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Análisis del uso de la Modelización (Inteligencia Artificial): un estudio cuasiexperimental para fortalecer los desempeños en las Ciencias Naturales en estudiantes de undécimo grado

Analysis of Modeling Supported by Artificial Intelligence: A Quasi-Experimental Study to Strengthen Performance in Natural Sciences among Eleventh-Grade Students

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ABSTRACT
The purpose of this study is to evaluate the effect of an Artificial Intelligence–based modeling intervention on the performance of eleventh-grade students at Escuela Normal Superior Santa Teresita, specifically in Natural Sciences. Artificial Intelligence with modeling strategies was introduced as an approach to strengthen learning outcomes and competencies in inquiry, problem-solving, and digital literacy. The methodology was framed within an analytical-experimental paradigm, aligned with a quasi-experimental design. The population consisted of the eleventh-grade cohorts of the 2024 academic year, comprising 69 students in total. A repeated-measures ANOVA was applied to determine intra- and inter-group differences, using SPSS version 29. The results showed that the implementation of Artificial Intelligence enhanced students' performance, enabling them to acquire key skills such as creativity, discovery-based learning, and personalized task engagement. In conclusion, AI as a support tool emerges as an innovative resource that facilitates the development of capacities such as anticipation, self-directed learning, computational competencies, and problem-solving abilities..

RESUMEN
La finalidad de este estudio es evaluar el efecto de una intervención de modelización por Inteligencia Artificial en los desempeños de los estudiantes de grado undécimo en la Escuela Normal Superior Santa Teresita, concretamente en las Ciencias Naturales. Se planteó implementar la Inteligencia Artificial con Modelizaciones como una propuesta para fortalecer los aprendizajes y competencias de indagación, resolución de problemas y dominio de competencias digitales. La metodología estuvo enmarcada en el paradigma experimental analítico, alineado con el diseño cuasiexperimental. Se abordo como población los grupos undécimos del año 2024, con 69 estudiantes, en definitiva. Se empleó un tratamiento analítico de ANOVA de comprobaciones repetidas con la intención de deducir las diferenciaciones a nivel de intragrupos e intergrupos por medio del software SPSS versión 29 libre. Los resultados demostraron que, con el uso del Inteligencia Artificial los adolescentes fortalecieron los desempeños, por lo que, adquirieron habilidades fundamentales como la creatividad, aprendizaje por descubrimiento y personalización del trabajo. En conclusión, la IA como herramienta de apoyo se establece como una herramienta novedosa, que posibilita el dominio de capacidades como la anticipación, el autoaprendizaje, competencias computacionales y la capacidad de resolución de problemas.

KEYWORDS · PALABRAS CLAVES
Artificial Intelligence; Natural Sciences; Creativity; Modeling; Active learning.
Inteligencia Artificial; Ciencias Naturales; capacidad creadora; Modelling; Aprendizaje activo.

1. Introduction

The implementation of Artificial Intelligence (AI) in the classrooms has been considered a topic of great impact in the Natural Science teaching in the educational institutions (Gomez and Sanchez, 2024), that promotes a more efficient and enriching learning in the students (Valencia & Figueroa, 2023).

Undoubtedly, Artificial Intelligence in the education offers multiple significant benefits. It guarantees a personalized learning through flexible systems that adapt the contents to the specific needs of each student (Cervantes et al., 2024). Besides, it automates interactive activities, making time for teaching and improving the efficiency in the educational management. It also simplifies the preparation of didactic materials and provides immediate feedback processes, which fosters a more effective and comprehensible learning (Anchapaxi et al., 2024).

Evidently, one of the most relevant problems is the lack of comprehension and training, both from teachers and institutions, to integrate in a decisive way the Artificial Intelligence in the teaching methods (Flores & Peña, 2024). Further, the uncertainty persists on a possible dehumanization of the formative process in and outside the classroom, as well as the loss of personal interaction between students and teachers, a key element in the learning processes specially in the Natural Science scope (Méndez, 2024).

Persuasively, Almasri (2024), points that Natural Science teaching through the use of Artificial Intelligence faces different transcendental challenges. One of the main challenges is to guarantee the quality and accuracy of the data used by the AI systems, since if these are not relevant or trustworthy, they could provide wrong feedback to the students, significantly affecting their learning process. Besides, Rodríguez & Genes (2024) agree in keeping that the opposition to change by some educators and students could obstruct the suitable implementation of the Artificial Intelligence, creating queries about the teacher's role.

In Colombia, few studies have been reported, some convincing researches such as the one by Lancheros & Vesga (2024), titled Implementation of the Augmented Reality, Virtual Reality and Artificial Intelligence in Secondary Education. In addition, Cervantes et al. (2024) on his paper titled incidencia de la Inteligencia Artificial en la Institución Universitaria Americana en la ciudad de Barranquilla. Finally, Numa et al. (2024), researched the quality of the Artificial Intelligence in the 21st century education and concluded that education and preparation is prevailing through the correct use of AI.

In this context, the researchers of this study, different factors were identified that influenced in the scarce incorporation of the Artificial Intelligence in the education of young students from eleventh grade at Escuela Normal Superior Santa Teresita in Lorica, Córdoba, Colombia. Among those factors, the ones that highlighted are the limited availability of technological resources, insufficient information and disposition of the teachers, as well as the institutional politics that ultimately made its implementation difficult.

In effect, the use of Artificial Intelligence can automate administrative tasks, facilitating teachers the appropriation of this resource in teaching in a more supported way (Benítez, 2025). In addition, this technological tool, facilitates the analysis of abundant information supplying worthy perceptions to optimize the study plans and the pedagogical strategies (Flores & Peña, 2024). Therefore, the objective of this research was to evaluate the effect of an intervention of modeling by Artificial Intelligence in the performances of eleventh grade students at Escuela Normal Superior Santa Teresita, specifically in Natural Science. Year 2024.

2. Theoretical foundation of the variable studied

2.1. Artificial Intelligence

The Artificial Intelligence represents the revolution the education field, since it seeks to implement technological resources to transform the way in which educators teach, and how the learning is executed inside and outside the classrooms, adapting the tematic units studied at school and the methodologies according to the needs of each student, which produces a more significant improvement of the expected performances.

2.2. Modeling in Teaching

The modeling in teaching is a educative method that develops the complex comprehension of the simplified representations of concepts, facts and phenomena of certain complex processes. This method seeks that students could be able to identify, visualize and manage abstract ideas through schems, simulators, graphics and other visual resources (Li et al., 2025).

In education, the modeling is applied as a revealing alternative in areas such as science, mathematics and technology, favoring the curiosity and the exploration of the students through predictions, problem solving and discovering (Wang et al., 2021).

2.3. Competences in Natural Science

According to Ministerio de Educacion Nacional (MEN) of Colombia, the competences in Natural Science are built to strenghthen in students a deep comprenhension of the natural environment and the capacity to interact with it in a reflexive and responsible way. These competences are adjusted with the curriculum guidelines, the Basic Competency Standards (Estándares Básicos de Competencias (EBC)) and the Learning Basic Rights (DBA), providing a educative frame for the development of performances and relevant learning to the scientific skills (MEN, 2006).

3. Methodology

The executed studied is derived from the formative experiences that are fundamented in the educational relaity of the young students from eleventh grade at Escuela Normal Superior Santa Teresita. In this research proposal, the experimental analytic paradigm was implemented, with a quantitive approach (Smith & Rayfield, 2017), since it frames the statistic data collection from the previous characterization and analysis of these. Likewise, the data obtained were sequentially examined to make the respective comparisons based on the worked hypothesis complying with the implemented method (Han & Lee, 2022).

It is proposed, to contrast the findings with the initial reality of the addressed population, through the respective statistic treatment in the pratice, as well as comparative intervention. Statiscally, the above implies to complement the extraction of information with the analysis of the final achievements and, besides, the description of the variables of the research topic, to later, make right decisions (Olney, 2025).

3.1. Design

Based on what has been stated, the quasiexperimental model was executed, since it favors in a regulated way an order in the research, specifically for the addressed population. However, in this perspective, and cosidering that the designed method could not be random with the dispersion measurments in the researched groups, it was determined, in first place, the establishment of the samples of the studied groups (Smith & Rayfield, 2017).

Under the mentioned circumstances, the Artificial intelligence was implemented (AI) in the teaching of Natural Science through the modeling processes, which consist on recognizing original schemes, modifying and designing archetypes in an organized way to address prediction challenges. These formative aspects are carried out from the planning, the development and evaluation of the interdisciplinary research experiences in the school.

With this apprach, a diagnostic test was applied, a follow – up evaluation and, finally, a clousure test. These analysis were done at the beginning, along the academic year and at the end of it, always considering the proposed objectives for the education and formation in Natural Science. Consequently, the implemented methodological approach in this research adjusts to a quasiexperimental model of temporary series, since the evaluation system is continuous and is carried out in different moments during the study, as shown on Table 1.

Table 1

Quasiexperimental Method in cronological order

Treatment of equivalences	Group	Test 1 (diagnostic)	Appication of Artificial Intelligence (AI)	Test 2 (follow - up)	Appication of Artificial Intelligence (AI)	Test 3 (Clousure)
	E	O1	X1	O2	X2	O3
	C	O4		O5		O6

Source: adapted from Rodríguez & Genes (2024).

3.2. Population and sample

The addressed population was the eleventh grade, that involves two groups belonging to the last year of secondary education (2024). The first one, denominated the control group (eleventh A, with 35 students), and the second one, the experimental group (eleventh B, with 34 students). All the students were legally enrolled at Escuela Normal Superior Santa Teresita, located in the town of Santa Cruz de Lorica, Còrdoba, Colombia (See table 2).

Table 2

Sample of the study

	Eleventh A	Eleventh B	Total
Group	Control	Experimental	
Intervention	None	Use of Artificial Intelligence (Modeling)	
Number of students	34	35	69

Source: adapted from Rodríguez & Genes (2024).

It should be noted that, the Student t test was used to analyze the variations between the two studied groups (McMillan y Schumacher, 2014). The control group corresponded to the grade without the technological intervention (use of Artificial Intelligence), while the experimental group was the one that the treatment was applied. For this analysis, the used evaluative notes were assumed as an equivalence test, according to the obtained data in the evaluations carried out in the form of multiple – choice questions with a single answer. Therefore, the groups were equivalent in the evaluation related to the use of the Artificial Intelligence.

3.3. Research hypothesis

H0: There are no significant differences in the Natural Science performances (cognitive, procedural and attitudinal processes) among students that get modeling interevention mediated by Artificial Intelligence (AI), and those who are not intervened, neither between the mediations pretest nor postest.

H1: The students that participate in the modelin intervention assited by AI present significant improvements in the Natural Science performances (cognitive, procedural and attitudinal processes) in the comparison pretest – postest, in relation with the control group.

3.4. Techniques and instruments

Three phases were configured. In first place, a diagnostic test was developed; later, an additional follow – up test; and, by last, a clousure test (final test). In fact, every test was designed with twenty multiple – choice questions and a single answer, all of them focused and elaborated according to the guidelines and Basic Competency Standards (Estándares Básicos de Competencias) (MEN, 2006), as well as the Basinc Learning Rights (DBA) for Natural Science.

Each built item had the purpose to reveal the knowledge and performances of the students in relation to the stablished competencies for the natural science. Therefore, it was determined the operationalization of the variables in the following way: the independent variable was the use of the Artificial Intelligence, and the dependent variable corresponded to the learning of the students in the natural science field. From this perspective the adopted method, the reliability and validity of every question were evaluated with the consento of five expert teachers in the field, with postgrduate studies or doctorate degree, besides with formative experience of ten years in the vocational secondary education.

For the measurement of the validity, the corelation of Pearson (Cohen et al., 2003) yielded a positive value over 0,809, which indicates an acceptable rank for the built items in every test. Regarding reliability (Faplan & Saccuzzo, 2017), a high corelation of r = 0,746, p < 0,01 bilateral was observed, which admits deducting a significant proximity to one and statistic separation from zero.

3.5. Data analysis

For the data treatment, an analysis was carried out with the objective to stablish the simple and centered estimations of the ANOVA tests (Analysis of Variance), in order to compare the means and their discrepancies at the intragroup and intergroup levels. Thus, the sofotware SPSS version 29 libre was used. The statistic treatment and its grouped method corresponded in total to the design quasiexperimental model, with intact sets and cronological series, distributed in three evaluations carried out un sequencial phases. In accordance to the reliability analysis the Cronbach's Alfa index was applied.

All the sufficient details must be provided for the reader to comprehend and confirm the development of the research. The methods already published must be indicated by a reference.

With reference to the numbering system, we indicate that when the unit has the zero vlaue, this one does not settle, using period instead of comma, as it is recommended by APA. Example: "p < .005". The thousand units, for their part, will be separated with a comma and the decimals with a period: 1,532.27.3.

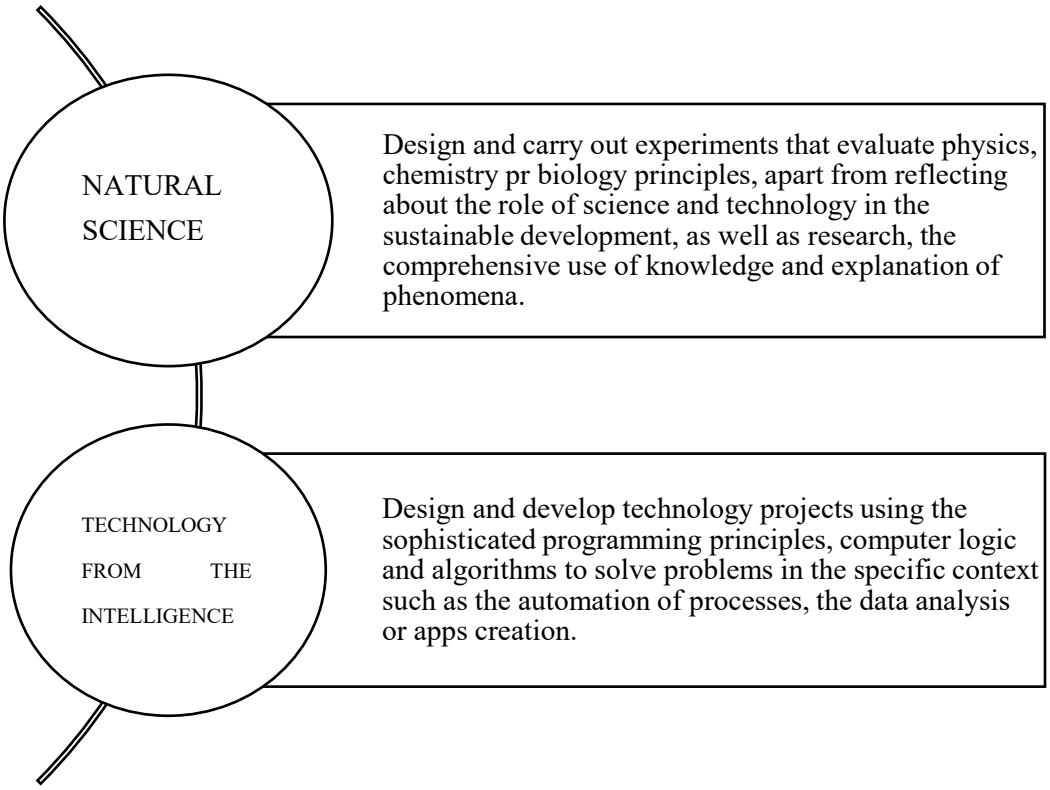
4. Analysis and results

4.1. Design and pedagogical intervention of the Artificial Intelligence use.

The integration of Artificial Intelligence (AI) in the teaching of natural science, through the modeling processes, is inspiring the possible progression itineraries in knowledge, increasingly aligning with the pedagogical guidelines with the educative standards. This specifically includes the Information Technology area stablished by the National Government (MEN) and the curriculum guidelines for natural science and environmental education (MEN). The figure 1 illustrates the proposed objectives by MEN regarding the natural science and information technology competency, critical thinking skills and natural phenomena comprehension through advanced technological tools such as Artificial Intelligence.

Figure 1

Educative objectives (Basic Competency Standards in natural science, and curriculum guidelines for information technology focused on Artificial Intelligence).



To determine the sequentiality of the activities, initially an evaluation of the reliability coefficient was carried out as a valuation of the solidity, with the objective of stablishing the similarity of designed tests. It is important to highlight that for the presentation of the informed consent, communication processes were carried out with the parents, the school administration and teachers, informing them about the educational intentions of the study. Later, different evaluations were carried out in the subsequent stages of the project for the two selected grades.

Within the pedagogical intervention, through the modeling processes in the natural science teaching, practice fields were implemented using Artificial Intelligence. In this mediation different encounters and educational spaces were organized, such as, practical workshops through digital tools and integrated activities that were carried out during 50 minutes every day along the week.

4.2. Diagnostic test evaluation: study of discrepancies between the groups.

Initially, an evaluation was carried out before the pedagogical mediation, denominated diagnostic test. The desgined exam included related questions to the attitude of the students from eleventh grade, organized according to the stablished objectives by the Colombian state for the science and technology education. In this way, it was corroborated the intact group (Eleventh A) and the experimental group (Eleventh B).

This intragroup diagnostic test allowed to make a statistical avarage contrast of both groups (Table 5) and obtain real results in function of the motivation of the students. The data were confronted considering the measure of dispersion regarding their corresponded means, which allowed to verify the differences between the groups.

Table 3

Purposes of Artificial Intelligence in learning

Purposes	
Basic Competency Standards	Curriculum guidelines
Natural Science	Information technology
PCC	PCTI
Boost the critical and scientific thinking development, the biological, physic and chemical changes of nature from the different models. Model the nature phenomena based on the analysis of variables, the relation between two or more concepts of scientific knowledge and the derived evidence of scientific researches. (MEN, 2006, p.113).	Promote the skills as the problem solving, making use of the digital tools such as TIC.

In relation to table 3, the purposes to promote favorables attitudes towards the natural science and technology are resumed in the following way: PCC, refers to the scientific reasoning and correct application of its theories; PCTI, encompasses computing, computing logic thinking, life and comprehend nature in a deeper way.

Table 4

Diagnostic test intergroup univariate

	Test	Mean (intervined group)	Mean (control group)	|GE-GC|	F	p
PCC (10 questions)	1	2,8	3,02	0,13	1,04	0.99
PCTI (10 questions)	1	3,4	3,22	0,08	0,0216	0,443

Note. F: Snedecor test: In its analysis, a higher piece of information stablishes that the difference between the means; F. has been obtained through p=0,05 (SPSS, version 29).

The hypotesis H0 can be statistically corroborated if the p value is higher to 0,05. In relation with table 4, it is categorically supported that, in the initial diagnostic test, there were no statistically significant variations between the obtained results from the eleventh A and B groups. For this reason, the data do not show discrepancies between the two courses in this

phase of the implemented educational implemented process. In this way, it was determined that the first purpose, aimed to promote the perfomances of the students, that is, PCC, registred a value of 1,06 in the Snedecor, with a p=0,99, higher to a 0,05; while the the PCTI purpose reached a value of 0,216 in the statistic F, with a p=0,443, also higher to 0,05.

It is notable that the fluctuations of the analyzed means are minimun, which means that the results are similar in the eleventh grade A and B, considered as intact and experimental group respectively. Therefore, the carried out analyses in this initial phase, known as the diagnstic test, are addressed to highlight the alternative hypothesis (H1) and accept the null hypothesis (H_0). This points that, before the intervention, an equivalence in the position of all of the students existed regarding the mentioned areas in this research.

Table 5

Estimation between the score of Escuela Normal Superior Santa Teresita and the mean of the diagnostic test.

Group	Intervened		Control	
Dimension	PCC	PCTI	PCC	PCTI
Average	2,8	3,03	3,1	3,18
Scale of the school	2,33	2,64	2,5	2,8
Performance	Low	Low	Low	Low

Source: own elaboration adapted from Rodríguez and Genes (2024).

According to the stipulated liberties on the Decree 1290 of 2008, the Escuela Normal Superior Santa Teresita grants the following performance evaluative institutional levels: the interval of 4,69 to 5,0 corresponds to a higher performance, the rank from 4,0 to 4,59, corresponds to a high performance; between 3,0 and 3,99 is the basic level; and, finally, from 1 to 2,99 is classified as low performance.

Therefore, the shown results on table 5 clearly evidence that the attitude of the students were inadequate (low performance level) during the beginning and development of the modeling project supported with Artificial Intelligence (AI) in the natural science teaching, probably due to the application of a strict and lineal approach in the learning spaces, which reflects the use of traditional teaching methods.

Table 6

ANOVA test analysis of repeated means combined between intragroups and intergroups.

Effects	Intragroups		Intergroups		Interaction	
Variables	F	p	F	p	F	p
PCC	15,220	0,000*	3,998	0,012	2,875	0,028
PCTI	32,404	0,000*	14,989	0,000*	2, 723	0,012

Note: In the analysis, it waw considered the route with inferior and superior limits, the assumed sphericity and the Greenhouse – Geisser method.

The information on table 6 evidences a remarkable change between the groups regarding the Snedecor F test. For the variable PCC, this F rate was situated in the interval of 2.875, with a *p*=0.028, lower to 0.05. In the same way, PCTI registered an F value of 2.723 and a *p*=0.012, also lower to 0.05. Thus, it is observed that when implementing the assisted modeling with Artificial Intelligence (AI) in the natural science teaching; the students are enthusiastic and develop significant competencies as Flores & Peña (2024) state.

Morover, the previous results show statistic statistical approximations to a intragroup level, which indicate that, thrrough the implementation of an attractive educational methodology, the values were statistically variable. Therfore, the result of the F test for the PCCA was 15.220, with a p = 0.000, lower to 0.05; while the PCTI, with a value of 32.404 in the Snedecor F test, presented a p = 0.000, also lower to 0.05.

However, it becomes vital to determine if the detected variations in the groups were attributed to the exclusionary processes or, on the contrary, the fluctuating dynamics were ariginated due to the interactions. Therefore, it is necessary to stablish if the ocurred modifications in both groups during this phase if the project were distinguishing or not.

To achieve this objective, the treatment that referst to the interaction, as it indicates that the PCC registered a value of 2.875 in the statistic F and a p = 0.028, lower to 0.05; while in the PCTI, it was determined an F of 2.723 and a p = 0.012 also lower to 0.05. In this way, it is possible to determine that significant changes were done in the implementation, the programming, the design and teaching execution of Natural Science through the Artificial Intelligence for the modeling in the eleveth grade. This can be confirmed in the carried out researches by León et Al. (2023) that acknowledge these teaching methods for their efficiency and pedagogical impact, which promotes positive performances and develop fundamental skills in the science and technology field.

From this point of view, the results found allow to infer that teaching trough assisted modeling with Artificial Intelligence in the natural science has a big effect and reliability as pedagogical intervention resource (Amírez, 2023). Through this methodology, it was possible to stimulate competencies in the students, encouraging them to approach in a natural and enjoyable way to the knowledge linked to the analyzed areas and studied disciplines. Thanks to this strategy the teaching developed stages around the modeling projects promoted different skills: from discovery learning, collaborative work, autonomous learning, computing – thinking and critical thinking to problem – solving based projects.

In relation to table 7, it is shown the development and progress of the students from the beginning of the project until the final phase, with the implementation of Artificial Intelligence for the modeling of the learning process. This phase begins with the incorporation of Natural Science and Information Technology. Besides, a comparison is presented between the control group and the experimental group.

Table 7

Modified global evaluation according to the evaluation scale of Escuela Normal Superior Santa Teresita

	Control group (eleventh A)								
	Diagnostic test			Follow – up test			Final test		
	MV	PE	EC	MV	PE	EC	MV	PE	EC
PCC	1.90	1.80	DBA	3.18	3.52	DBS	3.30	3.52	DBS
PCTI	2.10	2.11	DBA	2.80	3.15	DBA	2.50	2.99	DBA

Note. On the table MV = valid items mean; PE = school scale appreciation; EC = qualitative scale (DS=desempeño superior, DA=desempeño alto, DBS=desempeño básico and DBA=desempeño bajo).

The table 7 presents, the obtained ratings at the beginning of the project, when Artificial Intelligence (AI) had not been used yet in the Natural Science teaching through modeling, which grants that the groups were in the same conditions. In the control group, the scores of the PCC were 1.80, 3.52 and 3.52, considerably low values, which indicate a performance between low and basic; this implies low performances towards the Natural Science. For the PCTI, the scores were 2.11, 3.15 and 2.99, which evidences, in a clear way, that maybe the used strategies are not the suitable ones to instruct the students in the Science knowledge, this can be verified with the contributions Flores & Peña (2024).

By contrast, in the experimental group – it means, in the intervened group by the modeling supported with Artificial Intelligence -, the scores of PCC were 2.70, 4.50 and 4.60, extremely motivating numbers that evidence important results and show that the attitude towards the Natural Science experimented a significative progress. In terms of PCTI, the scores 3.81, 4.44 and 4.80 clearly evidence that the students showed interest for technology and that, through the modeling methods with Artificial Intelligence, reveals the significative learning as mentioned by Amírez (2023).

5. Discussion

The objective of this study was to analyze the impact of the educative approach of the modeling supported with Artificial Intelligence in the performances of the students from eleventh grade at Escuela Normal Superior Santa Teresita, concretely in the Natural Science. With the development of Artificial Intelligence in the formative experiences, solid and significant data were obtained that demonstrate the adequate learning and performances in the students regarding the Natural Science competencies.

Likewise, through the pedagogical mediation competencies linked to research were promoted, the prediction of results, critical thinking and creativity, which allowed the students exercise a more solid control over the knowledge and the work done from the interdisciplinary pedagogical experiences.

Consequently, the intervined group, as well as with the guidelines and possibilities that offer the Artificial Intelligence from a modeling perspective, significant advances were done with the adoption and the development of skills such as research, the comprehensive use of knowledge and explanation of phenomena in the Natural Science area. These appreciations keep coherence with the study carried out by Lancheros & Vesga (2024), who contributed selected data about the application of Artificial Intelligence in school contexts, with the condition that, anytime a planned work is carried out and executed from a multi – disciplinary and curricular approach. This allows to establish bonds between the mandatory subjects and technology, building spaces for significative learning.

Besides, Cervantes et al. (2024) concluded that teachers act as innovation agents, transforming their educational practice and providing feedback on teaching in an attractive and passionate way. When incorporating technologies, promoting curiosity in the students, such as emotions and positive feelings that can integrate to their daily life (Sein et al., 2025).

It is important to highlight, that the learning personalization, emerged from the use of Artificial Intelligence, is presented as a definitive factor in the processes through which the students incorporate knowledge and competencies in the Natural Science subject (Lee et al., 2025).

The personalization, in consequence, strengthens the autonomy, the motivational processes and the domain of contents, which is enhanced by the interdisciplinary pedagogical practices and by the interaction of more real contexts, adapted to the conditions and needs of the students.

On the other hand, Almasri (2024) claims that the automation of pedagogical actions inside and outside the classroom is presented as an element that reduces the teachers‘ traditional tasks, allowing them focus their abilities and initiatives in more reflexive processes and individual attention. In this way, repetitive activities such as findings review and field practices can be addressed in a consitent way through the use of Artificial Intelligence, which creates a more flexible time of more personalized assistance. This facilitates the learning analysis and the students‘ feedback the search of solutions to the identified situations and the investigative experiences (Wang et al., 2024).

Commonly, the automated evaluations facilitate the progress in the aggregated that the teachers implement during thr development of formative spaces. A sample of it is the follow – up and the competencies evaluation of the students, which can be boosted through algorithms based on Artificial Intelligence (Li et al., 2025).

These mediations, through the technological digital resources managed by Artificial Intelligence, transform and consolidate the teachers function from a more practical perspective. In turn, they promote the building of skills and necessary knowledge to configure an innovative surrounding with solid educative practices in Natural Science (Rodríguez & Genes, 2024).

It was noticed that the intervened group, through the use of Artificial intelligence and the modeling process, clearly demonstrated that it is possible to enrich the formative and experiential structures of the students. This was achieved through the significative implementation of technological tools that promoted the self – knowledge, creativity, the development of digital competencies and, specially, the ability to analyze, deduct and propose new ideas regarding the preexisting models (Anchapaxi et al., 2024).

Consequently, the students, through the experience of interdisciplinary practices in nearby contexts to school, develop interactor learning from a collaborative construction figure, which allow them create significative knowledge and appropiate of key elements for their education (Lancheros & Vesga, 2024). From this argumentation, the hypothesis testing and the validation of knowledge, the students learn discovering and interacting in sociocultural surroundings facilitated by the planning and intentions of the teachers and mentors (Numa et al., 2024).

In property, the science and Artificial Intelligence favor the self – learning allowing the construction of formative itineraries that promote the autonomy guided through the use of modeling. This process articulates with the development of digital competencies in interactive surroundings, where the criticality and the right use of technology configure a stimulating space of work, projection and collaboration, guided to the search of innovative alternatives that contribute to relevant and effective formative processes (Cervantes et al., 2024).

Thereby, the appreciations previously described are consciously linked to the constructivist and humanist approach that found the educative routes of Escuela Normal Superior Santa Teresita, where the students complement their knowledge with the experience and contact with the near communities of the municipality of Lorica-Córdoba, Colombia.

As to the problem – solving capacity and the developed creativity through the use of the Artificial Intelligence give the youngs fundamental tools to face challenges, analyze, check and elaborate new and different solutions facing the situations that emerge in the experience and the interdisciplinary practices. All this articulates with the thoughts of Gómez y Sánchez (2024) who indicated that, with the comprehension of the nature and the social contexts with which the students interact, this, later allows them to make informed choices and critically evaluate the addressed realities.

In this regard, the use of Artificial Intelligence, as part of the educative modernization process, a powerful tool is established to create knowledge and performances in the Natural Science subject, developing key skills in the students for their access and projection to higher education. This purpose can be reached through the adequate attitude, the use of infrastructure and relevant technological endowment, and, above all, with the training and teacher qualification, essential factors to propitiate positive learning actions and the development of scientific competencies.

6. Conclusions

In conclusion, the result showed that the assisted intervention by the supported modeling with the Artificial Intelligence (AI) contributes with the strengthening of the performances in Natural Science with the eleventh grade students. Besides, the designed program had concordance with the curricular planning, this, consciously announces the reinforcement of important processes in the cognition and conceptual comprehension demonstrating that modeling favors the creativity, problem – solving ability and anticipation creating a positive impact. In the procedural processes, relevant demonstrations were revealed to the elaboration of conjectures, interpration of archetypes and phenomena explanation. And in the attitudinal part it was notorious some advances in the interest and attraction with tools of Artificial Intelligence.

Consequently, the use of AI favors the adquisition of practical knowledge and digital competencies, besides the collaborative dynamics that are adquired in the group work.

The ANOVA analysis of repeated means manifestated with the intervened group elicited favorable performances in the three addressed processes, corroborating the alternative hypothesis, referred to the positive effects of modeling mediated by the AI, this, opens the consequent hinge to generate significative knowledge in Natural Science, keys for the ability to recognize and analyze possible solutions valid to the present facts in the adjacent stages of every school, and at the same time promote a better attitude towards learning.

Interest conflict

The authors of the article claim that there is no conflict to state.

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