



Incidence of virtual learning environments in the development of mathematical logical thinking

Incidencia de los entornos virtuales de aprendizaje en el desarrollo del pensamiento lógico matemático

MGs. Ángel Cesar Mendoza Hidalgo

Teacher at the Vicente Anda Aguirre Educational Unit, Guayaquil, Ecuador
angelc.mendoza@educacion.gob.ec, <https://orcid.org/0000-0003-3088-3775>

MGs. Rosana Fátima Álvarez Franco

Teacher at the Vicente Anda Aguirre Educational Unit, Guayaquil, Ecuador
rosana.alvarez@educacion.gob.ec, <https://orcid.org/0000-0001-9077-0591>

Abstract

This research work shows the lack of knowledge of teachers about the use of virtual learning environments within the teaching and learning process. The main objective of the research work was to analyze the incidence of the use of virtual learning environments in the development of mathematical logical thinking in academic performance. The methodology to be used is bibliographic research, since research has been carried out in books and publications on the Internet to detail the shortcomings that are being experienced in the educational establishment. The method used is the scientific method, since it is the method of systematic study of nature that includes the observation technique, rules for reasoning and prediction, ideas on planned experimentation. The experimental and theoretical results obtained are shown in the analysis table, which were analyzed and interpreted qualitatively in order to have a more realistic view of the results. With the conclusions it can be evidenced that, in the

educational unit there is enough resource to implement a module for the use of virtual learning environment for the development of mathematical logical thinking.

Resumen

El presente trabajo de investigación muestra el desconocimiento de los maestros del uso de los entornos virtuales de aprendizaje dentro del proceso de enseñanza aprendizaje el objetivo fundamental del trabajo investigativo fue analizar la incidencia del uso de los entornos virtuales de aprendizaje en el desarrollo del pensamiento lógico matemático en el desempeño académico. La metodología a utilizar es de tipo de investigación bibliográfica, pues se ha realizado investigaciones en libros y publicaciones en internet para detallar las falencias que se está viviendo en el establecimiento educativo. El método utilizado es el científico ya que este el método de estudio sistemático, de la naturaleza que incluye la técnica de observación reglas para el razonamiento y la predicción, ideas sobre la experimentación planificadas. Los Resultados experimentales y teóricos obtenidos constan en la tabla del análisis que fueron analizados e interpretados de manera cualitativamente para tener una visión más real de los resultados. Con las conclusiones se puede evidenciar que, en la unidad educativa existe el recurso suficiente para implementar un módulo de uso de entorno virtuales de aprendizaje para el desarrollo de pensamiento lógico matemático.

Palabras clave/ Keywords

Virtual learning environments, Explanatory, Descriptive, Evolutionary, Feasible.

Entornos virtuales de aprendizaje, Explicativo, Descriptivo, Evolutivo, Factible.

Introduction

The present research work on the incidence of virtual learning environments in the development of logical thinking, the role of teachers has evolved in recent years. Not only have they had and have to catch up in the use of technologies in the classroom, but their tasks have also changed, the teacher acts as a facilitator who encourages students to discover principles on their own, as a specific objective we can analyze the aspects that should be considered for the design module of virtual learning environments for the development of mathematical logical thinking in the Vicente Anda Aguirre Educational Unit in the city of Milagro.

In the development of this research, it allows to determine the incidence of the use of virtual environments in the development of mathematical logical thinking, this work will be very productive for students because they will learn to use tools for their academic development. The use of technology in the classroom makes it possible to introduce changes in the way of teaching and learning. The use of these resources favors the acquisition of some of the most useful skills for students in the future, but, above all, the specific needs of each student are addressed.

That of teachers has evolved in recent years. Not only have they had and still have to catch up with the use of technologies in the classroom, but their tasks have also changed. The teacher acts as a facilitator who encourages students to discover principles on their own.

Virtual education is "the educational modality that raises the quality of teaching and learning... that respects its flexibility or availability (at any moment, time and space) reaches its apogee with technology to integrate the three methods asynchronous, synchronous and self-training" (Gros & Lara, 2009).

The elements that make up a virtual classroom arise from an adaptation of the traditional classroom to which technological

advances accessible to most users are added and in which factors such as face-to-face communication are replaced by other elements described (Scagnoli, 2006).

Being a virtual educator will be one of the most sought after options in the XXI century, not all educators are willing to give up their master classes, so the virtual educator in addition to stimulating one of the professions with more future in the new economy, if this become the most sought after by universities and business schools (Gavilanes Sagñay et al., 2019).

For (Mota et al., 2016) he goes ahead in his conception and states: "virtual education is a combination of virtual reality technology, communication networks and human beings. In the coming virtual education will be to reach out and touch someone or an entire population in a way that humans never experienced before".

For the present research work we consider that virtual education is a modality of the teaching-learning process, which starts from the virtual intelligent - imaginative of man to the point of giving an effect to reality in the interrelation with the innovative technologies without limit of time - space that induces constant updates and innovations of knowledge.

Meaningful learning occurs when innovative information is connected to a relevant pre-existing concept in the cognitive structure. This requires that innovative ideas, concepts and propositions can be meaningfully learned to the extent that other ideas are adequately clear and available to the individual's cognitive structures and that they function as an anchor point to the former.

Learning is the process through which skills, abilities, skills, behavior or values are acquired or modified as a result of experience, instruction, reasoning and observation; this process can be analyzed from different perspectives and therefore there are different learning theories.

To begin commenting on this topic we would have to start by defining technology, sociology and science which is a term in which they have been arriving so we would say that technology is a set of scientifically ordered technical knowledge, which allows the design and creation of goods and services that facilitate adaptation to the environment and satisfy both the essential needs and desires of people (Barros Bastidas & Turpo Gebera, 2018), (Aparicioetal., 2005. p 45).

Knowledge is not an object that is passed from one to another, but is something that is constructed through cognitive operations and skills that are induced in social interaction. Vygotsky points out that the intellectual development of the individual cannot be understood as independent of the social environment in which the person is immersed (Berríos & Omaira, 2009. 43).

Innovative communication technologies offer new means to confront and nurture educational practice and ideas, but their value emerges to a great extent from the way they are used in the educational process. In this field, it is essential to investigate the student-teacher-media-knowledge relationship in order to find adequate strategies.

This era of change affects all levels of human life; education cannot remain unaffected; however, change does not force us to change because not all change is good, but it demands an openness to the possibility of change. A critical, conscious, committed openness that demands thinking before acting and rethinking what has been done.

It is thus a knowledge independent of the teacher's classroom, of curricula, of evaluations, of fixed schedules. It is permanently available to students through Web sites. Not only is the teacher not the repository of knowledge, but the student can acquire more knowledge than the teacher.

However, there is a great distance between a click and what you want to achieve. This ease of access to knowledge requires an innovative way of learning, since there are no summaries, no indexes, no maps or routes, although there are tools to search for what is requested, it is

necessary to imagine an innovative way of learning and an innovative way of teaching.

Every innovative advantage that technology offers to education, immediately constitutes a new challenge. Every solution to a new problem leads to a new problem; what seems to balance things out causes a new imbalance.

76

The summit also established development objectives for the year 2015, known as the "UN Millennium Development Goals", in the field of education, including: "achieving universal primary education and promoting gender equality and the empowerment of women.

In this last objective, one of its indicators is to eliminate gender inequalities in primary and secondary education. The term basic education in most countries refers to compulsory education and has been acquiring enormous relevance, particularly since the 1950s, when it initially referred specifically to primary education. At the international level, coverage and quality objectives have been established for basic education.

At the World Conference on Education for All, the need to guarantee universal access with an "Expanded Vision" to meet the basic learning demands of every child, young person and adult was raised, as well as the possibility and the responsibility of respecting and enriching the common linguistic and spiritual heritage of all members of a society.

This agreement of the world conference seems to us fundamental to be taken into account as a starting point for the actions that have been carried out in the field of education since this year and as a precedent in the recent history of educational reforms at the national and international level.

It is based on abstract thinking, which a student at this educational level is able to develop, according to Piaget, because it is located in the stage of abstract thinking that provides the ability to deduce,

synthesize, interpret and analyze phenomena and abstract situations such as mathematical logical thinking.

It is the teacher's job to make children feel part of the group, interacting professionally with children through guidance, monitoring, guidance and evaluation in the learning process. In this regard (Abreu et al., 2018) state that the teacher in his professional practice, usually shares learning experience with children who show or are in the beginning of some kind of learning problems hindering their normal academic development and social coexistence.

For (Moinelo et al., 2017) at present the vast majority of contemporary technologies and scientific work are supported, directly or indirectly, in mathematical results, such is the situation that today we speak of mathematization of sciences as an expression of the process of increasing penetration of mathematical methods and products in the different branches of human knowledge. This transforming process has been accentuated in the teaching of this discipline, in which the objectives aimed at the mastery of large volumes of mathematical knowledge are replaced by those that propose a professional with an integral form that allows him to successfully undertake the specific activity that society requires of him. This means that the teaching-learning process must be achieved so that students internalize the meaning and the process of construction of mathematical processes.

El Salvador for many years has observed that the teaching of mathematics in Salvadoran schools has been focused on the development of programs presented in the educational reform of nineteen ninety-eight, with the presentation of the National Education Plan 2021, it "highlights the change of humanistic and socially committed education programs, in the area of mathematics as such, is modified in terms of its structure, proposed objectives, teaching methodologies, curricular activities, achievements and goals, competencies to be achieved, among others".

In Guatemala, the CNB base curriculum has responded to a national educational need that seeks to achieve optimal learning, so that people can develop fully and autonomously within society. One of the greatest challenges presented by the curriculum is "[...] to provide opportunities for students to develop scientific ways of thinking and acting" and the development of logical-mathematical thinking contributes to this objective.

The educational reforms by the government of Honduras as proposals to the commitments assumed as part of the education for all program, known by its acronym in English as EFA (Education For All) plan, which proposed several goals to fulfill the educational period, one of them being to increase the academic performance of sixth grade students in mathematics and Spanish.

Nicaragua has a national early childhood policy, "Love for the little ones", approved in 2011, which emphasizes information for teachers and calls for strengthening the knowledge, capacities and skills of teachers to master early childhood and inclusive education concepts and methodologies in order to develop pedagogical, social and human relationships. It is also necessary to develop a training strategy for teachers who work with children from zero to six years of age in order to ensure that they acquire neuro-educational knowledge, skills and abilities.

In the portal of the Ministry of Education, strategically designed for innovation, creativity and technological updating of the community in general; it seeks to support the development of academic, cultural, scientific and technological activities, as well as the integration of the educational community to collaborative spaces for the exchange of experiences that enrich the teaching and learning processes. (educapanama).

Inspired by new research in early mathematics, in 2009 the government of Paraguay decided to strengthen mathematics instruction in preschool. After considering a number of initiatives

from around the world, the government opted for the "Big Math for Little Kids," or BMLK, program.

There is growing evidence to suggest that mathematics education is a cumulative process and that the development of pre-mathematical skills at an early age is important for future mathematical understanding and problem-solving skills.

The development of logical thinking in the Dominican Republic is a project in the process of implementation that aims to develop logical thinking at the primary level, through mathematical content and problem solving. To this end, a diagnosis will be carried out to determine the initial situation of the development of students' thinking, and a didactic material will be prepared containing exercises and problems that will contribute to the logical thinking of the students.

The Venezuelan denominated education indicates that the profile of the teacher must, "use different strategies for the development and evaluations of the teaching-learning processes, in order to optimize the time and resources available". (p60).

There are many laws and regulations under which the educational system in Venezuela is found, these have been created with the purpose of allowing a more active participation of both teachers and students creating an environment of trust, creativity and responsibility in the different areas taught in education.

After analyzing the term basic education in most countries, it refers to compulsory education, and has been acquiring enormous relevance, particularly since the 1950s. At first it referred specifically to primary education. At the international level, coverage and quality objectives have been established for basic education. This agreement of the World Conference seems to us fundamental to be taken into account as a starting point for the actions that have been carried out in the field of education since that year and as a precedent in the recent history of educational reforms at the national and international level.

Materials and Methods

The methodology of this research on the incidence of virtual learning environments in the development of mathematical logical thinking is based on the scientific method, which is the method of systematic study of nature that includes the technique of observation, rules for reasoning and prediction of ideas about planned experimentation and ways of communicating experimental and theoretical results in Latin America. Based on the information was used the collection of indexed articles from international journals in the database: Redalyc, Scopus, and Scielo on the development of mathematical logical thinking with the objective of analyzing the aspects that should be considered on the topic to be addressed.

Results

Table 1 *Mathematical logical thinking and its development in Latin America*

Country	Logical Thinking	Mathematical
Jomtien, Tahiland	The Universal Declaration of Human Rights states that "everyone has the right to education", despite the significant efforts made by the countries of the world.	To ensure the right to education for all, the following realities persist: <ul style="list-style-type: none"> - Functional illiteracy is a major problem in all countries, both industrialized and developing. - They lack access to technologies. - More than 100 million children fail to complete the basic education cycle.

Mexico	The educational outlook in the country is not encouraging.	The company has not had the capacity to respond to the educational dilemma, so they suggest that all the actors involved act as soon as possible, with or without the help of the Secretary of Public Education (SEP), either by convention or even by convenience.
Peru	Children with special educational needs	The type of learning disability hinders the normal academic development and social coexistence, many of the teachers are not sufficiently trained to meet the needs of students with some special needs, being necessary to receive some specialization, or insert in the curriculum of higher education.
Cuba	Students have limitations in the development of inductive reasoning, they act in a mechanical way, as for the	It was found that there are insufficiencies in the conceptualization of concepts related to formalization and difference.
Ecuador	The 2016 curriculum is based on what was proposed in 2010 and 2011, it is focused on the critical and reflective development to interpret and solve real life problems, its construction is based on mathematical logic, the use of technologies that allow confirming its importance.	Within the curriculum of the area highlighting the need for its management from the lower grades, since we are immensely in an era where technology has become an inseparable ally when it comes to generating knowledge.

El Salvador	In the last 10 years, El Salvador has sought to maintain a coherent educational course based on the National Education Plan 202, made possible by the various sectors of society, and to face the educational challenges of the 1990s.	The (MINED), is looking for a pedagogical tool for teaching mathematics in the classroom and thus improve student learning. Teachers are using a mathematical language that allows them to deepen their understanding of mathematical logic and the development of logical thinking, with this strategy they use logic through a game and thus develop the mind in the use of basic operations.
Guatemala	The National Base Curriculum has been conceived as the "educational project of the Guatemalan state" and seeks to provide opportunities for students to develop ways of thinking and acting.	The curriculum is based on three components: the individual, the context in which he/she lives and knowledge. conceptual, procedural and attitudinal.
Honduras	The national EFA Plan (2003), which covers the EFA goals, Education for All, adopted by all the countries mentioned above. Emphasis on quality allows basic skills - literacy and numeracy - to lead to the acquisition of other skills in higher-level thinking and logical-mathematical thinking,	creativity, the ability to plan for problem solving, establish harmonious interpersonal relationships, as well as other social and emotional skills and competencies. PESE 2018-2030 recognizes that SDG-4 and its targets promote a model in which learning, in all its forms and modalities, has the capacity to influence people's decisions to create more just, inclusive and sustainable societies.
Nicaragua	The purpose of the National Education Plan is to provide the country with a reference framework to guide changes	Specifically, the plan seeks to define the principles of Nicaraguan education for the next fifteen years, promoting a

in the education system, face the challenges of overcoming poverty and strengthen the modernization of the State, in order to contribute to the achievement of sustainable development of the country with greater equity.

participatory process for the articulation of the educational subsystems among themselves - formal and non-formal - and with the social and economic environment.

Panama	In Panama, difficulties in mathematics are included in the overall failure rates, such as 5% in primary school and 17% at the secondary level, according to a study conducted by the Ministry of Education in Panama,	The PISA test results report that 80% of Panamanian students do not reach the basic level (Panama National Report, PISA 2009).
Paraguay	Do teachers in top-performing countries teach mathematics and science differently than teachers in lower-performing countries? To explore these questions, the IDB visited math and science classrooms in three countries: Paraguay, the Dominican Republic and the Mexican state of Nuevo León.	In order to obtain quantitative indicators on teaching practices, Paraguayan students are lagging behind in mathematics and science Paraguay is no exception to the overall low performance in mathematics and science in Latin American countries. A large number of graduates will not acquire sufficient knowledge and skills to function in society. Paraguayan students consistently underperform their peers in other nations in the region.
Dominican Republic	One of the central purposes of the educational system in the Dominican Republic is the integral formation of the personality of the students who will serve as future professionals.	The reports of the Secretariat of State for Higher Education, Science and Technology of the Dominican Republic show that the level of satisfaction achieved in the teaching-learning process of mathematics in initial teacher training does not always meet the expectations of those involved in

it, where it is notorious that students and graduates do not manage to appropriate the mathematical didactic knowledge, in a way that allows them to be trained with an integrative character to ensure that students in schools learn well and with pleasure for mathematics.

Venezuela

In this way, the teacher will play a very important role in consolidating the development of logical mathematical thinking skills in children, and that is why the teacher must have the profile of the adult we want the students to become,

always trying to motivate students, to awaken the children's desire to learn, and this will be achieved through the development of strategies applied in class, according to the needs of children, ensuring meaningful learning.

After analyzing country by country in Latin America, and specifically in Ecuador, province of Guayas, Canton Milagro, in the Vicente Anda Aguirre Educational Unit, it can be seen that some of the teachers wish to receive training on virtual learning environments, in order to apply them in the classroom so that students can develop logical mathematical thinking. While the students state that there is a need for their teachers to use virtual environments in the classroom, which contributes to improving the educational quality of the institution. The educational authorities state that the virtual environment modules should be in line with current technology, which becomes a support material to facilitate meaningful learning where they will positively influence the development of logical mathematical thinking.

Conclusions

In the Educational Unit there are enough resources to implement a module for the use of virtual learning environments for the development of mathematical logical thinking. Students do not submit homework because they do not have a place to do research and do not give importance to the work submitted. The authorities of the educational unit do not take steps to obtain resources for the implementation of a module for the use of virtual learning environments for the development of mathematical logical thinking.

Classes are routine, focused on the orthodox and are not encouraged through didactic material for the area of mathematics, such as virtual environments. With the analysis of Latin America, it can be observed that teachers who teach mathematics classes are transmitted through a routine system which does not allow students to develop mathematical logical thinking. Students feel motivated when they hear that their mathematics classes will be applied through virtual environments, allowing the teacher a better teaching and therefore a good learning.

References

- Abreu, O., Rhea, S., Arciniegas, G., & Rosero, M. (2018). Object of Study of Didactics: Historical Epistemological and Critical Analysis of the Concept. *Formación Universitaria*, 11(6), 75-82. <https://doi.org/10.4067/s0718-50062018000600075>. <https://doi.org/10.4067/s0718-50062018000600075>
- Aparicio, P. C., Blanco, N., Alvarado, M. E., Brien, Kyoung, H., Glenmayer, L., Yoon, D. P., Chakrabarti, B., Christensen, C. M., Eyring, H., Craney, C., McKay, T., Mazzeo, A., Morris, J., Prigodich, C., Groot, R., Denofrio, L. A., Russell, B. S., Lopatto, D., ... Prada, Á. R. (2005). Educación y jóvenes en conte. *Archivos Analíticos de Políticas Educativas*, 17(2), 1 citation_lastpage=35,2-229. <https://www.redalyc.org/pdf/2654/265425848014.pdf>.
- Barros Bastidas, C., & Turpo Gebera, O. (2018). Factors influencing the scientific production of university professors: a systematic

- review. *Factores Que Influyen En La Producción Científica de Los Docentes Universitarios: Una Revisión Sistemática.* , 11(22), 225-234. <http://10.0.85.43/pensam.v11i21-1.276%0Ahttps://ezproxy.uniandes.edu.co:8443/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=fua&AN=141223533&lang=es&site=ehost-live>
- Berríos, D., & Omaira, G. (2009). Epistemological approaches guiding 4th level research. *Visión Gerencial*, 3(3), 47-54. <https://www.redalyc.org/pdf/4655/465545882009.pdf>
- Gavilanes Sagnay, M. A., Yanza Chavez, W. G., Inca Falconi, A. F., Torres Guananga, G. P., & Sánchez Chávez, R. F. (2019). ICTs in teaching and learning processes. *Digital Science*, 3(2.6), 422-439. <https://doi.org/10.33262/cienciadigital.v3i2.6.575>.
- Gros, B., & Lara, P. (2009). Innovation strategy in higher education: The case of the Universitat Oberta de Catalunya. *Iberoamerican Journal of Education*, 49, 223-245. <https://rieoei.org/historico/documentos/rie49a09.pdf>
- Moinelo, C., Caridad, M., Kassabb, A., & Mercedes, M. (2017). *Educational care for cognitive stimulation in people with special educational needs . Intervention strategy.* 3(4). <https://www.redalyc.org/pdf/3606/360657467012.pdf>
- Mota, L., Daniel, Á., & Delgado, A. (2016). Representaciones Estudiantiles Sobre Nutrición Humana Como Modelo Estudiantil Inicial Para Referencia Didáctica. *Revista Latinoamericana de Estudios Educativos (Colombia)*, 12(2), 83-108. <https://www.redalyc.org/pdf/1341/134149931005.pdf>
- Scagnoli, N. (2006). Collaborative learning in distance courses. *Investigación y Ciencia: De La Universidad Autónoma de Aguascalientes*, 36, 39-47. <https://www.redalyc.org/pdf/674/67403608.pdf>