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Evaluación de la asistencia de inteligencia artificial en la labor docente en la Unidad Educativa Digna María Beatriz Cerda Neto, Pujilí-Ecuador

Evaluation of artificial intelligence assistance in teaching work at the Digna María Beatriz Cerda Neto Educational Unit, Pujilí-Ecuador

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Palabras claves: Inteligencia Artificial, educación, labores docentes, satisfacción

Resumen

Introducción: El avance gradual y la adopción de la automatización y la inteligencia artificial (IA) han impulsado cambios significativos en todos los sectores. La naturaleza interdisciplinar de la IA tiene un gran alcance, ya que se ha expandido rápidamente con diversas aplicaciones en casi todos los sectores como la medicina, la educación, *networking*, entre otros. Los profesionales de la educación pueden beneficiarse de los recursos de la IA, que promete revolucionar las tareas cotidianas. El panorama educativo mundial se está transformando al adaptarse a nuevas tecnologías como la IA, mejorando la eficiencia, la productividad y la calidad de la enseñanza. Este es un estudio que compara las herramientas de IA para educadores con el método tradicional de hacer las actividades laborales docentes en la institución educativa, en el cual se pretende analizar la satisfacción de la calidad del trabajo. Utilizando el análisis ANOVA, la investigación. **Objetivo:** Demostrar cómo el uso de la inteligencia artificial puede influir en la satisfacción de la calidad del trabajo evaluado por docentes en cada una de las actividades de la jornada laboral docente en una institución educativa. Para ello, se utilizará el análisis de la varianza (ANOVA) para comparar y analizar los datos recogidos en ambos entornos de trabajo, lo que nos permitirá identificar cualquier diferencia significativa entre los métodos. **Metodología:** La metodología utilizada para esta investigación fue un cuestionario diseñado para evaluar el nivel satisfacción de trabajo de las herramientas de inteligencia artificial en entornos digitales para ayudar a los profesores en su trabajo en una institución educativa. Este estudio cualitativo-cuantitativo involucró técnicas e instrumentos para la recolección y análisis de datos, centrándose en el cuerpo docente de la Unidad Educativa "Digna María Beatriz Cerda Neto" ubicado en El Tingo, Pujilí Ecuador. La investigación, realizada en marzo de 2024, también fue inductiva, partiendo de análisis específicos para sintetizar el problema de investigación. Se utilizaron herramientas de IA como Megaprofe y Magic School AI, la comparación entre las actividades asistida por IA y los métodos tradicionales se analizó utilizando métodos estadísticos como ANOVA. El formulario de calificación se diseñó con 36 ítems. Para el análisis estadístico se utilizó el software Minitab 18. La investigación fue descriptiva y aplicativa, evaluando la IA en el contexto laboral educativo. **Resultados:** Las actividades educativas dentro de la institución

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asistidas por IA muestran diferencias significativas en los niveles de satisfacción de los profesores con una confianza del 95%, son: registro de notas, planificación, reuniones, coordinación con otras áreas y finalmente supervisión y control. Sin embargo, tareas como el apoyo familiar o la orientación profesional muestran niveles de satisfacción más bajos. **Conclusión:** Los educadores deben mantenerse al día sobre las capacidades de la IA para la mejora pedagógica, la automatización de tareas y la reducción de la carga de trabajo y estrés laboral. Una utilización adecuada de la IA puede agilizar las tareas administrativas, pero la intervención humana en el trabajo de las IAs sigue siendo crucial para el toque personalizado y la garantía de calidad. El acceso fiable a Internet en las escuelas rurales es crucial para la utilización eficaz de las IAs. Garantizar la accesibilidad a las herramientas de IA, a pesar de los costes, es esencial para el desarrollo profesional de los educadores ecuatorianos. **Área de estudio general:** Educación. **Área de estudio específica:** Entornos digitales.

Keywords:
Artificial Intelligence, education, teaching, satisfaction.

Abstract

Introduction. The gradual advancement and adoption of automation and artificial intelligence (AI) has driven significant changes across industries. The interdisciplinary nature of AI is far-reaching, as it has rapidly expanded with diverse applications in every sector such as medicine, education, networking, among others. Education professionals can benefit from the resources of AI, which promises to revolutionize everyday tasks. The global education landscape is transforming as it adapts to modern technologies such as AI, improving efficiency, productivity, and the quality of teaching. This is a study comparing AI tools for educators with the traditional method of doing teaching work activities in the educational institution, in which we aim to analyze job quality satisfaction. Using ANOVA analysis, the research. Objective: To demonstrate how the use of artificial intelligence can influence satisfaction with the quality of work evaluated by teachers in each of the activities of the teaching workday in an educational institution. To this end, analysis of variance (ANOVA) will be used to compare and analyze the data collected in both work environments, which will allow us to identify any significant differences between the methods. Methodology. The methodology used for this research was a questionnaire designed to assess the level of job satisfaction of artificial intelligence tools in

digital environments to assist teachers in their work in an educational institution. This qualitative-quantitative study involved techniques and instruments for data collection and analysis, focusing on the teaching staff of the Educational Unit "Digna María Beatriz Cerda Neto" located in El Tingo, Pujilí Ecuador. The research, conducted in March 2024, was also inductive, starting from specific analyzes to synthesize the research problem. AI tools such as Megaprofe and Magic School AI were used, the comparison between AI-assisted activities and traditional methods was analyzed using statistical methods such as ANOVA. The rating form was designed with 36 items. Minitab 18 software was used for statistical analysis. The research was descriptive and applicative, evaluating AI in the educational work context. Results. The educational activities within the institution assisted by AI show significant differences in teachers' satisfaction levels with 95% confidence are: recording grades, planning, meetings, coordination with other areas and finally supervision and control. However, tasks such as family support or career guidance show lower levels of satisfaction. Conclusion. Educators must stay open to AI capabilities for pedagogical improvement, task automation, and reduction of workload and work stress. Appropriate use of AI can streamline administrative tasks, but human intervention in AIs work remains crucial for personalized touch and quality assurance. Reliable Internet access in rural schools is crucial for effective utilization of AIs.Ensuring accessibility to AI tools, despite the costs, is essential for the professional development of Ecuadorian educators.

Introduction

The gradual advancement and adoption of automation and artificial intelligence (AI) in recent decades have driven remarkable changes in various industries. The interdisciplinary nature of AI that combines computer science, mathematics, and cognitive psychology has expanded rapidly, finding diverse applications across industries (Jaboob et al., 2024) and important sectors of society such as medicine, education, social media, among others. For education professionals, time and resource management is crucial (García et al., 2020), and the normalization of the use of Artificial Intelligence (AI) promises to revolutionize the way professionals perform their daily tasks. In the global educational environment, adaptability to new technologies such as AI is

revolutionizing the way work activities are carried out both inside and outside educational institutions (Sun et al., 2021). The adoption of tools offered by AI promises to improve the efficiency, productivity, and quality of teaching work, transforming traditional processes. It should be noted that for this work the Megaprofe and Magic Tools AI AIs were used and the analysis results were done in a general way, it should be noted that no comparison was carried out between said AIs.

This study compares the performance of AI tools for teachers with the traditional method in work activities carried out in educational institutions and in person or outside the school (Ministry of Education of Ecuador, 2024). The research focuses on analyzing and evaluating the satisfaction in work quality (Colchester et al., 2017) of teachers when using AI tools compared to traditional methods in the work context.

The justification of this study lies in the need to understand the impact of AIs on daily activities, as well as to statistically determine how reliable the use of AI tools is for teachers, in each of the activities of the teaching workday regulated through Ministerial Agreement No. MINEDUC-MINEDUC-2023-00005-A according to the Ministry of Education of Ecuador (2024), within educational institutions. The comparison of artificial intelligence and traditional methods for these activities will allow us to identify possible improvements in job quality satisfaction (Pan & Zhang, 2021). This comparative analysis will also provide valuable insights to optimize teaching practices and support the successful integration of cutting-edge technologies in the Ecuadorian environment.

The main objective of this study is to demonstrate how the use of artificial intelligence can influence the satisfaction of the quality of work assessed by teachers in each of the activities within the teaching workday within an educational institution as well as outside it (Colchester et al., 2017). To do this, analysis of variance (ANOVA) will be used to compare and analyse the data collected in both work environments, which will allow us to identify any significant differences between the methods.

The analysis is based on the use of analysis of variance (ANOVA) to compare the results obtained with both methods, allowing the identification of possible significant differences in terms of satisfaction with the quality of work assessed by teachers. This study aims to contribute to existing knowledge on the impact of artificial intelligence in the educational field and provide valuable insights to improve teachers' work practices both inside and outside educational institutions.

Through this study, it is hoped to provide valuable information that will contribute to the understanding of the benefits and challenges associated with the implementation of AI tools in the teaching environment. These findings could have important implications for policy formulation, decision-making, and strategic planning in educational organizations

or ideally in the Ministry of Education of Ecuador to optimize operations and improve the performance of its professionals.

Methodology

The technique used for this research was the survey, having the questionnaire as the selected instrument, whose questions were designed to reflect the effectiveness of artificial intelligence used as tools of digital environments to assist in the execution of teachers' activities during the working day in the educational institution.

This research consists of a qualitative-quantitative study since according to Finol & Vera (2020), this model reflects the empirical and methodological component of the research, in which techniques and instruments based on procedures for the collection and analysis of data will be used, with a sample of people who belong to the teaching staff of the Mathematics area of the Educational Unit "Digna María Beatriz Cerda Neto". This study was carried out in March 2024. This study can also be described as inductive, since it begins with specific analysis around the study variables to culminate in a synthesis of the research problem (Rodríguez, 2011).

Additionally, it was carried out with the teaching staff of the “Digna María Beatriz Cerda Neto” Educational Unit located in the rural parish of El Tingo, Pujilí, Ecuador (Decentralized Autonomous Government of the Rural Parish of El Tingo, 2024). This school has a total of 29 teachers, 16 are women and 13 are men according to the official register of 2023 - 2024 (Ecuador Schools, 2023). Taking into account the inclusion and exclusion criteria, a sample corresponding to teachers in the mathematics and English areas of the institution is obtained. For privacy reasons of the Institution, the specific number of participants is reserved.

Instruments, the AI tools for teachers used were; Megaprofe and Magic School AI

- *Magic School AI*

Magic School AI (2024), developed by educators with the goal of assisting other teachers around the world in reducing their workload, thus allowing them to conserve their energy, reduce work stress, and better teach their students. It features 60 AI tools tailored to reinforce and assist educators in their work environment, free community resources, and more.

- *Megaprofe*

In Megaprofe (2024), developed by José Antonio Tamayo and Vicenç Yll Escot, whose mission is to take full advantage of the potential of various AI technologies in the educational environment, encouraging teachers and students to fully benefit from these

tools in their learning process. The goal is to provide tools and resources that empower educators and foster an enriching and stimulating educational environment tailored to the individual needs of each student (Yll Escot, 2023). It has more than 13 AI tools focused on teaching work, blogs, multimedia, among others.

In the traditional method, teachers spend numerous hours planning their activities, participate in training sessions, attend committee meetings, collaborate in the development of educational projects and other curricular activities, all following the guidelines of the Ecuadorian Ministry of Education. This pre-process in most cases exceeds the paid working hours of teachers, and also generates intellectual exhaustion and work stress, which impacts their performance as educators (García, 2020).

Teachers carried out their teaching activities in the educational institution assisted by AI and without AI, as teachers usually do, a method known as "traditional" from now on, to make an exhaustive comparison between both methods, the data analysis in statistics, the analysis of variance (ANOVA for its acronym in English (ANalysis Of VAriance) will be applied. This methodological approach will be carefully designed to obtain detailed information on satisfaction with the quality of the work evaluated by teachers of the two methods investigated (Colchester et al., 2017).

The premise that encompasses the AIs rating form versus the traditional method in the execution of the teaching day activity is:

Step 1:

Carefully review the activities you perform as a teacher, as illustrated in the chart titled "Teachers' Workday."

Step 2:

Use the artificial intelligence (AI) tools mentioned for each of the activities in the "Teachers' workday" graph:

- Magic Tools - MagicSchool.ai

- Megaprofe

Step 3:

Evaluate AI performance against your usual teaching practice, without the assistance of AI.

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Figure 1

MINEDU Ecuador teacher work day

Fountain: Ministry of Education of Ecuador (2024)

The form was developed considering key indicators and relevant parameters, to quantitatively and qualitatively evaluate the applicability and results obtained by each method, resulting in 36 items to be answered by each teacher. The selection of specific variables and the application of strategic questions will allow a meaningful comparison, obtaining reliable and relevant data, supported by ANOVA analysis. The rigorous application of this survey will guarantee a critical and objective evaluation of the methods in question. Finally, results obtained based on the analysis of results will be presented. It is worth mentioning that the ANOVA analysis was performed in Minitab 18, which is a statistical software for data analysis. Minitab 18 has a wide range of statistical functions and graphics to facilitate the interpretation of data and decision making based on them (Minitab, 2024).

The research is descriptive, given its nature, the modality is applicative, since the problem to be solved presents the variables: Artificial Intelligence as a tool for teachers and the execution of work activities of teachers in the Educational Institution (Ministry of Education of Ecuador, 2024). The research was carried out in the Ecuadorian state educational institution Unidad Educativa Digna Beatriz Cerda Neto, based on a bibliographic and documentary analysis of the systematically processed information on similar topics.

This study proposes to evaluate the effectiveness of the application of the educational AIs Magic Tools - MagicSchool.ai and Megaprofe in teaching activities compared to

conventional methods. The procedure will be designed with specific instructions for test administration, integrating AI in an experimental group and maintaining a control group without AI intervention. Detailed data will be collected on the performance, effectiveness and satisfaction of participants in both conditions.

Therefore, the approach will provide a rigorous quantitative assessment of the relative effectiveness of AI in teaching activities, contributing to an objective understanding of its impact on educational performance and efficiency. Ideally, for the creators of AI, it should have the potential to transform education by providing tools that help teachers to be more efficient, effective and ultimately reduce burnout and job stress. In LATAM countries like Ecuador, in its rural areas like El Tingo, it is expected that technology will fulfill its purpose.

Development

1. Contextualization of the study:

Within the framework of this research, the activities of the working day of teachers working in the Ministry of Education of Ecuador are described, which is the responsibility of the teaching staff of the "Digna María Beatriz Cerda Neto" Educational Unit by state, according to the guidelines established based on the current ministerial regulations Agreement No. MINEDUC-MINEDUC-2023-00005-A (Ministry of Education of Ecuador, 2023), teaching activities are categorized into two main modalities: those carried out within the educational institution and those carried out in person outside the campus (Ministry of Education of Ecuador, 2024).

Teachers' working hours in the educational institution, which add up to 6 hours a day and 30 a week, arranged for 25 pedagogical periods, however, participatory management consists of the activities detailed in the following table and it is in these activities that I carry out this analysis. The second modality is in person or outside the school (Ministry of Education of Ecuador, 2024) consists of two hours a day, giving a total of 10 a week.

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Figure 2

Working hours of teachers in the educational institution

Fountain: Ministry of Education of Ecuador (2024)

The teacher sample analyzed works at the "Digna María Beatriz Cerda Neto" Educational Unit, which is located in the rural parish of El Tingo (Rural Parochial Decentralized Autonomous Government of El Tingo, 2024), located in the foothills of the Western mountain range belonging to the Pujilí Canton, in the Ecuadorian Andes in Ecuador.

Megaprofe and Magic School AI programmers have developed a wide range of tools with artificial intelligence, focused on providing solutions that can alleviate the workload and stress of teachers. These artificial intelligence systems are designed to analyze any topic in the educational field, differentiating between typical and school age, among others. Provide information on the collective progress and individual needs of students and others, in order to provide teachers with help and facilitate the post-process teaching learning more effectively (Sun et al., 2021).

The justification for this study arises from the need to show the effects and influence of the use of AI tools in educational environments regulated by Ministerial Agreement No. MINEDUC-MINEDUC-2023-00005-A (Ministry of Education of Ecuador, 2023), inside and outside educational institutions. Contrasting artificial intelligence with conventional methods in these tasks will allow us to identify which activities are satisfied with the quality of the work evaluated by teachers. This comparison of methods with ANOVA will also provide valuable information to improve teaching methodologies and facilitate

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the successful integration of advanced technologies in the educational landscape of Ecuador.

The statistical approach known as ANOVA will be used to establish the significant difference between the means of two or more groups (Cortina & Nouri, 2000). In this case, ANOVA can be used to compare labor productivity from the use of artificial intelligence with the traditional workday.

Taking this into account, a questionnaire was designed to collect information on the use of two methods: teaching workday at the institution with the assistance of AIs and the performance of said activities in a traditional way. Subsequently, an ANOVA analysis was carried out in Minitab.18, to find out if there is a significant difference with 95% confidence between the use of AI in educational tasks versus traditional methods.

The data obtained from the survey was placed in the Minitab worksheet using these aviations

Table 1

Renaming Activities for Minitab

Activities to evaluate	Abbreviation of activities for Minitab.18
Attention to families with artificial intelligence	AIA
Attention to families on a regular basis	TO
Note taking with artificial intelligence	ESTUARY
Recording notes on a regular basis	RI
Planning with artificial intelligence	PIA
Planning on a regular basis	PI
Meetings with artificial intelligence	ESTUARY
Meetings on a regular basis	R
Career and professional guidance with artificial intelligence	OIA
Vocational and professional guidance on a regular basis	EITHER
Coordination with other areas with artificial intelligence	INC
Coordination with other areas on a regular basis	C
Monitoring and control with artificial intelligence	SIA
Regular monitoring and control	S

Due to the nature of the data the coefficient of determination of one-way ANOVA analysis indicated that the proportion of total variability in the data analyzed should be treated as shown in the following section.

The ANOVA analysis parameters will determine if there is a significant difference between teaching tasks with and without AIs, for which a high average value is required in the analysis of the means, because the teachers evaluated the level of satisfaction according to each statement using a scale from 1 to 5, where 1 = Dissatisfied and 5 = Completely Satisfied. Therefore, the high average value is the most appropriate for the study.

Finally, as a limitation of this study, it was found that, in most educational units in rural areas such as the parish of Tingo in Ecuador, there is no good internet connection, the AIs work with this digital resource, therefore, the absence of WIFI would make its use impossible in teaching tasks within the facilities of the educational unit.

Results

One-way ANOVA analysis to determine whether there is a significant difference with 95% confidence between family care and recording of notes with artificial intelligence assistance and the traditional method.

Table 2

One-way ANOVA for AI analysis versus usual or traditional method

Source	Date
Null hypothesis	All means are equal
Alternative hypothesis	Not all means are equal
Significance level	$\alpha = 0.05$
Equal variances were assumed for the analysis	

Table 3

Analysis of Variance for AIA, A, RIA and A

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	17.2	5.7333	7.91	0.002
Mistake	16	11.6	0.725		
Total	19	28.8			

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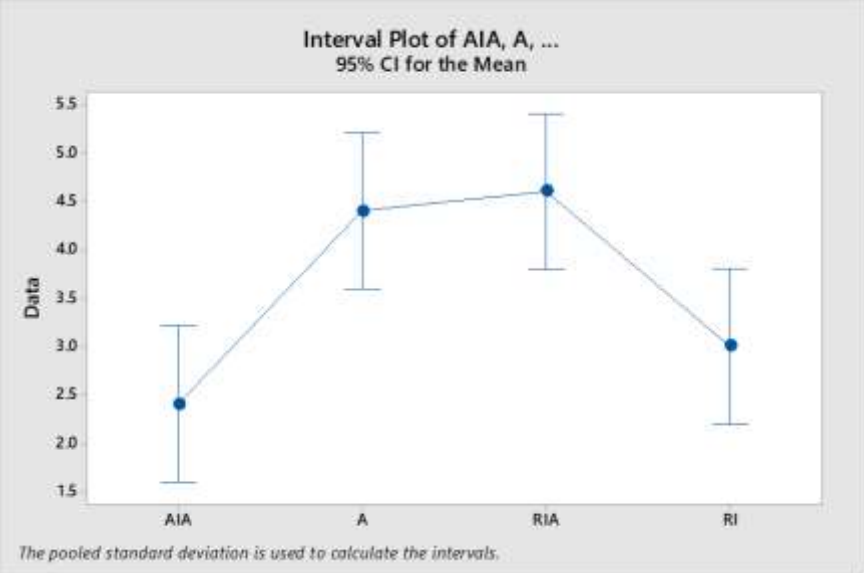
Since the p-value is 0.002, the alternative hypothesis is accepted, since there is a significant difference with 95% confidence between family care and recording of notes with the assistance of artificial intelligence and the traditional method.

Figure 3

Interval plot of AIA, A, RIA, RI 95% CI for the mean



According to the results of the Tukey analysis, the confidence interval data for the mean reveal that the most recommended methods are: recording grades with artificial intelligence and providing regular attention to parents.

One-way ANOVA analysis to determine if there is a significant difference with 95% confidence between planning and meetings with artificial intelligence and the traditional method.

Table 4

Analysis of Variance for PIA, PI, RIA, R

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	17.2	5.7333	7.91	0.002
Mistake	16	11.6	0.725		
Total	19	28.8			

With a P value of 0.027, the ANOVA analysis determines that there is a significant difference with 95% confidence between planning and meetings with artificial intelligence and the traditional method.

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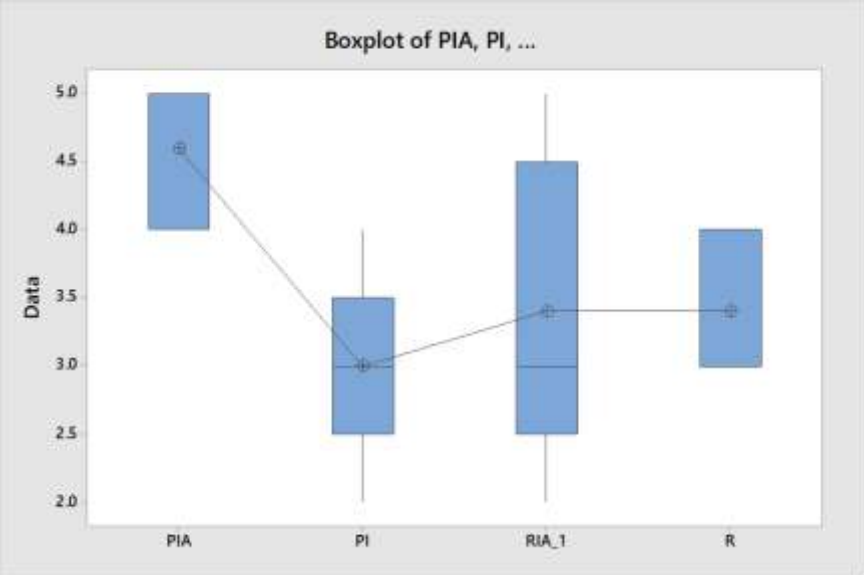
Figure 4

Box plot of PIA, PI, RIA and R



The difference between the medians in the diagram shows that Planning with the assistance of AIs is really satisfactory, followed by the execution of meetings with a satisfaction level of 90%.

Vocational and professional guidance, coordination with other areas using artificial intelligence and in a traditional way.

Table 5

Analysis of Variance for OIA, O, CIA and C

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	9	3	1.76	0.194
Mistake	16	27.2	1.7		
Total	19	36.2			

The one-way ANOVA analysis with 95% confidence for vocational and professional guidance, coordination with other areas using artificial intelligence and in a traditional way, indicates that the P value of 0.194 is greater than the significance level α (0.05), so that, in this case, if the null hypothesis is true, it means that there is no significant difference between using artificial intelligence or not, in the following:

- Vocational and professional guidance
- Coordination with other areas

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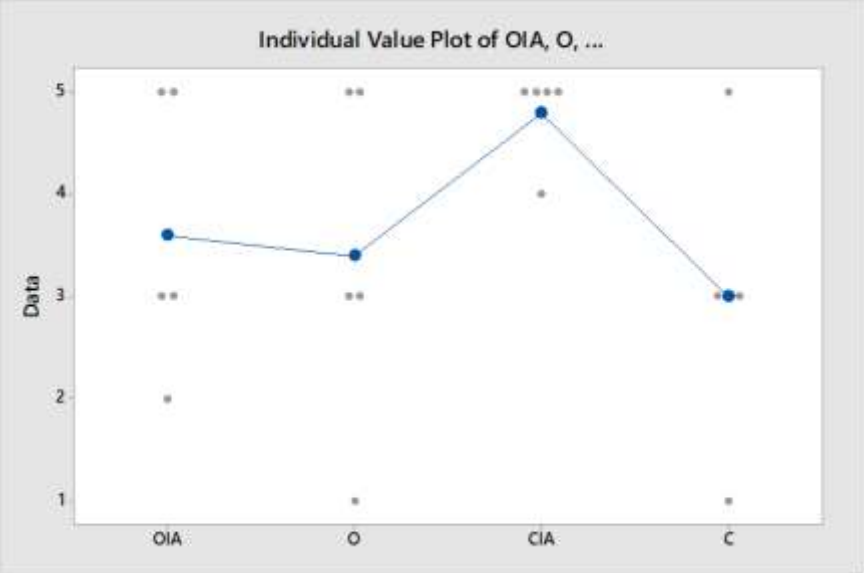
However, according to the confidence interval graphs for the mean and the table of individual values for the mean, coordination with other areas with artificial intelligence stands out as the highest value, thus reflecting the level of satisfaction of teachers for this work activity.

Figure 5

Individual values for the mean of OIA, O, CIA and C



The one-way ANOVA analysis with 95% confidence for vocational and professional guidance, coordination with other areas with the use of artificial intelligence and in a traditional way, indicate that the P value of 0.019 is less than the significance level α (0.05), so that, In this case, if the null hypothesis is false, it means that there is a significant difference in using artificial intelligence in supervision and control.

Table 6

P value for monitoring and control

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Factor	3	12.95	4.3167	4.43	0.019
Mistake	16	15.6	0.975		
Total	19	28.55			

Conclusions

- The work activities in the educational institution with the help of the AIs, in which there is a proven significant difference in levels of teacher satisfaction in the quality of work with 95% confidence are: recording grades, planning, meetings,

coordination with other areas and finally supervision and control. The tasks in which the assistance of the AIs did not reach the levels of satisfaction for teaching use, with a significance level of 0.05 are: attention to families, vocational and professional guidance.

- It is imperative to stay up to date with everything AI can offer teachers. AI presents a diverse range of pedagogical activities that encompass manual components, discussion composition elements, and challenges among other tools. Consequently, these advances streamline and improve pedagogical tasks, ensuring that the workload of teachers in the educational institution is lightened.
- AIs can automate tedious administrative tasks, such as grade taking, planning, and other activities, as mentioned by the creator of one of the most current and innovative AIs in the educational environment in the world. Well-used AI-powered virtual assistants perform around 80% of the work, the remaining 20% is up to the teacher. The teacher must give his or her personalized touch and review the rubric obtained from the AI, so the idea that arises around the work of AI, dimensioning it as unavoidable and inerrant is not true.
- In rural educational institutions, a reliable Internet connection would allow educators to effectively leverage AI for various pedagogical and administrative tasks and to reduce work stress. It is also imperative for MINEDU to prioritize providing training and sponsorship of AI tools, since, for example, those analyzed in this work are not free and there are many more like them on the web. It would be ideal if the cost of access to these technologies were not an obstacle for Ecuadorian state educators.

Conflict of interest

There is no conflict of interest in relation to the submitted article.

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