

Open and collaborative innovation: elements that promote multiple intelligences in students of uniminuto's bachelor's degree in early childhood education

Innovación abierta y colaborativa: elementos que promueven las inteligencias múltiples en estudiantes de Licenciatura en Pedagogía Infantil de UNIMINUTO

  Erica María Ossa Taborda¹

  Benjamín Barón Velandia²

¹ Secretaría de Educación, Universidad Nacional de Colombia Sede Medellín, Colombia

² Corporación Universitaria Minuto de Dios - UNIMINUTO, Colombia

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Autor de correspondencia: Erica María Ossa Taborda

Resumen

El artículo buscó identificar las metodologías que incluyen la innovación, la investigación y la tecnología educativa, que favorecieron el desarrollo de las inteligencias múltiples en estudiantes de Licenciatura en Pedagogía Infantil de UNIMINUTO. Se implementó el método mixto de investigación, ya que esta combinación entre el método cualitativo y cuantitativo permite tener una mirada mucho más compleja y detallada de la realidad que se interviene. La población, participante y muestra fueron los estudiantes y docentes de la Licenciatura en Pedagogía Infantil del séptimo semestre con edades entre los 20 y 50 años de ambos sexos, con niveles socioeconómicos y socioculturales y académicos diversos. Los instrumentos que se implementaron fueron entrevistas y encuestas. El resultado de los análisis evidenció que es necesario considerar dentro de este contexto, retar a las instituciones dedicadas a la formación inicial y permanente de maestros, ya que implica replantear el rol que se asigna a la figura docente. Como conclusión se reconoce que es imperativo poner en marcha proyectos de investigación educativa enfocados en el desarrollo de inteligencias múltiples a través de recursos, como la tecnología educativa y la innovación en los procesos pedagógicos, porque proporcionan herramientas efectivas, pertinentes y coherentes en el marco de la planeación curricular.

Palabras clave: Innovación, inteligencias múltiples, investigación, TIC, tecnología.

Abstract

The article sought to identify the methodologies that include innovation, research and educational technology, which favored the development of multiple intelligences in students of the Bachelor's Degree in Early Childhood Education at UNIMINUTO. The mixed method of research was implemented, since this combination of qualitative and quantitative methods allows for a much more complex and detailed view of the reality being studied. The population, participants and sample were the students and teachers of the Bachelor's Degree in Early Childhood Pedagogy of the seventh semester, between 20 and 50 years of age, of both sexes, with diverse socioeconomic, socio-cultural and academic levels. The instruments used were interviews and surveys. The result of the analysis showed that it is necessary to consider, within this context, challenging the institutions dedicated to initial and continuing teacher training, since it implies rethinking the role assigned to the teacher. In conclusion, it is recognized that it is imperative to implement educational research projects focused on the development of multiple intelligences through resources such as educational technology and innovation in pedagogical processes, because they provide effective, relevant and coherent tools within the framework of curricular planning.

Keywords: Innovation, multiple intelligences, research, ICT, technology.

INTRODUCTION

The teaching-learning processes in universities are undergoing accelerated changes where innovation, research and the use of ICT are transcendental aspects in the pedagogical dimension and in the methodology applied by the teacher in the classroom. To approach the complex concept of innovation is to compile a series of requirements that are of utmost importance to improve the quality of education in universities and especially in the educational policies of the state, because to talk about quality is not to incorporate models from other countries, it is to evaluate and diagnose the educational contexts to have a significant impact at the educational level, since students need to be guided and their abilities enhanced, that is, to discover their intelligences.

Colombia is going through a series of challenges in the context of citizenship, labor and cognitive competencies. The purpose of this article is to reflect, discuss and contribute to the educational process in terms of teaching-learning processes, as well as to present clear strategies and approaches to improve educational processes and practices in order to create participatory, democratic and ethical spaces conducive to comprehensive evaluation.

The proposal “Innovation, research and educational technology, elements that contribute to the development of multiple intelligences in undergraduate students in early childhood pedagogy at UNIMINUTO” is a pedagogical and didactic tool of great projection for the university, since with it, students acquire autonomy, discipline, scientific and multifaceted knowledge, and integrate other disciplines that are in line with the approach of Gardner (2005) regarding the management of multiple intelligences.

BACKGROUND

In Colombia there are projects that transcend at a formative and cognitive level in the students, allowing them to discover a series of skills that allow them to enrich their learning in a favorable way and develop in them competencies, such as the Sister Classrooms project, which through ICT transforms knowledge into competencies for both teachers and students.

Another example commonly recognized worldwide is the project established in Colombia called “Thinkquest”, a new way of incorporating educational content through research and innovation processes, compiling a fundamental factor in education, which is collaborative work with other countries.

Another nationally recognized entity that incorporates learning based on competencies, skills and development of intelligences into its curriculum is SENA, which contributes from its pedagogical model to train people with leadership and transformation capabilities in all processes related to training for work and human development.

It is important to recognize that in several academic curricula there is evidence of the need to establish new educational reforms that lead students to develop skills at the university. It is the clear example that is evident from its PENSUM (Curriculum of a career, in this case the Bachelor’s Degree in Early Childhood Education) of the University UNIMINUTO, where it incorporates a pedagogical innovation based on the development of thinking skills, teaching for understanding and evaluation by competencies in order to achieve in the student the integral formation from all its dimensions such as being, doing, knowing and living with the other.

The research arises from the need to implement an innovation that generates change in educational policies, methods and methodologies used by teachers, to improve the quality of education in our country, which is going through a crisis at the educational level. In the records of the Pisa tests, Colombia is among the most deficient countries in the world reaching a state of decomposition, where the teacher becomes only a transmitter of knowledge, just another subject, who does not matter to the state his qualification and status within a society (Garcés, 2021). Likewise, in national tests, such as the ECAES, it is observed as a result that “the lowest scores are in preschool and good answers in health and engineering” (MEN, 2006). Therefore, with this proposal we intend to implement research in the university, using innovation and educational technology as resources in the teaching-learning processes, to significantly enhance the innate intelligences in each of the students.

In the above context, it is imperative to ask how innovation, research and educational technology contribute to the development of multiple intelligences in students of UNIMINUTO's Bachelor's Degree in Early Childhood Education?

To recognize the evolution of the multiple efforts and challenges that education in Colombia and the world have faced in the last 10 years (2004-2014) with the advent of ICT, generative Artificial Intelligence, including the most widespread for now the ChatGPT and its development not only in the context of society, industry and business, but also in the field of higher education, in particular (Roman-Acosta et al., 2024). For this reason, it is important to select the lenses through which the analyses of the results that the research will yield in its data collection process will be carried out.

THEORETICAL REFERENTS

Innovation

Innovation is the strategy that allows changing educational processes through a coherent and relevant praxis to the demands of the local world, i.e., recognizing the impacts of global communities, but identifying the influence necessarily generated by local communities (Rodríguez Pérez, *et al.* 2021). Educational policies should involve the teacher in this whole process of change and opportunity to mediate other disciplines in the field of knowledge. This is how educational technology becomes an indispensable tool that allows the incorporation of competencies to innovate in every field of action. These respond to the needs of the environment and manage to articulate other aspects in education such as: the distance modality that contributes notoriously in the time and space of students generates intercultural knowledge, thus satisfying human needs (Romero and Martinez, 2017).

When the student is allowed to incorporate technology into the classroom is when a good methodological approach can implement research in the classroom, since:

The student develops a research process from the quantitative methodology applied to a problem identified in the educational reality, based on both the assumptions of the quantitative pa-

radigm and the theoretical/analytical perspectives of approach, incorporating advances in the field of educational knowledge, supported by ICT and with a critical and ethical attitude in the construction of knowledge (Chacon, 2013, p.739). (Chacon, 2013, p.739).

It is in this process where the state establishes clear educational policies that enable equity based on access to resources and benefits for all members of a society, regardless of their physical and cultural characteristics, age and place of residence (Alemán and Gómez-Zermeño, 2012).

Multiple intelligences

In order to make the enrichment of pedagogical strategies for teaching and evaluation of learning a reality, it is necessary to take up the theory of multiple intelligences proposed by Gardner (2005), which are as follows:

- Linguistic intelligence. Ability to use words effectively, either orally or in writing. This intelligence includes the ability to manipulate the syntax or meanings of language or practical uses of language.
- Logical-mathematical intelligence. Ability to use numbers effectively and to reason appropriately. This intelligence includes sensitivity to logical schemes and relationships, statements and propositions (if-then, cause-effect), functions, and abstractions.
- Kinesthetic body intelligence. Ability to use the whole body to express ideas and feelings (e.g., an actor, a mime, an athlete, a dancer) and the facility in the use of one's hands to produce or transform things (e.g. a craftsman, sculptor, mechanic, surgeon). It can be stimulated through activities such as: body language, impersonations, games, mime, sports, choreography, dances, among others.
- Spatial intelligence. Ability to accurately perceive the visual-spatial world (e.g., hunter, explorer, guide) and to execute transformations on those perceptions (e.g., interior decorator, architect, artist, inventor).
- Musical intelligence. Ability to perceive (e.g., a music fan), discriminate (e.g., as a music critic), transform (e.g., a composer), and express (e.g., a person who plays an instrument) musical forms.

- Interpersonal intelligence. Ability to perceive and make distinctions in the moods, intentions, motivations, and feelings of other people.
- Intrapersonal intelligence. Knowledge of oneself and the ability to adapt one's own ways of acting based on that knowledge. This intelligence includes having an accurate self-image (one's powers and limitations).
- Naturalistic Intelligence. Ability to solve problems or create products related to nature; sensitivity to relate to nature, adapt to diverse environments, and manifest environmental awareness (Gadamer, 2005).

The above concepts are constituted as referents of the complex understanding of multiple intelligences and from there recognize them as a motivational device for students, throwing them collaboratively towards knowledge, recognizing their learning styles as a starting point and thus being guarantors of a truly meaningful learning. This is why learning styles must "resort to teaching behaviors (...) that favor the characteristics of each Style, (...) and incorporate them in each step of the sequence according to the Learning Styles diagnosed" (Martínez, 2008, p.80).

METHODOLOGY

Approach

Research is a "systematic process of collecting, analyzing and interpreting information in order to increase our understanding of a phenomenon" (MEN, n.d., p.7). However, research is not limited to gathering information through the Internet or library research. There are certain "stages in conducting research, such as identifying a potential problem to investigate, developing a plan for study, exploring a critical assumption, and preparing the main study" (MEN, n.d., p.6).

The most appropriate method to provide a viable solution to this type of needs is the incorporation and application of the mixed method, since this method enables the combination of qualitative and quantitative methods. Thus, action research (also known as teacher research or autonomous research) (Gall, Gall and Borg, 2007) develops

skills in terms of the depth of teachers' experiences where experiences are raised around classroom practice.

Socio-demographic context

UNIMINUTO University is located in the municipality of Bello, at Km. 0 Highway Medellín - Bogotá (near the Wood metro station) CRA 45 # 22 D- 25 Barrio Zamora, which offers several professional programs in different modalities, for example, the programs offered in the traditional distance mode have face-to-face tutorials at the times indicated by the UNIMINUTO headquarters. Attendance to tutorials is mandatory. It is a private institution, dedicated to the provision of formal education services at the undergraduate and graduate levels, with a social emphasis.

Population, participants and sample

The target population is the seventh semester undergraduate students in Early Childhood Pedagogy. The ages of the students range from 20 to 50 years old, of both sexes, with diverse socioeconomic, socio-cultural and academic levels. For the purposes of the study, this semester is considered as a representative sample due to issues related to the PENSUM, since this semester includes subjects focused on innovation. As for the group of teachers, it is necessary to work with the teachers of the Bachelor's Degree in Early Childhood Pedagogy who teach in the respective semester.

Instruments

The combination of different qualitative and quantitative research methods allows, from the Participatory Action Research approach, the incorporation of a series of instruments that make it possible to probe and intervene effectively in the problem detected through the diagnosis made from the initial phase, which improves the quality of the research results, favoring the development of the question and not the results per se. The combination of the instruments enables a better and quicker understanding of the main causes (...). These instruments are constructed in such a way that they provide an answer to the research question. Both quantitative and qualitative understandings are considered separately, giving priority to the quantitative method in the search for understanding (Valenzuela and Flores, 2012).

Interviews with program directors

All information concerning innovation processes and educational technology applied to educational contexts is analyzed through interviews applied directly to the program director. For this reason, the ideas presented in the study by Salyers and Ritchie (2006) regarding the use of MCC as a tool to obtain qualitative data through the study subjects are taken into account. For Hernández et al., (2006), qualitative data make it possible to fully capture and, above all, to understand the underlying motives, meanings and internal reasons for human behavior.

Surveys to teachers

The survey is applied to teachers and students to make a reading of the findings, taking as a reference the problem posed around the pedagogical practices used, verifying through the quantitative research approach, figures and percentages of responses that account for the way in which it is taught, if the educational practice is based on the styles and rhythms of learning.

Research procedure

For Hernández, *et al.* (2006), the combination of quantitative and qualitative approaches can occur at various levels and sequences. In a two-stage design, first one approach is applied and then another, independently or not, and in each stage the techniques corresponding to each approach are followed. Thus, in the qualitative phase, teachers' managers were interviewed as a sample, taking as a reference their practices at the strategic management level, and in the quantitative phase, teachers were taken into account through an interview, where aspects such as: the teaching vocation, current educational policies in Colombia, the status of the teacher, the suitability from their discipline and the permanent qualification within their educational practices were incorporated. With all of the above, it is intended to triangulate the approaches in such a way as to respond to the research question through the report of findings as follows:

First phase: Quantitative Approach	Second phase: Qualitative Approach	Third phase: Action-participation approach
Sign the informed consent form.	To study the context based on the analysis of cases.	
Conduct the pilot test to students in the seventh semester.	Interview with Program Director and Dean.	
Apply the pilot test to students.	To survey teachers who teach courses in the seventh semester	
Analyze the data collected in the pilot test.	Analyze the results.	
Initial diagnosis.	To compare results and triangulate quantitative and qualitative data.	
Design the instrument (surveys) to students to identify types of intelligence.	To review the curriculum of the bachelor's degree in Early Childhood Pedagogy.	
Analyze the results.	To review the pedagogical model.	
Proposal.	Final report of documentary review.	
	To triangulate the data.	
		This approach takes into account the mixture of quantitative and qualitative approaches, taking as a viable and enriching reference the visualization of the community. Taking into account some people from different areas to be part of the research process.

Analysis strategy

The research process takes into account the mixed research method where the quantitative approach prevails, since the data collected were recorded in a database to randomly perform a statistical analysis with measures of central tendency focusing on making explicit in each explanation of the graph the arithmetic mean, mode and averages in order to make an exhaustive analysis of each of the elements that are integrated in the research.

Analysis and results

According to the methodological design proposed, the interpretation and consolidation of the data and results of both components is done in a step at the end of the process (Hernández *et al.*, 2006; Valenzuela and Flores, 2012). This is why the fieldwork provides information that provides essential elements to determine conclusions and make inferences in order to develop a proposal in accordance with the needs and demands of the context.

According to Strauss and Corbin, quoted by Romero, (2005)

Categorization consists of assigning concepts to a more abstract level (...) categories have a conceptual power since they have the capacity to bring together groups of concepts or subcategories. At the moment the researcher begins to group concepts, he or she also begins the process of establishing possible relationships among concepts about the same phenomenon (p.114).

These same authors cited by Romero argue that: "Categories are concepts derived from data that represent phenomena (...) Phenomena are relevant analytical ideas that emerge from our data" (Romero, 2005, p.114).

Matrix for data analysis

A matrix was used to allow a hierarchical ranking by categories, integrating, likewise, some items or criteria under some specifically planned parameters, which in turn made viable a proposal that took into account innovation, educational technology and research to develop multiple intelligences in students.

Analysis of quantitative data.

In the quantitative analysis of social phenomena, statistics is a technique supported by scientific methods used to collect, organize, summarize and analyze data, as well as to make decisions and obtain valid conclusions (Kerlinger, 1985). Currently, quantitative analysis is performed by means of computer systems or statistical packages, which are used especially when there is a considerable volume of data to be analyzed (Vilá, 2006; Hernández *et al.*, 2006).

Qualitative data

From the qualitative analysis, the collected experiences were analyzed in order to make a holistic process, taking as a methodology the systemic study of the data considering the sequentiality of the narrated facts. "It implied a construction from the elements obtained in the context to reconstruct them in complete meanings (...)" (Cuevas *et al.*, 2014).

Thus, the interventions are classified as follows:

Concept	Notion of each concept.
Innovation	There is innovation from new technologies applied to educational processes. At the institutional level, there have been innovations from significant experiences through the use of the institutional web page, in addition to virtual classrooms, where students and tutor teachers can communicate and develop different learning processes. In addition, it is observed how teachers are articulated with the computer systems and make use of them in each of their classes.

Educational Technology	UNIMINUTO is a standard bearer in the use of new technologies in teaching practices, thanks to its virtual and distance learning program that takes full advantage of new technologies, thanks to its virtual classroom. Teachers appropriate new technologies to innovate in their educational practices.
Multiple Intelligences	Empowering intelligences is difficult to work with. The university does not have enough tools to enhance the intelligence of each student. It is also necessary to start from the rhythms and difficulties of learning in order to carry out a quality education. For this, new methodological strategies must be addressed and resources must be available to innovate from this proposal. In addition, it was found that some teachers take into account the rhythms and learning styles of students, while others do not. Likewise, the evaluation processes are standardized and students cannot be measured in the same way, which is why the teacher must recognize these differences.
Quality of Education	It is necessary to mobilize pedagogical practice in order to mobilize thinking from school age. Change is needed through teaching, teachers must be updated in innovation and new pedagogical practices to enhance the skills of learners. Educational policies are well defined. It should focus more on good educational management. We must have committed teachers to innovate and enhance the intelligences of students using technological resources, and then make an impact from the curriculum, thematic areas according to the interests of students.

Table No.1. Qualitative data analysis. Interviews with teaching directors.

From the action-participation approach, several references were diagnosed to inquire about the pedagogical practices of teachers. Thus, from these points of view, it is clear that research is not part of the pedagogical processes and neither is the enhancement of multiple intelligences from the different areas, since there are no specialized classrooms and practical methodologies that contribute to the strengthening of the skills and aptitudes of the students.

With the whole process of analysis it is necessary to consider, within this context, the challenge for institutions dedicated to initial and continuing teacher training is enormous, since it implies rethinking the role assigned to the teaching profession.

It is pertinent and necessary to implement a proposal that emerges in the teaching-learning processes a relevant methodology such as “Innovation, research and educational technology, elements that contribute to the development of multiple intelligences in undergraduate students in early childhood pedagogy at UNIMINUTO”.

CONCLUSIONS

Implementing educational research projects focused on the development of multiple intelligences through resources such as educational technology and innovation in pedagogical processes provide effective, pertinent and coherent tools within the framework of curricular planning. Within this planning, the context in the educational processes is a

determining factor and that is why the MEN (Ministry of National Education) structures in a particular way the guidelines and educational policies according to the conditions in which the students are immersed. In turn, analyze from the general law of education transcendental aspects that are a fundamental part of the educational process, the area plans that must be functional according to the styles and rhythms of learning, where the actors of the educational community must establish objectives, goals, activities and projects that fit the context and not outdated and brought from other countries, as sometimes ideologies and educational policies of other countries are contemplated, distant and decontextualized to the reality of the country.

RECOMMENDATIONS

Co-constructing actions and goals with students will improve educational practices through innovative resources such as technology in the classroom, integrating the areas in a symbiotic way, so that, on the one hand, there should be no subordination of areas and, on the other hand, to ensure meaningful learning in those who participate in the process (Martinez, 2023). It is important to carry out what is stated by the MEN (Ministry of National Education) in the pedagogical practices; the learning environments in an adequate and pertinent way, where “the dynamics that constitute the educational processes and that involve actions, experiences, experiences for each one of the participants; attitudes, material and socio-affective conditions, multiple relationships with the environment” (Duarte, 2003, p.102) are established.

It is for all of the above that it is imperative a permanent accompaniment to all teachers, but especially to those teachers who need updating, where innovation, research and the use of technologies are far from the real pedagogical practices of the educational contexts, in order to increase the educational quality that is so much desired in the country, taking as an innovative tool the specialized classrooms where students feel motivated to meet with knowledge and thus give viability to the topics through a relevant curriculum led by qualified teachers and with

great vocation for their teaching work, being this valued by society (Caldeiro-Pedreira & Castro-Zubizarreta, 2020).

These aspects imply that school climate comprises the attitudes, beliefs, values and norms that underlie institutional practices, both at the level of academic achievement and the operation of a school (...). Climate is constructed by the behavior patterns of students and teachers in the school (...). The climate that is built in the classroom must be favorable for the development of basic and citizenship competencies, that is, a safe climate of recognition and trust for students and teachers involved there (MEN, 2011, p.29).

Therefore, the classroom climate should be favorable for the development of basic and citizenship competencies, that is, a safe climate of recognition and trust for the students and teachers involved.

Encourage meaningful learning, favoring learning styles and rhythms through the intelligence that each student possesses and, as stated in the standards, “it is not about not teaching what is specific to each area, but on the contrary, to take advantage of that knowledge and specific skills to contribute to the formation of citizenship” (MEN, 2011, p.32). When linking meaningful learning, it is important to recognize that the curriculum must be accompanied from its construction and restructuring to the context and the needs of the students in order to enhance their innate abilities or intelligences.

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