same educational requirements.

- **The formation of panel discussions and groups to study around the clock (Groups)**

Through the discussion sessions (Organization, Jan 21, 2019), it is possible to help students interact together during these seminars that revolve around academic topics, and the following must be taken into consideration:

- 1- Building public and private partnerships between students and each other and encouraging them to work together so that they can benefit from all aspects.
- 2- Providing access to more data and understanding the problems related to the subjects of the study.
- 3- Continue to encourage students and teachers to share knowledge and educational resources in a more free way.
- 4- Encouraging better learning of educational information by discussing it together through various discussion groups.

- **Live broadcast of lectures and seminars:**

Each student can create his own groups (Spierling, Nov 13, 2008) that he wishes to access from lectures and seminars, and in the case of study, which means

the applications of artificial intelligence in teaching computer science, these lectures include the following:

- 1- General skills on IT topics
- 2- Special topics in programming and mathematics, and each of them has sufficient knowledge required for each educational program, and many of them are required from the employers that request graduates every year, and this includes providing the field in which applications for interaction with students are made.
- 3- Helping students to develop their behavior as well as directing their interests in various fields.
- 4- Students' evaluation based on the lectures and seminars they obtained.

- **Office hours:**

Office hours' service (Akerkar, Aug 11, 2018) is provided to students with teachers through the development of artificial intelligence technologies. There is a demand for regular learning and students' learning of educational topics. This system is characterized by the ability to change the information available according to behavioral determinants through the ability to report, learn and self-participate based on previous events and work according to on her.

### 2.3 The Third Dimension: The Role of Artificial Intelligence Applications in Developing Education:

Business climate in light of the applications of artificial intelligence in higher education

Through the working climate, in light of the applications of artificial intelligence in higher education, it is possible to provide a wide range of:

- Flexibility in the choices between educational materials.
- Wide range of educational content.
- Ease of choosing between educational materials.
- Follow-up to the amendment in educational curricula

Meeting the needs of the labor market for educational skills by providing the various specializations required by it.

Providing a wide range of interactive learning systems that enable them to develop students' skills at work.

- **Evaluating the reality and results of using AI applications tools in higher education**

There are many challenges imposed by the environment in which higher education institutions have imposed on it the search for foundations and ways through which the available capabilities can be invested in order to keep pace with successive tech-

nological changes, including the Fourth Industrial Revolution, as well as applications of artificial intelligence in education, which provided many smart and necessary solutions to the crisis To keep pace with technological development.

- **How to achieve success in higher education through the applications of artificial intelligence?**

The artificial intelligence system used in education (Charles Wankel, 2015) is a system that analyzes the surrounding environment of the educational institution and responds to changes in that environment to improve the chances of success, and this element is considered vital in understanding the opportunities available from the use of artificial intelligence applications at the academic level, not only in providing educational materials for courses but also to improve experiences of Students, facilitating the administrative tasks of administrators, and supporting the use of teaching tools for teachers.

- **The need for excellence in education through the use of artificial intelligence applications**

The educational policies must be developed to reach a state of excellence in education (Skelton, 2013) for the following:

- 1- There are many challenges facing graduates when they enter the job market and compete by private and foreign universities.
- 2- The need to provide several visions of the same educational material, which leads to further learning on the part of students when they are integrated with the educational materials currently available.
- 3- The need to provide many sources of education through cloud computing technology, which can be accessed through the access to excellence.
- 4- Finding the wide range of professional and future views of the same scientific facts
- 5- The need to access many educational materials that have the same or similar content available for students and adapt them to suit the local work environment and conditions.

Applications of the current movement of artificial intelligence and the fourth industrial revolution led to excellence in education not only in Egypt but in various governments and this movement coincided with the structural reform of the educational process, which shows its impact at the global level when students are able to work in all countries in the outside world that require of which:

- 1- Conscious management of the educational structural reform process.
- 2- Tracking market needs for potential jobs.

3- Preparing and qualifying the student with the necessary skills to measure him with good performance.

- **The use of Artificial Intelligence in Mental Workload modelling**

Mental Workload modelling using deductive inference techniques (Defeasible Reasoning) and inductive modelling approaches (Machine Learning).

The role of Etherealization in education

the implications of etherealization - is a term coined by R. Buckminster Fuller is the ability of technological advancement to do "more and more with less and less until eventually you can do everything with nothing" - through artificial intelligence and machine learning.

- **The reality and prospects of using Artificial Intelligence applications in higher education**

The current movement in education that emerged after the fourth industrial revolution and based on the use of artificial intelligence applications in higher education can lead to excellence in education. Not only in developing countries but in various governments and this movement coincided with the structural reform of the educational process, whose impact appears at the global level when Graduates who are able to work in all organizations locally or at other countries in the outside world with which it requires:

- **The working environment in light of the applications of artificial intelligence in higher education**

Higher education institutions need to continue developing their systems (Dr. Harikrishnan M, 2021) in line with recent technological developments, innovating new ways of teaching, and restructuring education systems based on the available requirements through artificial intelligence.

The applications of artificial intelligence enabled (Verma, 2020) the training of students on skills that were not possible to train them before the emergence of these new technologies.

Its impact on students' success and providing rich educational materials environments and enabled the possibilities of solving traditional problems for education by the use of artificial intelligence applications which provide speed and accuracy and train students to solve problems.

Intelligent systems used in education plays an important role in improving educational standards and providing solutions to learning problems, also intelligent education systems Provides an effective control environment and accurate results.

### **3. Research methodologies:**

#### **3.1 Research problem**

The need to provide an educational system based on applications of artificial intelligence that can provide an opportunity to dissect graduates who are able to work under different circumstances and to improve the educational systems currently used by educational services that can be accepted by leaders in educational institutions that educational institutions can absorb and provide the necessary performance content for these graduates.

#### **3.2 Research objectives:**

Accordingly, the research objectives were as follows:

- 1-Discussion on the modern tools available through artificial intelligence applications in higher education.
- 2- A review of services and processes that can be provided or completed through applications of artificial intelligence in higher education.
- 3- Evaluating the use of artificial intelligence applications in higher education.
- 4- Reviewing the scientific content of the available courses through the applications of artificial intelligence in higher education
- 5-General concepts and examples of applications of artificial intelligence in higher education.
- 6- Tools used in higher education and applications of artificial intelligence in higher education

#### **3.3 Research importance**

- 1- There is a need to develop and develop work tools in higher education institutions in a way that ensures benefit from the applications of artificial intelligence
- 2- The rapid development of educational technology based on the applications of artificial intelligence needs to be updated to face these rapid and successive changes.

#### **3.4 Research society**

The research society consists of a group of private higher institutes that are accredited by the Ministry of Higher Education and that teaches computer science

#### **3.5 The research sample**

The research sample consists of two groups an experimental group and a governmental group

The experimental group that uses artificial intelligence technology in teaching computer science

The governmental group that does not use artificial intelligence technology in computer science education

The following was taken into consideration:

- 1- Those students in both groups are equal in academic achievement and their grades in computer science subjects are close in the academic year 2018/2019
- 2- Age convergence between students.
- 3- Similar environmental conditions and learning environment in the two groups.

### 3.6 Research Methodology

The research includes conducting a study to use three techniques of artificial intelligence in education

**Smart Content** - Technology that attempts to condense text books into useful tool for exam preparation such as true or false questions

**Intelligent Tutoring Systems** - Personalized electronic tutoring customized to the learning styles and preferences of the pupil

**Virtual Facilitators and Learning Environments** - Virtual human guides and facilitators for use in a variety of educational and therapeutic environments

### 3.7 Research Design

The experimental method is used and accordingly the research sample is divided into two groups, the first is the ruling sample and the second is the experimental sample. Computer science has been taught using artificial intelligence technology while the ruling group has been teaching computer science without the use of artificial intelligence techniques

- **Experimental group that uses artificial intelligence technology in computer science education**

A number of 80 questionnaire were distributed to the learners, in which 71 were approved, and 9 were excluded in the following institutes:

1. Modern Academy for Computer Science and Management Technology in Maadi
2. Cairo Higher Institute for Engineering, Computer Science and Management in the land of the violet 2
3. Thebes Higher Institute for Computer and Administrative Sciences - Maadi
4. Higher Institute of Technology - Tenth of Ramadan
5. The Higher Institute for Computers and Information Technology in El-Shorouk City
6. Higher Institute for Computer Science and Information Systems - Fifth Settlement
7. New Cairo Higher Institute for Administrative Sciences and Computer in the first Settlement - New Cairo City

- **The governmental group that does not use AI technology in computer science education**

A number of 70 questionnaire were distributed to the learners, in which 61 were approved, and 9 were excluded in the following institutes

1. Abbasia Institute for Computers and Commercial Sciences
2. Higher Institute of Marketing, Commerce and Information Systems First Assembly Center
3. The Higher Institute of Computers and Management Information Systems in the first Settlement - New Cairo
4. Al Jazeera Higher Institute for Computer and Man-

agement Information Systems - Mokattam

5. Pharaohs Higher Institute for Computer, Information Systems and Management - El Haram

6. Higher Future Institute for Specialized Technological Studies

### 3.7 Research Tool:

The research tool was built and developed through a review of the literature, previous studies on which the study was based, where a survey questionnaire was distributed that included five study parts which are demographic analysis, questions about research variables in the first and second hypothesis, open questions about the obstacles to applying the applications of artificial intelligence in education and questions specific to proposals Overcoming obstacles to applying artificial intelligence applications in education to the experimental group that uses artificial intelligence technology in teaching computer science as well as the governmental group that not using artificial intelligence technology to teach computer science

The validity of the study tool was verified before its distribution after the presentation of the study tool to a number of arbitrators with specialists, and the model was modified according to the observations and recommendations of the arbitrators

the experimental group: Experimental group that uses artificial intelligence technology in computer science education

the governmental group: The ruling group that does not use AI technology in computer science education.

## 4. Hypotheses Testing

### 4.1 The first hypothesis

There are no (statistically) significant differences between the average score of the experimental group and the control group with respect to Compatibility of teaching tools components of traditional teaching methods and the Compatibility of teaching tools components based on the applications of artificial intelligence technology.

**H0:** There are no (statistically) significant differences between the average score of the experimental group and the governmental group with respect to Compatibility of teaching tools components of traditional teaching methods and the Compatibility of teaching tools components based on the applications of artificial intelligence technology.

**H1:** There is a (statistically) significant differences between the average score of the experimental group and the governmental group with respect to Compatibility of teaching tools components of traditional

teaching methods and the Compatibility of teaching tools components based on the applications of artificial intelligence technology.

### Group Statistics

	N	Mean	Std. Deviation	Std. Error Mean
The experimental group	71	37.37	5.509	.654
The governmental group	61	16.18	2.559	.328

### Independent Samples Test

	Levene's Test for Equality of Variances		t	df	Sig. (2-tailed)	t-test for Equality of Means		95% Confidence Interval of the Difference	
	F	Sig.				Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	81.490	.000	25.082	130	.000	26.632	1.062	24.532	28.733
Equal variances not assumed			26.689	86.385	.000	26.632	.998	24.649	28.616

p-value less than 0.05 (typically  $\alpha$  0.05) is statistically significant. It indicates strong evidence against the null hypothesis, as there is less than a 5% probability the null is correct (and the results are random). Therefore, we reject the null hypothesis, and accept the alternative hypothesis.

## 5. Research Main Results and Recommendations:

### 5.1 Main Results:

1- Through the study, it is enabled to determine the practical ways of using the applications of artificial intelligence technology in education.

2- It is enabled by the study, developing a vision for the development of educational institutions, supported by the applications of artificial intelligence technology, which leads to the development of educational institutions.

### 5.2 Recommendations:

Based on the results of the study, the following can be recommended:

- 1- Make an attempt to benefit from the applications of artificial intelligence technology in education
- 2- trying to find different ways to support educational

institutions by the use of artificial intelligence technology applications in education.

3- Working on automating many educational activities such as correction of answer sheets.

4- Helping students to form groups to discuss the topics of the educational lessons.

5- It is possible to identify the elements that need to be improved in the educational process.

6- Students can get additional support through ITS

7- A general idea of the subject of the study can be provided through the smart contents' programs

8- Various experiences can be obtained by supporting students and encouraging them to research and elicit facts about the topics they wish to research.

### Research Appendix: Research Instrument

Note: The data of this form is confidential and used only for the purposes of scientific research

gender: Male  Female

Age: 20 -30  30-40  40-50  50  20-30  30-40  40-50  50 or more

Employment: A technical  Administrative  Other   
A Study of AI applications and Infrastructure and Its Relationship with education

Please answer the following questions by circling the appropriate number selection from (1) "strongly disagree" to (5) "strongly agree." This questionnaire is targeted toward senior information technology (IT) executives in educational institutes.

Your responses will be held in the strictest confidence as only the researchers will see the individual data forms.

These Questions Relate to Compatibility of AI applications	Strongly Disagree					Strongly Agree				
	1	2	3	4	5	1	2	3	4	5
1- Our institute provides multiple interfaces or entry points (e.g., web access, smart content, ITS) for students to share all kinds of educational resources.										
2- Our educational AI capabilities provide access to a large variety of educational material types.										
3- Our institute offers a wide variety of types of educational resources to students (e.g., ITS, smart content).										
4- Flexible electronic links exist between our institute and students.										
5- Our institute has very high flexibility in its AI links and connections.										
6- AI facilities can easily be added to, modified, or removed from the existing IT infrastructure with very few problems.										
7- Our institute has extensive electronic links and connections throughout the entire AI system.										
8- students in our institute are electronically linked with most AI applications.										
9- Reusable AI applications are widely utilized in new systems development in our institute										
10- IT personnel utilize AI applications and tools to create smart education system based on AI applications										

These Questions Relate to the use of AI applications in education	Strongly Disagree			Strongly Agree	
	1	2	3	4	5
1- Our institute AI system works well addressing most educational problems	1	2	3	4	5
2- Our institute AI system is encouraged to apply each new educational technologies	1	2	3	4	5
3- Our institute AI system is able to interpret educational problems and develop appropriate technical solutions	1	2	3	4	5
4- Our institute AI system have the ability to work cooperatively in a flexible educational environment	1	2	3	4	5
5- Our institute AI system is applied in multiple AI technologies and tools	1	2	3	4	5
6- Our institute AI system is self-directed and proactive	1	2	3	4	5
7- Our institute AI system can quickly respond to students' requests for peter educational service.	1	2	3	4	5
8- Our institute AI system have an agile, flexible organizational structure that enables us to produce customized educational services very rapidly	1	2	3	4	5
9- Our institute AI system is able to deliver a wide variety of educational services	1	2	3	4	5
10 - Our institute AI system has a very dynamic and entrepreneurial place for students to work	1	2	3	4	5

What are the opportunities provided by the use of Artificial intelligence applications in education?

What are the disadvantages associated with the mismanagement of the use of Artificial intelligence applications in education?

What are the solutions proposed to overcome the disadvantages associated with the use of Artificial intelligence applications in education?

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