Artificial Intelligence-AI to Improve Learning Achievements in Technical High School Students Specialization in Accounting

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Abstract

This research aimed to investigate if an artificial intelligence-based program improves financial reporting skills among technical-accounting high school students in Ecuador in 2023. The study employed an applied methodology, quantitative approach, and quasi-experimental design, involving a population of 183 students. A census sample of 80 students was divided into control and experimental groups, each with 40 students, where pretests and posttests were administered.

The pretest results showed that 35 participants in the control group (87.5%) had a low level of knowledge, while 90% (36 participants) in the experimental group also displayed a low level of understanding regarding financial report management. After the program's implementation, the control group maintained an 87.50% low knowledge level in financial report management, while the experimental group demonstrated that 95% exhibited a high proficiency level in financial report management. Analyzing the significant differences yielded a p-value of 0.00 < 0.05, supporting the hypothesis that artificial intelligence had a highly significant impact on enhancing financial reporting skills.

Keywords: *Program, artificial intelligence, financial reports, financial education.*

INTRODUCTION

The global demand for professionals with skills in accounting and finance areas, combined with an effective mastery of technology, is growing significantly. Authors such as Tonysé (2020), Bonami et al. (2020) and James et al. (2018) It emphasizes the expansion of international markets that require financial experts to handle complex financial information. Advances in artificial intelligence (AI), according to Craglia et al.

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(2018) and Pérez et al.(2023), are transforming accounting and finance functions, although they face challenges such as a lack of teacher training (López de la Cruz & Arévalo Vidal, 2022; Mejía Soto, 2019; Ponce, Julio: et, 2019). This study focuses on how an AI-based program can improve financial reporting management in technical-accounting high school students in Guayaquil, Ecuador, a region where, according to Espinoza et al. (2021), inadequate financial training has been identified. Merging artificial intelligence in education is essential to building a more equitable and prosperous society, as Villares suggests (2021).

The need to integrate advanced technologies such as AI into financial education is becoming increasingly pressing. According to research by Serna M. (2020), incorporating cutting-edge technologies into the educational curriculum not only improves student understanding, but also prepares future professionals for the challenges of the global marketplace. In addition, authors such as Álvarez-Herrero (2021) They emphasize the importance of adapting teaching methods to emerging technological trends to ensure relevant and up-to-date education.

The Ecuadorian context, especially in regions such as Guayaquil, presents unique challenges in terms of educational resources and access to advanced technologies. According to studies by Durán Macedo (2022), many educational institutions in Ecuador still struggle to incorporate digital technologies into their pedagogical practices. This deficit highlights the urgency of exploring and validating innovative approaches such as the use of AI in technical education. The present research seeks not only to evaluate the effectiveness of an AI program in improving financial skills, but also to propose a pedagogical model that can be replicated in other educational institutions in the country.

METHODOLOGY

Type and design of research:

Type of research:

This research is of an applied type, characterized by its focus on the use of the knowledge obtained, as pointed out by Holguer et al. (2021) According to Concytec (2018), the purpose of this type of research is to employ scientific understanding in the selection of methodologies, protocols, and technologies needed to address a specific and identified need. Romero et al. (2021) They also describe this type of research as practical or empirical, highlighting its focus on the implementation and use of the knowledge acquired. Unlike other types, applied research is intimately related to fundamental research.

The form of inquiry is of a quantitative type, where the author refers to how the main emphasis of this approach lies in the examination of phenomena that can be observed and measured. Employing empirical-analytical methodology, this approach uses statistical tests to analyze the collected data (Claudia et al., 2020).

Research Design:

The perspective considered in this study is of a quasi-experimental nature, where the authors Hernández and Mendoza (2018) They express that it refers to pre-existing groups in experiments that are not formed randomly but are intact, their conformation and reason are alien to the experiment.

When conducting quasi-experimental research, it is essential to develop hypotheses that establish a connection between independent and dependent variables. In addition, alternative hypotheses incorporating control variables should also be formulated (Cohen & Gómez, 2019).

It is highlighted that in terms of research design Arévalo et al. (2020), the researcher formulates a plan or strategy to acquire the necessary information.

With an exploratory scope that, according to Cabezas et al. (2018) Research is conducted to explore topics or problems that are little studied, and therefore full of uncertainties or not previously explored.

It is shown as follows:

$$GE \quad O_1 \quad X \quad O_2$$
$$\text{---}$$
$$GC \quad O_3 \quad - \quad O_4$$
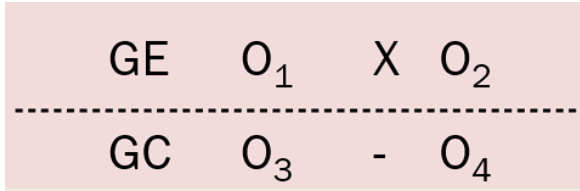
Where:
GE. Experimental group
GC. Control Group
X. Treatment or Independent Variable (Program)
01- Pre-test
O2 Post test
O3 Pre-test
O4 Post test

Variables and operationalization:

Independent Variable: Program based on Artificial Intelligence

Dependent variable: Management of financial reports

Operationalization of variables

The dimensions of the variables are detailed in the annex

Population:

According to this approach, the authors Hadi et al. (2023) They cite as a population the set of individuals or elements from which information or knowledge is sought, known as the research population. This population, in the context of a scientific study, consists of individuals or elements with different characteristics, about which inferences or generalizations are intended to be derived. Therefore, these have shared attributes (based on selection criteria: inclusion and exclusion), which are analyzed by the researcher. These attributes allow generalizations to be made from the observation of the sample.

On the other hand, it can be identified that the population is accessible by referring to a group that is easily accessible to the researcher, either because of its physical proximity or because of its availability through various forms of media communication (Hadi et al., 2023).

Board 1. Total population of technical-accounting high school students.

Población Total De Estudiantes Bachillerato Técnico- Contable.

	Males	Women
First Accounting "A"	17	18
First Accounting "B"	20	20
Second Accounting "A"	20	17
Second Accounting "B"	20	20

Third Accounting "A"	16	15
Total	93	90

Note: List of CAS- Leonidas Ortega Moreira Educational Unit

• Inclusion criteria: Students in the second year of technical-accounting baccalaureate, students whose representatives have authorized the evaluation process by rubric, students who are enrolled in the tax system during the 2023-2024 school year

• Exclusion Criteria: This study excludes students who are not in the second year of high school enrolled in 2023-2024, those without authorization from their representatives to be evaluated, dropouts or in a situation of vulnerability, those in the first year of high school due to their lack of previous accounting knowledge, and those in the third year of high school without pedagogical reports that show their deficiencies.

Sample: According to the study, the sample size used is second-year technical-accounting high school students, made up as follows:

Board 2. Sample of Technical-Accounting Baccalaureate Students

Muestra De Estudiantes Bachillerato Técnico- Contable

Groups	Number
Research Group	40
Second Accounting "A"	
Control Group	40
Second Accounting "B"	
Total	80

Note: List of students of the Leonidas Ortega Moreira Educational Unit

Sampling

This study, non-probabilistic and for convenience, carefully analyzes how the modification of one variable impacts another, accurately evaluating the results. Non-probability sampling, according to the authors Hernández and Mendoza (2018), means that the selection of subjects for the sample is not based on equality of probabilities.

Data collection techniques and instruments:

According to Ríos (2017), techniques represent the conceptual aspect of the process. They serve as the researcher's means of collecting data and thus dictate the choice of instruments to be employed, when selecting a technique, it is imperative to accurately define the problem being investigated, consider the attributes of the units being analyzed, determine the nature and extent of control over the variables, and evaluate the available resources.

The technique to be used will be observation, which is why it was used as a tool to collect information through an evaluative rubric. According to the author Benítez (2022), "observation involves knowing reality directly through the interaction between the observer and the object or phenomenon to be studied, using the senses as a means to gather information and understand reality in a tangible way".

To this end, an Evaluative Rubric was used as a data collection instrument using the rubric technique, defined by the author Crespo (2022) "as the objective is to certify the level of learning achieved qualitatively and quantitatively, through various activities or work suggestions". Therefore, "when developing a rubric, the teacher, as a learning

evaluator, must consider a series of elements that give it distinctive characteristics" (Cabezas et al., 2018).

The validity of the instrument was carried out through the judgment of 03 experts who endorsed the work reflected in this rubric in order to be able to apply it to the students of technical accounting baccalaureate.

The concept of validity ensures that results remain consistent and comparable across diverse sample groups. This consistency persists regardless of the context in which the results were initially derived. Reliability will be determined by Cronbach's Alpha index, where according to the author Caycho (2017) this index is recognized to determine reliability using internal consistency, it provides us with information on how much of the variability in the data is due to the actual differences between the subjects, and how much could be the product of errors in the measurement.

Within the established parameters, it can be indicated that a pilot test was carried out where a Cronbach's alpha of 0.919 was obtained.

Procedures

The mode of information collection was provided in an observatory way, measuring the knowledge of the students through an evaluative rubric referring to the research topic, focusing on the use of artificial intelligence in the management of financial reports, where several work sessions were planned to be explained and implemented through workshops where the students of the second year of high school will have the opportunity to generate a broader knowledge in the field of financial reporting. Management of the different accounting complements, their accounts and other accounting records to be used. With the endorsement of the school authority and the consent of the legal guardians of the students of the second year of technical-accounting high school, in the participation of the students there was a research group with a total of 40 students (Second Baccalaureate "A") and a control group of 40 students (Second Baccalaureate "B" respectively).

Data Analysis Method

Test data was analyzed using IBM SPSS Statistics v25. By using the program, it was feasible to interpret the data collected and analyze the conclusions drawn from them. As a result, the data were carried out through an exhaustive analysis and the results were interpreted with meticulous precision where the statistical significance of the variables was studied: Program based on artificial intelligence and Management of accounting reports.

Ethical aspects:

Following the guidelines of the Manual of Ethics for Research of the César Vallejo University. RCUN°0340-2021 UCV, the research was carried out with high ethical standards. The participants underwent an evaluation process and their participation was completely voluntary, without any coercion, obtaining informed consent from the school authority and legal representatives. The research had an altruistic purpose, seeking the greatest benefit for all involved. With great emphasis on fairness during the implementation of the investigation, ensuring the equitable and impartial use of the data collected. The research study was carried out with a high degree of professionalism and transparency, respecting scientific principles. Respect for employees was maintained throughout each phase of the evaluation procedure, avoiding derogatory or negative comments. Scientific rigor was maintained at all times to prevent any case of plagiarism and preserve the integrity and credibility of the research.

RESULTS

PRETEST

To measure the management of financial reports in students of the technical-accounting baccalaureate, before the implementation of the program based on artificial intelligence.

Board 3. Management of financial reports before implementing the program based on artificial intelligence.

Management of financial reports before implementing the program based on artificial intelligence.

	Total_prete_GC		Total_Prete_GE	
	number	%	number	%
Low	35	87.5%	36	90,0%
Medium-low	5	12.5%	4	10,0%
Middle	0	0,0%	0	0,0%
High	0	0,0%	0	0,0%
Total	40	100,0%	40	100,0%

The general table of the variable "Financial Reports" prior to the quasi-experiment revealed a predominance of a low level of understanding in both experimental conditions. In the Control Group, 87.5% of the participants were at this level, while in the Experimental Group, this percentage increased slightly to 90.0%. A small proportion of participants was observed in the lower middle level, with 12.5% for the Control Group and 10.0% for the Experimental Group. There were no participants at the medium and high levels in either group. This global analysis points to a clear need for intervention to improve financial reporting competition.

Although the Experimental Group showed a slight improvement, the absence of participants at higher levels indicates the need for additional efforts. It is interpreted that the implementation of specific educational strategies or programs, including the use of AI-based tools, is needed to address the identified deficiencies and promote an increase in proficiency levels. This approach must be accompanied by continuous monitoring and evaluation to effectively measure the impact of these interventions over time.

POS TEST

Table 4. Management of financial reports after implementing the artificial intelligence-based program.

Management of financial reports after implementing the artificial intelligence-based program.

The table of the general post-test, made after the implementation of the Artificial Intelligence-Based Program to improve the management of financial reports, evidenced significant changes in the participants' understanding in both experimental conditions. In the Control Group, the proportion of 87.5% was maintained at the low level, however, in the Experimental Group, this percentage decreased to 0.0%, indicating a substantial improvement in financial reporting proficiency. In contrast, while the Control Group retained 12.5% at the lower middle level, the Experimental Group did not record participants at this level. At the middle level, an appearance of 5.0% was observed in the Experimental Group, suggesting an acquisition of skills in this dimension.

The most notable transformation occurred at the high level, where the Experimental Group showed a significant increase of 95.0%, while the Control Group remained at 0.0%. These results indicate that the Artificial Intelligence-Based Program had a positive

impact, raising the competence of the participants, especially at the medium and high levels. It is suggested to continue with the implementation and improvement of strategies based on artificial intelligence to further strengthen financial reporting skills in future educational interventions.

Posttest Hypothesis Testing

Table 5. Normality Test

Normality Tests

	Kolmogorov-Smirnova		
	Statistical	Gl	Gis.
Experimental	,489	40	,000
Control	,265	40	,000

to. Lilliefors Significance Correction

The Post-test hypothesis test table shows the results of the normality tests (Kolmogorov-Smirnov) for the Experimental Group and the Control Group. In the Experimental Group, the Kolmogorov-Smirnov statistic was 0.489, with 40 degrees of freedom, and a significance of 0.000. Similarly, in the Control Group, the statistic was 0.265, with 40 degrees of freedom, and a significance of 0.000. These results indicate that, in both groups after the post-test, the data distributions do not conform to a normal distribution, since the significance values are less than 0.05. This finding suggests a clear rejection of the null hypothesis of normality, highlighting the efficacy of the program carried out.

Specific hypothesis

Hi by dimensions, after the execution of the program based on artificial intelligence to improve the management of financial reports in the experimental and control group, it is evident that there are differences in the data groups at the level of development of the dimensions: identification of accounting accounts, classification of accounts, records of accounting entries, execution of transactions, Selection of the accounting process.

HO by dimensions, after the execution of the program based on artificial intelligence to improve the management of financial reports in the experimental and control group, it is evident that there are NO differences in the data groups at the level of development of the dimensions: identification of accounting accounts, classification of accounts, records of accounting entries, execution of transactions, selection of the accounting process.

Table 6. Mann-Whitney U test in Postest.Mann-Whitney U test in Postest

Test Ranges & Statistics

Dimension	Groups	N	Average Range	U de Mann-Whitney	Asymptotic (bilateral)	sig.
Identifying Ledger Accounts	Experimental	40	60.50	0,000	,000	
	Control	40	20.50			
	Total	80				
Account Classification	Experimental	40	60.50	0,000	,000	
	Control	40	22.30			
	Total	80				

Accounting Entry Records	Experimental	40	60.50	0,000	,000
	Control	40	21.08		
	Total	80			
Transaction Execution	Experimental	40	60.50	0,000	,000
	Control	40	20.15		
	Total	80			
Selection of the accounting process.	Experimental	40	60.50	0,000	,000
	Control	40	23.52		
	Total	80			

The hypothesis suggests that there is a significant difference between the Experimental and Control groups in the dimension of Identification of accounting accounts after the post-test. The results support this hypothesis, as an average range of 60.50 is observed for both groups and the Mann-Whitney U test yields a value of 0.000, with a bilateral asymptotic significance of 0.000. This finding indicates that the implemented intervention has had a statistically significant impact on the improvement of accounting identification skills in the Experimental Group compared to the Control Group after the post-test.

The second hypothesis states that there is a significant difference between the Experimental and Control groups in the dimension of Account Classification after the post-test. The results support this hypothesis, as an average range of 60.50 is observed for both groups and the Mann-Whitney U test shows a value of 0.000, with a bilateral asymptotic significance of 0.000. This indicates that the intervention has had a statistically significant impact on improving accounting classification skills in the Experimental Group compared to the Control Group after the post-test.

The third hypothesis suggests that there is a significant difference between the Experimental and Control groups in the dimension of Records of accounting entries after the post-test. The results support this hypothesis, as an average range of 60.50 is observed for both groups and the Mann-Whitney U test yields a value of 0.000, with a bilateral asymptotic significance of 0.000. This indicates that the intervention has had a statistically significant impact on improving the skills of recording accounting entries in the Experimental Group compared to the Control Group after the post-test.

The fourth hypothesis states that there is a significant difference between the Experimental and Control groups in the dimension of Transaction Execution after the post-test. The results support this hypothesis, as an average range of 60.50 is observed for both groups and the Mann-Whitney U test shows a value of 0.000, with a bilateral asymptotic significance of 0.000. This indicates that the intervention has had a statistically significant impact on improving transaction execution skills in the Experimental Group compared to the Control Group after the post-test.

The fifth hypothesis states that there is a significant difference between the Experimental and Control groups in the Selection dimension of the accounting process after the post-test. The results support this hypothesis, as an average range of 60.50 is observed for both groups and the Mann-Whitney U test yields a value of 0.000, with a bilateral asymptotic significance of 0.000. This indicates that the intervention has had a statistically significant

impact on improving accounting process selection skills in the Experimental Group compared to the Control Group after the post-post-post

Within the framework of this research, it was hypothesized that there would be a substantial difference between the Experimental and Control groups in the dimension of Identification of accounting accounts after the post-test. The results obtained consistently confirm this premise. The average range of 60.50 for both groups suggests a clear trend, but it is through the Mann-Whitney U test that the disparity between the two sets is most accurately evidenced. With a value of 0.000 and a bilateral asymptotic significance of 0.000, the statistical evidence supporting the hypothesis is consolidated. This finding shows that the AI-based intervention has exerted a highly significant impact on improving accounting identification skills in the Experimental Group compared to the Control Group after the post-test.

In this context, an essential connection is established with the international precedent provided by Ibarra (2020). This study, focused on measuring the interaction between students and artificial intelligence, highlights the importance of assessing how students relate to technological tools. Although the approach differs, it offers a valuable context to understand the dynamics between students and technology, thus enriching the analysis of the present research.

On a theoretical level, the perspective that artificial intelligence can be an effective resource to improve the skills of identifying accounting accounts is incorporated. The ability of machines to perform tasks that normally require human intelligence is integrated into an educational program designed to deliver an enriched and personalized experience. Within this definition, the identification of accounting accounts is conceived as the critical ability to properly recognize and apply accounting concepts, crucial for the generation of accurate financial reports.

Finally, the results obtained through the quasi-experiment in the dimension of Identification of accounting accounts reflect a substantial improvement in the Experimental Group compared to the Control Group. While the Control Group predominantly performed at the "Medium Low" level, the Experimental Group demonstrated exceptional performance, with 100% of participants reaching the "High" level. These findings support the efficacy of the AI-based program to elevate accounting identification skills in technical-accounting high school students in Ecuador. The direct inference is that technological intervention has had a significant positive impact on the acquisition and application of accounting knowledge, thus consolidating the relevance and effectiveness of artificial intelligence in the field of accounting education.

In relation to the background presented by Ibarra (2020), it is highlighted that, when evaluating the adaptation of new pedagogical tools, the assessment of the personality design of the Intelligent Virtual Assistant (AVI) revealed varied perceptions among students. This evidence supports the importance of considering the adaptability and acceptance of technological interventions in educational environments, relevant elements in the framework of the use of artificial intelligence to improve the execution of transactions in the management of financial reports.

From an inferential perspective, the fourth hypothesis proposed, which suggests the existence of a significant difference between the Experimental and Control groups in the dimension of Transaction Execution after the post-test, is supported by the results obtained. With an average range of 60.50 for both groups and a Mann-Whitney U test yielding a value of 0.000, with a bilateral asymptotic significance also of 0.000, it is confirmed that the intervention has had a statistically significant impact on the improvement of transaction execution skills in the Experimental Group compared to the Control Group after the post-test.

In the theoretical field, knowledge retention in artificial intelligence, according to García et al. (2020), is manifested through various mechanisms that allow artificial intelligence to remember and use learned knowledge. Likewise, the user interface, according to Garibay (2020), acts as the medium that facilitates interaction, presenting visual elements that represent the actions or tasks that the user can carry out. These concepts support the notion that AI-based intervention has significantly improved transaction execution in financial reporting by providing an effective interface for knowledge interaction and retention.

In accordance with the Specific Objective, focused on determining the level of the dimension "Selection of the Accounting Process" in the management of financial reports by technical-accounting high school students in Ecuador during the year 2023, after the implementation of the quasi-experiment, the descriptive results reveal notable differences between the Control Group (Gc) and the Experimental Group (Ge). In the Control Group, 90% of the participants have a limited performance in the selection of the accounting process, being at the "Medium Low" level, and 10% at the "Medium" level. In contrast, in the Experimental Group, 100% of the participants reached the "High" level, evidencing exceptional performance in the aforementioned dimension. No participants were recorded at the "Low" and "Medium" levels in either group. These results underline the significant positive impact of the intervention in the Experimental Group, indicating a substantial improvement in the selection of the accounting process compared to the Control Group.

In relation to the background presented, it is highlighted that in the face of the challenge involved in the application of artificial intelligence tools in education, it is essential that the pedagogical leader understands their influence on the teaching processes and the assistance they offer in the classroom for the progress of their lessons (Hurtado, 2020). Likewise, technology itself does not generate great concern, since professor-researchers have a mastery of the knowledge they transmit (Barberá & Suárez, 2021). In addition, the importance of services related to Information and Communication Technologies (ICT) has experienced a notable increase, being essential for the growth of other sectors (Gálvez, 2020).

From the theoretical perspective, usability, understood as a set of approaches and methodologies used during the design and development process to offer a high-quality product to the end user (Pailiacho et al., 2022), becomes a key element to evaluate the effectiveness of the intervention in the selection of the accounting process. In addition, accessibility in the artificial intelligence user interface, which seeks to ensure that all people can use the AI system effectively, emerges as a crucial factor in this context. This involves designing an accessible interface, considering alternative navigation options and features that facilitate interaction for people with visual, hearing, or motor disabilities (Porcelli, 2020). These concepts reinforce the importance of considering usability and accessibility in the implementation of artificial intelligence tools to improve the selection of the accounting process in the management of financial reports.

CONCLUSIONS

1. Prior to the implementation of the artificial intelligence-based program, it was observed that both the control group and the experimental group showed a low level of knowledge in the management of financial reports, giving this level with 87.50% equivalent to 35 students in the control group and 90% equivalent to 36 students in the experimental group.

2. During the development of the program, several key factors for success were identified. The combination of theory and practice, the adaptability of the program to the individual needs of the participants, and the effective use of artificial intelligence tools

were essential elements. The constant feedback and collaborative learning environment also contributed to the success of the program.

3. After the implementation of the AI-based program, after applying the Program, the Experimental Group showed a notable improvement, going from 87.5% to 0.0% at a low level of understanding, unlike the Control Group that remained unchanged, significantly establishing the change acquired between both sets.

4. In the comparison of the results of the artificial intelligence-based program, it is concluded that the Experimental Group experienced significant improvements in the identification of accounting accounts compared to the Control Group. All participants in the Experimental Group reached the "High" level, demonstrating outstanding performance, while in the Control Group, all participants remained at the "Medium Low" level. These results suggest that the intervention has had a positive and statistically significant impact on the development of account identification skills and accounting processes.

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