



Use of Educaplay and the development of scientific competences in natural sciences

Uso de Educaplay y el desarrollo de competencias científicas en ciencias naturales

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ABSTRACT

The objective of the research is to determine the impact of using Educaplay on the development of scientific competences in natural sciences in basic education students from private educational institutions in the city of Quito, Ecuador. A non-experimental, descriptive, cross-sectional design was used on 385 students. The results obtained show a very strong (0.89) and statistically significant ($p = 0.004$) positive correlation between the use of Educaplay and the development of scientific competences in natural sciences. This confirms that the integration of this technological tool in educational processes has a favourable impact on the strengthening of these competences, which supports the affirmative hypothesis (H1) and allows the rejection of the null hypothesis (H0). Therefore, it is concluded that Educaplay has a high potential for being systematically integrated into educational programmes, contributing to the development of scientific competences.

Descriptors: science and society; scientific culture; educational innovations. (Source: UNESCO Thesaurus).

RESUMEN

Se procesa como objetivo de investigación determinar la incidencia del uso de Educaplay en el desarrollo de competencias científicas en ciencias naturales en estudiantes de educación básica de instituciones educativas particulares de la ciudad de Quito, Ecuador. Se trabajó con un diseño no experimental, de tipo descriptivo de corte transversal en 385 estudiantes. Los resultados obtenidos evidencian una correlación positiva muy fuerte (0,89) y estadísticamente significativa ($p = 0,004$) entre el uso de Educaplay y el desarrollo de competencias científicas en ciencias naturales, esto confirma que la integración de esta herramienta tecnológica en los procesos educativos tiene un impacto favorable en el fortalecimiento de dichas competencias, lo que respalda la hipótesis afirmativa (H1) y permite rechazar la hipótesis nula (H0). Por lo tanto, se concluye que Educaplay tiene un alto potencial para ser integrado de manera sistemática en los programas educativos, contribuyendo al desarrollo de competencias científicas.

Descriptor: ciencia y sociedad; cultura científica; innovación educativa. (Fuente: Tesauro UNESCO).

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Research articles



INTRODUCTION

In contemporary education, the development of scientific competences in the area of Natural Sciences is a fundamental axis for the integral training of students. These competences, which include skills such as critical thinking, problem solving, evidence-based argumentation and the understanding of natural phenomena, are essential for students to be able to interpret, analyse and actively participate in the scientific, technological and environmental challenges of today's world. In this context, the incorporation of technological tools such as Educaplay in the teaching-learning processes is an innovative and effective strategy for strengthening these skills, especially in primary school students.

The use of Educaplay, an interactive platform that allows the creation of dynamic educational activities, has proven to be a valuable resource for transforming traditional pedagogical practices into more meaningful and participatory learning experiences. In this vein, Alcívar-Zambrano & Bowen-Mendoza (2024) affirm that this tool not only fosters students' motivation and interest, but also facilitates the acquisition of scientific knowledge by integrating playful and technological elements into the educational process, which is in line with current trends in Natural Sciences didactics, which seek to promote active, contextualised and student-centred learning. and technology into the educational process, which is in line with current trends in Natural Science teaching, which seek to promote active, contextualised and student-centred learning.

On the other hand, research such as that of Zompero et al. (2022) and Sepúlveda-Obreque et al. (2023) highlights the importance of strengthening scientific competences in Natural Science curricula in Latin America, where education systems face challenges related to curricular updating, teacher training and the integration of emerging technologies. In this sense, tools such as Educaplay not only contribute to the teaching of scientific content, but also



enhance transversal skills such as collaboration, creativity and logical thinking, basic aspects for the development of scientific citizenship.

In the case of basic education students belonging to private educational institutions in the city of Quito, Ecuador, the use of Educaplay takes on particular relevance, given that it is an educational context characterised by a growing demand for pedagogical innovation and the need to prepare students to face the challenges of the 21st century, which offers an ideal scenario for exploring the impact of this tool on the development of scientific competences.

In accordance with the above, the research objective is to determine the impact of the use of Educaplay on the development of scientific competences in natural sciences in basic education students from private educational institutions in the city of Quito, Ecuador.

Theoretical framework

The development of scientific competences in the area of Natural Sciences is a fundamental axis for the integral formation of students, therefore, the following are described:

Use of Educaplay as a technological tool

The incorporation of digital technologies in teaching and learning processes has significantly transformed educational practices, allowing for the creation of more interactive, dynamic and student-centred environments. In this context, Educaplay is presented as a technological tool that facilitates the design of interactive didactic activities, such as crossword puzzles, word searches, concept maps, questionnaires and educational games. These activities, designed with a pedagogical approach, allow teachers to diversify their teaching strategies and adapt them to the individual characteristics of the students, promoting meaningful learning.

From a pedagogical perspective, Educaplay is aligned with the principles of active learning, in which students not only receive information, but actively participate in



the construction of their knowledge. According to Alcívar-Zambrano & Bowen-Mendoza (2024), the use of Educaplay encourages intrinsic motivation in students by integrating playful elements with academic content, which generates a more attractive and participatory learning environment. Likewise, this tool allows teachers to address diversity in the classroom, as the activities can be personalised to respond to different learning styles and levels of cognitive development.

In terms of Natural Science teaching, Educaplay becomes a valuable resource for facilitating the understanding of abstract and complex concepts, while Hernández-Barbosa et al. (2024) mention that technological tools such as Educaplay allow the visualisation of scientific phenomena, the simulation of natural processes and interaction with content in a playful way, which contributes to a deeper and more meaningful learning. From this perspective, Educaplay not only acts as a means of transmitting knowledge, but also as a pedagogical mediator that promotes the active construction of knowledge.

Likewise, research such as that of Marcelo-Veliz (2022) and Tapia-Peralta (2024) warns that the use of technological tools in the classroom not only improves the understanding of content, but also encourages the development of transversal skills such as creativity, collaboration and critical thinking. These skills, essential in the framework of 21st-century competences, are particularly relevant in the teaching of Natural Sciences, where learning is not limited to the memorisation of concepts, but seeks to train students capable of analysing, interpreting and applying scientific knowledge in real contexts.

Development of scientific competences in natural sciences

The development of scientific competences is a central axis in the teaching of Natural Sciences, as these competences allow students to understand natural phenomena, formulate scientific questions, design research, interpret data and make evidence-based decisions. From a pedagogical perspective, these competences not only promote the learning of specific content, but also contribute



to the integral development of the student, fostering skills such as critical thinking, problem solving and scientific literacy (Zompero et al., 2022).

Within the framework of Natural Science pedagogy, scientific competences are understood as a set of cognitive, procedural and attitudinal skills that allow students to interact with scientific knowledge in an active and reflective way. According to Sepúlveda-Obreque et al. (2023), these competences include processes such as systematic observation, hypothesis formulation, experimentation, analysis of results and communication of conclusions. These skills are not only fundamental for learning about natural sciences, but they also have a cross-disciplinary character, in that they contribute to the development of essential life skills such as collaboration, creativity and informed decision-making.

In the Latin American context, research such as that of Ruiz et al. (2016; Cárdenas-Navas & Martínez-Rivera (2021), has indicated that school curricula have limitations in the integration of practical and experimental approaches in the teaching of Natural Sciences. This deficit raises the need to implement innovative pedagogical strategies that promote active and meaningful learning, in which students not only acquire knowledge, but also develop scientific skills that allow them to understand and transform their environment.

From a critical pedagogical perspective, the development of scientific competences also implies an integrative approach that connects scientific knowledge with the social, cultural and environmental contexts of the students. According to González-Abonía & Martínez-Casanova (2019), the CTSA (Science, Technology, Society and Environment) approach in the teaching of Natural Sciences promotes critical reflection on the impact of science and technology on society and the environment, which contributes to the formation of a responsible scientific citizenry, which, combined with the use of technological tools such as Educaplay, allows teachers to design learning experiences that not only address the curricular content, but also foster critical thinking and social awareness in students.



In this sense, the development of scientific competences in natural sciences cannot be understood as an isolated process, but as an integral component of educational training that seeks to prepare students to face the challenges of the contemporary world. The implementation of pedagogical strategies that combine active methodologies, technological resources and interdisciplinary approaches is essential to achieve this objective, especially in the context of basic education, where students are in a transitory stage for the construction of their scientific thinking and their understanding of the natural world.

METHOD

The research was carried out using a quantitative approach, with a non-experimental, descriptive, cross-sectional design, supported by correlational statistics, developing without manipulating the variables and collecting the data at a single moment.

The study population consisted of 385 basic education students belonging to private educational institutions in the city of Quito, Ecuador, which integrate technological tools into their teaching processes.

For data collection, a structured questionnaire was used that evaluated two main dimensions: the use of Educaplay and the development of scientific competences. In the first dimension, the frequency and level of integration of this tool in educational activities was measured, while in the second, skills such as critical thinking, understanding of scientific concepts and the ability to apply knowledge in practical contexts were evaluated. The questionnaire was validated by a panel of five experts in education and technology, and a pilot test was carried out to ensure its clarity. The reliability of the instrument was calculated using Cronbach's alpha coefficient, obtaining a value of 0.87, which indicates a high level of internal consistency.

The research procedure was carried out in several stages. First, the planning was carried out, where the objectives, variables and data collection instruments were defined. Subsequently, the questionnaires were administered, both in person and



online, depending on the conditions of each educational institution. Subsequently, the collected data was processed and analysed using the statistical software SPSS V25, using Spearman's correlation coefficient (Rho) to determine the relationship between the use of Educaplay and the development of scientific competences.

For the statistical analysis, the Spearman correlation coefficient was used due to the ordinal nature of the data, and a statistical significance level of $p < 0.05$ was considered to validate the results.

RESULTS

Based on the data collected, the results obtained in the research are presented:

Table 1. Use of Educaplay and the development of scientific competences in natural sciences.

Educaplay and scientific skills		
Spearman's Rho	Correlation coefficient	,89
	Next (bilateral)	,004
	N	385

Source: Prepared by the author.

The analysis carried out using Spearman's Rho coefficient shows a very strong positive correlation (0.89) between the use of Educaplay and the development of scientific competences, which suggests that the greater the integration of this tool in educational processes, the greater the strengthening of these competences.

The level of statistical significance ($p = 0.004$) confirms that this relationship is not the product of chance, but has statistical consistency in the analysed data. With a sample of 385 participants, the results are consistent and important for pedagogy, highlighting the potential of Educaplay as a didactic resource to promote meaningful learning in the scientific field.

In this sense, we proceed to accept the affirmative hypothesis H1 and reject the null hypothesis H0



Hypothesis test

H1: The use of Educaplay has a favourable impact on the development of scientific competences in natural sciences.

H0: The use of Educaplay does not have a favourable impact on the development of scientific competences in natural sciences.

DISCUSSION

The results of this study, which show a very strong (0.89) and significant ($p = 0.004$) positive correlation between the use of Educaplay and the development of scientific competences, are related to previous research that highlights the impact of technological and methodological tools in the teaching of natural sciences. Among them, Alcívar-Zambrano & Bowen-Mendoza (2024) point out that Educaplay encourages meaningful learning by integrating interactive activities that promote the understanding of scientific concepts, which coincides with the results of this study by showing its potential to strengthen scientific competences in primary school students. This is complemented by the reflections of Busquets, Silva & Larrosa (2016), who argue about the need to adopt new pedagogical approaches that integrate technology to face the challenges of learning in natural sciences.

In this way, in the curricular context, Cárdenas-Navas & Martínez-Rivera (2021), emphasise the importance of aligning school content with tools that foster critical and scientific thinking, which reinforces the relevance of Educaplay as a didactic resource. Similarly, Ruiz et al. (2016) mention that curricula should offer opportunities to develop scientific skills from primary education, suggesting that tools such as Educaplay can be key to achieving this objective. For their part, Zompero et al. (2022) and Hernández-Barbosa et al. (2024) emphasise the importance of epistemic practices and the organisation of content in natural science curricula, suggesting that the use of Educaplay could be integrated more systematically into educational programmes to maximise its impact.

From a didactic perspective, Tapia-Peralta (2024) and Sepúlveda-Obreque et al. (2023) highlight the need to develop scientific competences and critical thinking skills in students, as well as didactic competences in teachers. In this sense,



Educaplay is consolidated as a tool that not only benefits students, but can also be used in teacher training to improve teaching strategies. This approach is complemented by the ideas of Marcelo-Veliz (2022), who highlights the importance of methodological strategies in environmental education, an area that can benefit from the use of interactive platforms such as Educaplay.

On the other hand, research such as that of González-Abonía & Martínez-Casanova (2019) and Jaramillo-Naranjo (2019), approaches the teaching of natural sciences from integrative perspectives, such as the relationship between science, technology, society and the environment (STSE). These perspectives can be enriched by the use of technological tools that allow students to connect scientific concepts with their environment, an objective that Educaplay can facilitate. Likewise, Lozano-Cantú & Villanueva-Gutiérrez (2016), describe the role of the teacher in the implementation of innovative strategies in natural sciences, which reinforces the need to train teachers in the use of tools such as Educaplay.

In consideration, Figueroa-Rojas (2015) and Ortega-Bastidas et al. (2019) comment on the importance of educational evaluation and didactics in the teaching of natural sciences. In this sense, Educaplay not only allows for interactive teaching, but also offers tools to evaluate learning in a dynamic way, which can contribute to a continuous improvement in educational processes.

CONCLUSION

The results obtained show a very strong (0.89) and statistically significant ($p = 0.004$) positive correlation between the use of Educaplay and the development of scientific competences in natural sciences. This confirms that the integration of this technological tool into educational processes has a favourable impact on the strengthening of these competences, which supports the affirmative hypothesis (H1) and allows the rejection of the null hypothesis (H0). Therefore, it is concluded that Educaplay has a high potential to be systematically integrated into educational programmes, contributing to the development of scientific competences from basic education and strengthening the teaching of natural sciences in an innovative technological and pedagogical context.



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CONFLICT OF INTEREST

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