

# Analysis of Artificial Intelligence Applied in Virtual Learning Environments in Higher Education for Ecuador

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**Abstract.** Artificial intelligence in virtual learning environments in higher education for Ecuador continues to be a problem because there is no adequate analysis. The objective of this research is to carry out the analysis of artificial intelligence applied in virtual learning environments for higher education. The deductive method and exploratory research were used to analyze the problems that arise from properly applying artificial intelligence in virtual environments. Turned out a Prototype of Virtual Environments based on AI, considering all the necessary processes for an adequate virtual environment. It was concluded that for an adequate solution of virtual environments based on artificial intelligence, the characteristics, capabilities, virtual community and IT infrastructure must be defined, where it will be applied, knowledge and digital material information, AI components, among others.

**Keywords.** Artificial intelligence, virtual environments, higher education, learning

## 1. Introduction

Artificial intelligence in education; today we find ourselves living in a new era which is based on the digital, this is how we are facing great scientific advances in the entire world. The great evolution, technological acceleration and the intensification of skills has forced us to evolve and the educational field has not been the exception, which is why the need has arisen to implement new policies in the educational area where the pedagogical aspect strongly prevails. and that it is framed more in this time than in previous times[1]. The use of digital technology is permeating and transforming all social systems, and education is no exception. In the last decade, the development of Artificial Intelligence has given new impetus to the hope of providing educational systems with "effective" and more personalized solutions for teaching and learning. Educators and researchers in the field of education and policy makers, in general[2]. In the nineties

when the first intelligent agents began to be built, such as supercomputers capable of performing extremely complex tasks such as heuristic algorithms, which even paved the way for artificial intelligence; scientific advances in AI have made a change in all paradigms and have been generated rapidly from 2000 to today, which has caused it to be included in the daily life of human beings. Given the challenge presented by the use

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of AI tools and their relationship with education, it is important for the pedagogical leader teacher to know their impact on the pedagogical processes and the support they provide in the classroom for the development of their classes[3]. The Approach to Artificial Intelligence in distance education; it is born from different thoughts of various philosophers, such as Aristotle, who founded Syllogistic logic, which is based on a form of deductive reasoning; Leonardo Da Vinci, in 1495, built a robot capable of standing, sitting, walking, opening his mouth, moving his head and raising his arms, for this he used his studies in anatomy and kinesthetics; René Descartes proposes that the body of animals can be described as complex machines; Blaise Pascal, creates the first mechanical digital calculating machine, designed for addition and subtraction and many other Philosophers, mathematicians and scientists who stood out for their work and research carried out for several years and are still bases for Artificial Intelligence[4]. It is logical, in any case, that research on Information and Communication Technologies (ICT) takes into account, first of all, the multiplicity of interconnections and implications that are noted around the growing use of AI[5]. AI has strong potential to accelerate the process of achieving global education goals by reducing the difficulties of access to learning, automating management processes and optimizing methods that improve learning outcomes. This is why it is important to learn from these new innovations in teaching in order to improve and innovate classes[6]. The importance and challenges of the process in which knowledge and technology transfer are radically restructuring an environment in which knowledge, being increasingly accessible in a massive, open and low-cost manner, can be a solution. Information and communication technologies (ICT) give rise to a transfer of technology that easily permeates any geophysical point in a very accessible way, without major obstacles, such as the known barriers to the centralization of knowledge. The new paradigm of the decentralization of knowledge is the support of the new industrial revolution, no less important than the one that occurred after the invention of the Internet[7]. The impact of artificial intelligence (AI) in education. Based on the AI narratives and assessment frameworks identified from the preliminary analysis, the scope of the research is limited to the application and effectiveness of AI in management, teaching, and learning[8].

Why are the necessary artificial intelligence tools important in the teaching and learning process, does it enhance the opportunities it offers in the educational field?

For the strategies that teachers can implement in the teaching and learning process, relevant and that should be considered in the classroom. Various studies have managed to show that professionals in the area refuse to modify their practices and pedagogical strategies that have an impact on the immediate educational population, others because they find the training process difficult in new practices and others simply, they prefer to follow the same line.

The objective is to carry out the analysis of artificial intelligence applied in virtual learning environments in higher education for Ecuador, to define an adequate prototype.

Related references: Creation and Evaluation of a Pretertiary Artificial Intelligence (AI) Curriculum[9], Development of an AR-Based AI Education App for Non-Majors[10], Modern Artificial Intelligence Model Development for Undergraduate Student Performance Prediction: An Investigation on Engineering Mathematics Courses[11], Teaching machine learning in K-12 Classroom: Pedagogical and technological trajectories for artificial intelligence education[12], "Zhores" - Petaflops supercomputer for data-driven modeling, machine learning and artificial intelligence installed in Skolkovo Institute of Science and Technology[13], StEduCov: An Explored and Benchmarked Dataset on Stance Detection in Tweets towards Online Education

during COVID-19 Pandemic[14], Challenges and Opportunities in Game Artificial Intelligence Education Using Angry Birds[15], Cognition-Based Context-Aware Cloud Computing for Intelligent Robotic Systems in Mobile Education[16], Tooe: A Novel Scratch Extension for K-12 Big Data and Artificial Intelligence Education Using Text-Based Visual Blocks[17], Prediction of Physical and Mechanical Properties for Metallic Materials Selection Using Big Data and Artificial Neural Networks[18]. Application and theory gaps during the rise of Artificial Intelligence in Education[19].

The deductive method and exploratory research are used to analyze the problems that arise from properly applying artificial intelligence in virtual environments.

A Prototype of virtual environments based on IA is obtained, considering all the necessary processes for an adequate virtual environment.

It is concluded that for an adequate solution of virtual environments based on artificial intelligence, the characteristics, capacities, virtual community and IT infrastructure must be defined, where it will be applied, knowledge and digital material information, AI components.

## **2. Materials and Methods**

In the first instance, in Materials, a search for information was carried out from different sources that allowed defining the situation of virtual environments based on artificial intelligence. Second, in the methods, the steps to achieve the results were defined.

### *2.1 Materials*

The authors analyzed the implementation of a new assessment model based on an AI curriculum for the lower secondary school level using the co-creation process. This study presented two empirical findings and discussed its two main practical contributions to pre-tertiary AI education[9]. They present limitations of this study and considerations for future work. In the first place, the study is designed in a single group, it is necessary to carry out further studies with a complete experimental design. Second, to obtain generalized results, students who participated in the study must be taken into account. Finally, it is necessary to analyze education and its effect by designing a more sophisticated AR-based AI educational model[10]. They propose a modern educational decision support system adopted for prediction of student performance and academic program and implementation of quality assurance through practical, responsive course management, easy to use and learn. Platforms can promote a successful student learning journey, including student retention and progress, by adopting evidence-based models[11]. They describe some of the pedagogical elements computing educators need when considering machine learning in the K-12 classroom. This is a critical area for future citizens to be able to use the systems around them and put more emphasis on computer education research[12]. They are based on the properties of the group and we analyze the measured performance and modes of use of this new scientific instrument and is intended for cutting-edge multidisciplinary research in data-driven modeling and simulations, machine learning, Big Data and artificial intelligence (AI)[13]. They created and compared a new data set to analyze attitudes towards online education in the COVID-19 era. Data exploration was performed to provide summaries and insights about the dataset, such as topic modeling, tweet classification, and sentiment analysis[14]. They propose to experiment using the Angry Birds AI competition in a project-based

course as student groups explore computer vision, strategic decision making, resource management, and error-free coding of results[15]. The authors propose a system based on a context-aware cloud computing cognitive system for intelligent robotic systems in mobile education constant monitoring and present an adaptive context system, that is, a bridge connecting mobile recognition and AI services. Second, emotion recognition based on multimodal fusion is proposed to fuse multimodal emotional information[16]. They present a limitation in this study and that is that different types of instructional materials, such as teacher guides, lesson plans and rubrics, were not provided. So, in addition to eight sample apps and a ten-minute video tutorial, they planned to create and distribute more diverse resources that teachers can use in their classrooms. Since a new Scratch extension called Tooe was proposed allowing Scratch to communicate with text-based programming languages. Based on four design principles, the extension is made up of a minimum number of conversational blocks[17]. They performed predictive analysis, the predictive ability of a neural network improves as the data set grows, as it has more samples to learn from, and as a result, the network can learn more precise features (features that are closer to the reality of the problem)[18]. Growing importance of artificial intelligence (AIED) in education and lack of comprehensive evaluation of it [19].

## 2.2 Methods

To carry out this research, the deductive method was used with the exploratory investigation and the review of official websites regarding AI.

In the first instance, the information related to the research topic is analyzed in order to support the results based on the trends of AI and virtual environments.

In the second phase, possible problems in the application of AI and virtual environments in higher education institutions are identified.

Table 1: Problems in the application of AI in virtual environments

Ord.	Issues	Ref.
001	The fundamental pillars of the education system must be expanded with non-cognitive skills.	[1]
002	Educators lack the necessary experiences to understand new technological systems.	[2]
003	Accelerating the development of digital technologies and their presence in everyday life.	[3]
004	Countries with limitations to be at the forefront of new technologies.	[4]
005	The need for innovation and the application of AI.	[5]
006	Ability to understand and solve everyday problems with AI within the area of education	[6]
007	Techniques and methods of AI and the challenges that can be caused for problem solving.	[7]
008	Impact of AI in different industries.	[8]

In table 1. It can be seen the frequent problems with the application of artificial intelligence in virtual environments, being one of the causes inappropriate selections.

3. Results

3.1 Proper prototype of virtual environments based on AI

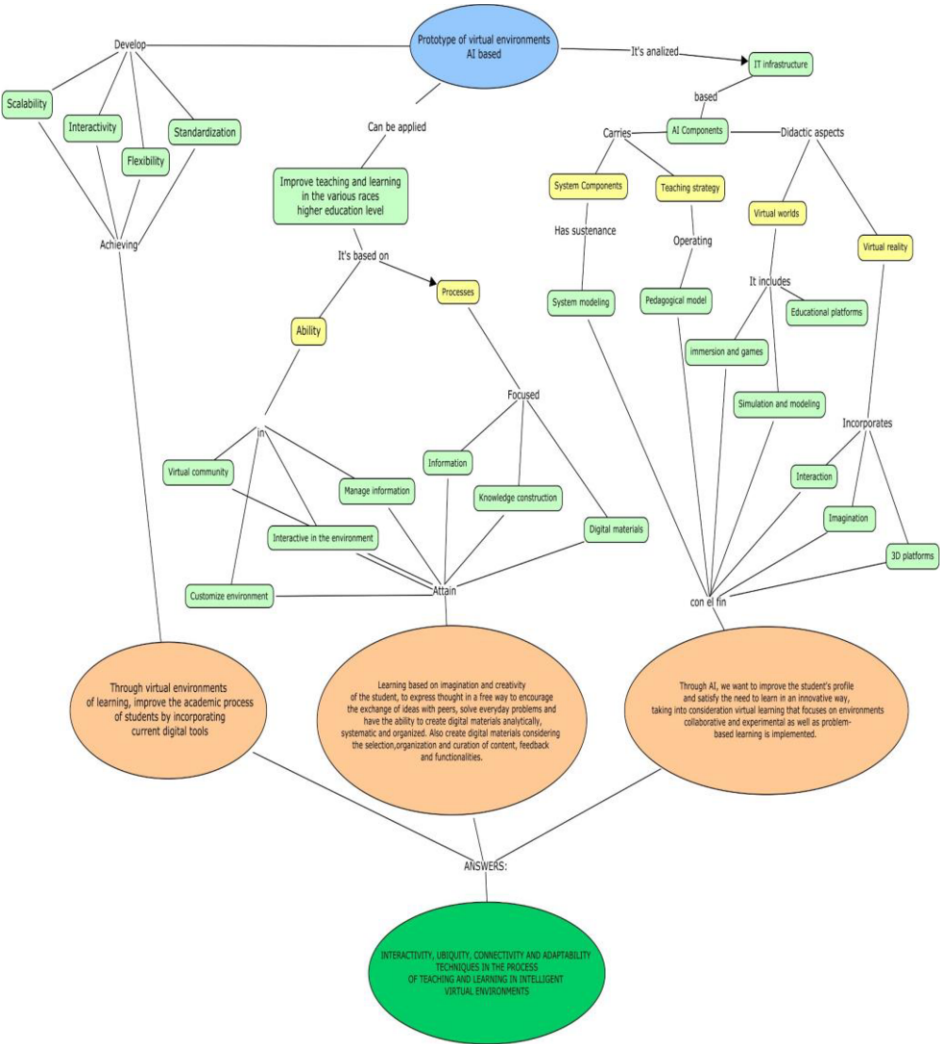


Figure 1. Proper prototype of virtual environments based on AI

Figure 1. In the Prototype for virtual environments based on AI, all the necessary processes that intervene to obtain as a result the techniques of interactivity, ubiquity, connectivity and adaptability in the teaching and learning process in intelligent virtual environments are visualized, that is a suitable prototype to improve virtual environments in higher education institutions.

### 3.2 A table of relevant indicators that will be used to carry out the different analyzes.

Table 2. Indicators and solutions defined by other authors.

ORD.	Indicator	Solution to the contribution	Ref.
001	Evaluation model.	New AI Curriculum.	[9]
002	Limitations of this study.	Design of an educational AI model based on AR.	[10]
003	Student performance.	Adopt evidence-based models.	[11]
004	Machine learning.	Computer education research.	[12]
005	Data-driven models.	Scientific instrument with AI and Big data.	[13]
006	Online education in the COVID-19 era.	Provide summaries and information on datasets.	[14]
007	High-level programming skills.	Software to help create user-created levels	[15]
008	Computational Cognitive System.	AI Mobile Recognition Services	[16]
009	Teacher Resource Distribution.	Scratch extension.	[17]
010	Artificial neural networks supported by big data.	computer aided tool.	[18]
011	Impact of AIED research.	Extensive review of AI-based material.	[19]

Table 2. Describes the indicators that other authors define for virtual environments that have allowed us to visualize in a better way to define the prototype of virtual environments based on AI.

## 4. Discussion

The solutions imposed by the authors of the references [9-19] are valid in virtual environments with their contribution to the investigation; the "Proper prototype of virtual environments based on AI" that is presented consists of defining the characteristics, capabilities, virtual community, IT infrastructure; where knowledge and information and digital material based on the reality of a higher education institution are applied.

The "Adequate prototype of virtual environments based on AI" can be applied in any higher education institution in Ecuador or countries with similar cultures and technological infrastructures similar to a developing country.

In this investigation, the implementation has not yet been carried out, an adequate prototype is presented so that it can be implemented in the future, considering the availability of the technological infrastructure.

## 5. Future Word and Conclusion

Carry out the implementation of this prototype in order to validate the applicability in a higher education institution.

It was concluded that for an adequate solution of virtual environments based on artificial intelligence, the characteristics, capabilities, virtual community and IT

infrastructure must be defined, where it will be applied, knowledge and digital material information, AI components, among others.

Artificial intelligence applied in virtual learning environments in higher education for Ecuador continues to be a problem because it has not been possible to standardize an adequate prototype based on the reality of the country.

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