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SUMARIO • SUMMARY • RESUMO

Editorial

The year 2025 will be remembered for many news items, but especially for the consolidation of artificial intelligence, which has gradually gained weight among us. The study on the perception, use and usefulness of artificial intelligence in the training of future foreign language teachers addresses the subject in a specific way, highlighting how these specialists perceive and use AI in their training, as well as identifying the most widely known and used tools. Likewise, ICT as an agent of change for the redesign of learning environments and didactic resources in reading and writing are addressed. As a result of this research, it is recommended to make proposals to the institutions so that they take measures regarding the implementation of didactic units to strengthen reading and writing and provide students with collaborative learning environments where there are the necessary resources to achieve significant learning. On the other hand, another study addresses the implementation of Moodle on Amazon EC2 to improve competency-based learning in an educational institution in Peru. The results obtained allow us to argue that the integration of Moodle in the Amazon EC2 cloud provides a scalable and efficient technological solution, providing quality education and strengthening the capabilities of students. Finally, the first block of articles is completed with the one dedicated to how the use of ICTs contributes to a new type of learning called reflective pedagogy, which is based on seven digital potentialities: ubiquitous learning, active knowledge creation, multimodal meaning, recursive feedback, collaborative intelligence, metacognition and differentiated learning. The results are relevant in the field of educational technologies worldwide, highlighting their impact on student learning.

A second block of articles focuses on different aspects surrounding learning. In the first of these, the educational community is offered a design of a proposal for action in the natural sciences curriculum, which involved learning the concept of energy through gamification. The results provide the educational community with an innovative learning strategy to teach the concept of energy through gamification, generating significant changes in the curriculum. At the same time, another study proposes to analyze the relationship between academic performance and learning strategies. The findings provide a solid basis for developing effective and personalized pedagogical strategies that promote better school performance in students, as well as evidence of the importance of implementing appropriate learning techniques focused on enhancing students' academic performance, providing relevant information that can be used to improve teaching and learning processes. Third, collective mathematical errors at the primary level in a bilingual system are addressed. The reason for this is the inadequate knowledge that bilingual students at the elementary level have of the errors they can and do make while learning mathematics. As a result, it stands out that at a collective level, students make mistakes in the thinking processes for the resolution of problems that require algebraic thinking skills, which, according to teachers, is largely due to the low level of understanding of English as a second language that is implemented as an educational requirement of the educational center.

In a different line, there are works related to teaching and learning. Thus, we can find a study on the development of oral language and its relationship with the acquisition of reading in students of a high mountain school, a peculiar learning environment. The

main conclusion is that a child's learning to read depends both on the way he or she is taught and on the nature and existence of the links between school and home in a context marked by the characteristics of the social, cultural and geographical environment. On the other hand, the analysis of the written pedagogical discourse of inclusion teachers in primary education stands out, in which it is concluded that it is a generative act of teaching where the inclusion student must establish a relationship with the procedures and contents proposed by the teacher, in order to seek a contextualized social practice. In another sense, but with a strong teaching component, is the review study on the curricular model of active methodologies in Ecuador. The articles analyzed highlight the implementation of new strategies such as project-based learning (PBL-projects), problem-based learning (PBL-problem), and flipped classroom learning.

This issue of MLSER closes with two very different articles. The first one addresses the validity, reliability and threats to validity in the evaluations of the virtual English I class of the Department of Foreign Languages of the National Autonomous University of Honduras, in which it is concluded that they do not have the validity or security to reflect the acquisition of linguistic competencies achieved by the students according to the CEFR corresponding to 56 hours. Finally, a study is presented on the demotivating factors of some employees of the Ministry of Land Administration in Angola and their impact on the lives of citizens, in which it is concluded that there are a series of factors, such as, for example, the lack of incentives from employers to subordinates, mistreatment among equals, the spirit of superiority, among others, which are the bases of demotivation.

Antonio Pantoja Vallejo
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PERCEPTION, USE, AND USEFULNESS OF ARTIFICIAL INTELLIGENCE IN THE TEACHING TRAINING OF FUTURE FOREIGN LANGUAGE TEACHERS

PERCEPCIÓN, USO Y UTILIDAD DE LA INTELIGENCIA ARTIFICIAL EN LA FORMACIÓN DEL FUTURO PROFESORADO DE LENGUAS EXTRANJERAS

Nelson Eduardo Corea[1]
Universidad Nacional Autónoma de Honduras, Honduras
(nelson.corea@unah.edu.hn) (https://orcid.org/0000-0003-0926-9367)

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ABSTRACT

This study explores the perception, use, and usefulness of artificial intelligence (AI) among future foreign language teachers who specialize in English teaching. The main objective was to analyze how these future professionals perceive and use AI in their undergraduate teaching training program. Furthermore, to identify the most well-known and frequently used AI tools in their classes, assignments, or projects. To achieve this, a descriptive quantitative study was conducted, gathering information using a Likert scale based on the questionnaire developed by Ayuso-del Puerto and Gutiérrez-Esteban. The sample consisted of 243 teachers in training from a Honduran university. The results show that most future teachers have a positive perception of AI, considering it clear and useful for learning, although there is a gap between this perception and its practical application. ChatGPT and Grammarly protrude as the most well-known and frequently used tools by teachers in training, while others are less utilized. Moreover, a positive trend toward AI use was identified, though additional training is needed to maximize its implementation in academic tasks. In conclusion, while AI is well-perceived among future teachers, its practical use faces challenges, particularly in prompt writing, suggesting the need for specific training programs and greater promotion of diverse AI tools in the educational environment.

Palabras clave:
inteligencia artificial, futuros docentes, lenguas extranjeras

RESUMEN

Este estudio explora la percepción, uso y utilidad de la inteligencia artificial (IA) entre futuros docentes de lenguas extranjeras con orientación en la enseñanza del inglés. El objetivo principal fue analizar cómo estos futuros profesionales perciben y utilizan la IA en su formación, así como identificar las herramientas de IA más conocidas y utilizadas en sus clases, asignaciones o proyectos. Para ello, en una investigación cuantitativa descriptiva, se recopiló información utilizando una escala de Likert a partir del cuestionario realizado por Ayuso-del Puerto y Gutiérrez-Esteban. La muestra fue conformada por 243 docentes en formación de una universidad hondureña. Los resultados muestran que la mayoría de los futuros docentes tiene una percepción positiva de y hacia la IA, considerándola clara y útil para el aprendizaje,

[1] Autor de correspondencia.

	aunque existe una brecha entre esta percepción y su aplicación práctica. ChatGPT y Grammarly se destacan como las herramientas más conocidas y utilizadas por los docentes en formación, mientras que otras presentan una menor utilización. Además, se identificó una tendencia positiva hacia la utilización de la IA, aunque también se señaló la necesidad de formación adicional para maximizar su implementación en tareas académicas. En conclusión, aunque la IA es bien percibida entre los futuros docentes, su uso práctico enfrenta desafíos principalmente en la redacción de los *prompts*, lo que sugiere la necesidad de programas de formación específicos y una mayor promoción de diversas herramientas de IA en el entorno educativo.

Introduction

Over the past two decades, Artificial Intelligence (AI) has had a significant impact on various sectors globally, including education. Globally, the potential of AI has been recognized for teachers' lesson plans, personalizing learning, automating administrative tasks, and improving teaching through data analytics. However, in teacher training, especially in specialized fields such as foreign language teaching, an imbalance has been observed where considerable challenges are faced. González-Videgaray and Romero-Ruiz (2022) state that "it is very convenient to make a review of how AI is being applied to education, but, on the other hand, it is necessary to promote AI learning from basic levels" (p. 52). Across Europe, we are seeing a considerable increase in efforts to incorporate artificial intelligence into education by promoting projects to provide training for teachers on how to use these technologies. An example of this is evidenced by seeing that the Spanish Ministry of Education, Vocational Training and Sports through the National Institute of Educational Technologies and Teacher Training (2024) created a "Guide on the use of Artificial Intelligence in the Educational field." Likewise, UNESCO's International Institute for Higher Education in Latin America and the Caribbean (2023) launched the quick start guide for "ChatGPT and artificial intelligence in higher education". Although there has been progress in terms of incorporating AI in education, there are still uncertainties about the effectiveness of artificial intelligence in language teaching. In addition, some educators remain resistant to change and there is concern about over-reliance on technology at the expense of traditional pedagogical methods.

In Latin America, the implementation of artificial intelligence in education faces certain difficulties due to factors such as the lack of technological infrastructure and economic inequalities that hinder access to more advanced educational resources. Despite this, teacher training programs that incorporate the use of AI tools are being implemented in countries such as Chile, Brazil and Mexico. In this case, the Chilean government, through the Innovation Center of the Ministry of Education (2023) published the "Guide for teachers: how to use ChatGPT to enhance active learning". However, these efforts have not yet been widely expanded throughout the region. In view of this, ProFuturo and the Organization of Ibero-American States (2023) suggest that "new alliances between countries, especially in a region with as many common challenges as Latin America, could be a way to achieve convergence in the approach and use of AI in education in the coming years" (p. 44).

Honduras is also affected by these trends, although it has specific challenges to face and overcome. In the country, teacher training in foreign languages follows a traditional approach and hardly any modern technology is used with intermittent Internet access in public education institutions. Although there are individual efforts by some university professors to incorporate AI in education, there is still a lack of awareness of its usefulness and a low level of adoption by foreign language faculty. This creates a significant problem since those who train future teachers do not incorporate AI in their classes, but those who receive these professorships do use AI in their training. Therefore, it was proposed to know what was the perception and use of artificial intelligence in the training process of future teachers in the teaching of foreign languages in Honduras. It is essential to recognize and understand these dynamics in order to formulate educational strategies that take advantage of the capabilities of artificial intelligence to train future language teachers with technological competencies, adapted to the specific context of Honduras.

Given the technological boom and the imminent incorporation of Artificial Intelligence in education, several researchers have conducted studies in this field. Gragera (2024) analyzed the perception of students at the University of Las Palmas de Gran

Canaria on the use of Artificial Intelligence (AI) in learning English for specific purposes. It was developed under the qualitative approach using surveys for data collection. Thanks to the use of AI, students showed improvements in written production and in the use of technical and academic language. The importance of a more active and personalized integration of these tools is highlighted. Also, Chao-Rebolledo and Rivera-Navarro (2024) in their quantitative, cross-sectional and inferential-exploratory study with a purposive sample of a total of n=227 teachers and n=180 Mexican students highlight the main findings where it was observed that at least 20% of teachers and 33% of students already use some AI tool in their academic life. Significant differences were found between teachers and students with respect to their use of AI tools in learning. In the research by Ayuso-del Puerto and Gutiérrez-Esteban (2022), through a mixed approach using a questionnaire and Likert scale, the responses of 76 teachers in initial training who were taking the subject ICT applied to Education in the Degree in Early Childhood Education at the University of Extremadura were analyzed. The results of the study show that students believe that artificial intelligence has a positive impact on their learning process and feel capable of creating their own educational resources if they receive support and guidance from university faculty. In addition, Ríos Hernández et al. (2024) set out to know the perception of students on the use of Artificial Intelligence in higher education in three Latin American countries: Ecuador, Peru and Mexico by applying a quantitative instrument to 423 undergraduate students from three universities. The results demonstrate that the potential of AI to improve educational quality and tailor the learning process to each student is widely recognized. It also highlights the relevance of ensuring an inclusive and equitable approach when applying AI in higher education.

In contrast to other areas, in the field of artificial intelligence there is no single definition for this concept, but rather multiple perspectives according to a personal conception of the term. In 1956, during a workshop held at Dartmouth College, a leading American Ivy League university, the term 'artificial intelligence' was first coined to refer to “the science and engineering of creating intelligent machines, especially intelligent computer programs” (McCarthy et al., 2006, p. 14). UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (2019) describes AI as "machines that can mimic some abilities of human intelligence, such as perception, learning, reasoning, and problem-solving skills. In addition, they are able to interact in natural language and even generate creative work” (p. 3). For the purposes of this study, the definition of the European Parliament (2021) will be adopted where “artificial intelligence is the ability of a machine to exhibit the same capabilities as humans, such as reasoning, learning, creativity and the ability to plan” (p. 2).

Objectives

This research investigated what happens in the university educational community of future foreign language teachers oriented to teaching English or French in terms of how Artificial Intelligence is perceived, used and incorporated in the training processes, in a context where educational innovation is crucial. Thus, the main purpose of this research was to determine how undergraduate students of Foreign Languages at the National Autonomous University of Honduras perceive and use AI tools during their training as future teachers in language teaching. Additionally, to know what AI tools they use in their teaching-learning process. There is a growing demand for technological competencies in education, as well as a need to understand how these technologies can be effectively integrated, especially in language teaching. By generating knowledge about the current

attitudes and practices of future teachers with respect to artificial intelligence tools, the aim is to design more effective training programs and promote educational policies that improve the quality of teaching, providing guidance on the use of AI in education. The scientific benefit of this study lies in its contribution to the field of education and applied technology, providing empirical data that can inform future research and pedagogical theories, especially in contexts with limited resources and little or no AI integration.

Method

Approach

In this research, the descriptive type quantitative approach was implemented, taking into account the concepts established by Hernández-Sampieri and Mendoza Torres (2018), which consists of using data collection for hypothesis testing through the use of numerical measurement and statistical analysis. The design of this study was non-experimental since the research was carried out without deliberately manipulating any variable. Likewise, it was cross-sectional, since the data collection was carried out in a single moment or period of time.

Instrument

A Likert-type scale with five rating levels (1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Neutral*, 4 = *Agree* and 5 = *Strongly agree*) based on the questionnaire developed by Ayuso-del Puerto and Gutiérrez-Esteban (2022) was used as a data collection instrument. The scale consisted of 16 items digitized in *Microsoft Forms*. In order to collect the data, a visit was made to each learning space during the different schedules and days that the subjects are offered for future teachers of English teaching. Before proceeding with data collection, informed consent was requested. A QR code was displayed in which participants scanned and completed the scale. The collection of information took place in the second academic period 2024 of the Universidad Nacional Autónoma de Honduras, specifically in building 1847 where the Foreign Languages Department is located.

Sample

The research subjects were students: teachers in training enrolled in the Bachelor's Degree in Foreign Languages with orientation in the Teaching of English or French at the Universidad Nacional Autónoma de Honduras. At the time of data collection, there were 660 trainee teachers enrolled in both English and French orientation. We worked with a probabilistic sample. Therefore, the *Decision Analyst* STATS™ 2.0 program was used to calculate the sample, resulting in 243 subjects to be studied. We worked with a 5 % error level and 95 % confidence level as parameters for this calculation. The data collected were entered, organized and analyzed in *Statistical Package for the Social Sciences* (SPSS) software, version 27.0. Consistency checks were performed and data were cleaned to identify and correct input errors, outliers and missing data.

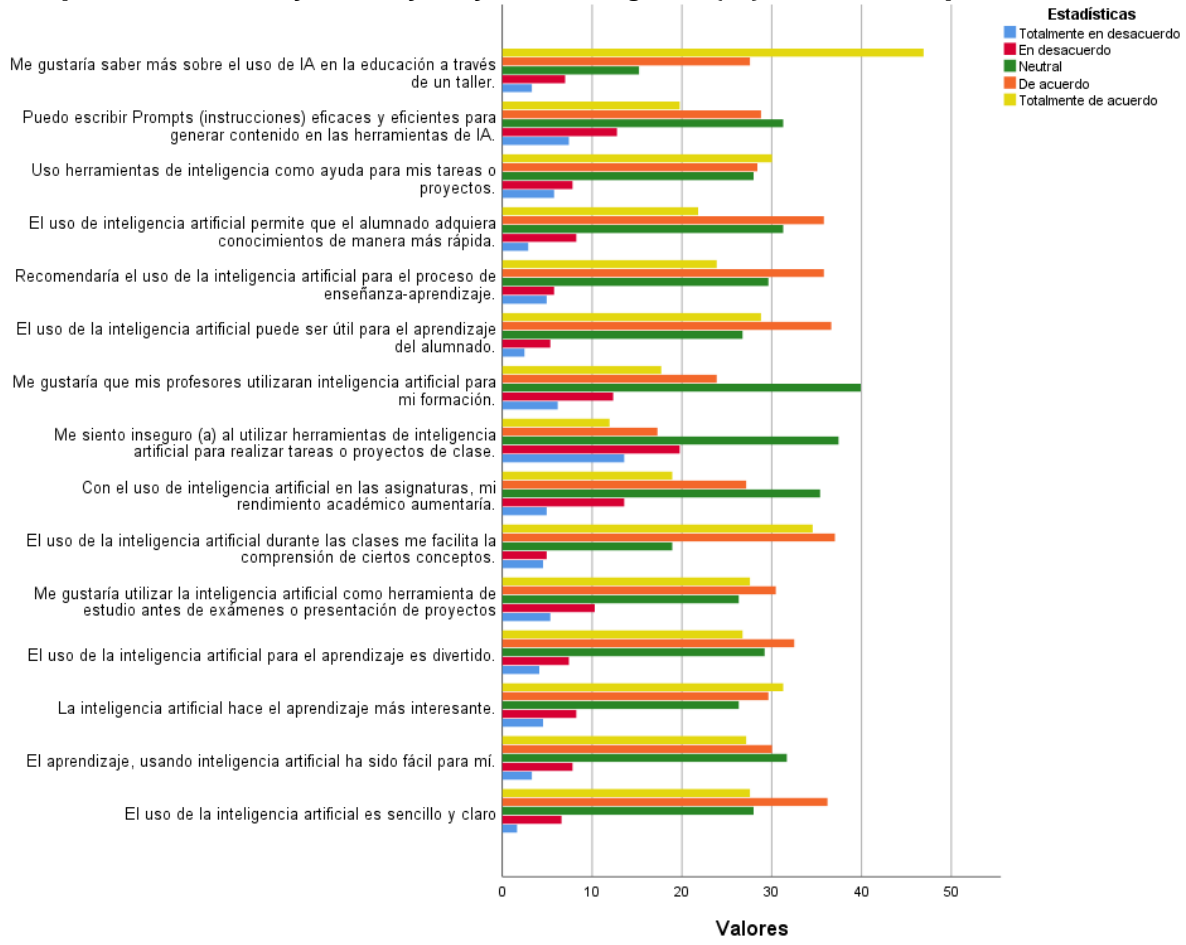
Results

The various statements of the Likert scale were analyzed both individually and as a whole according to their belonging to the variables. During the tabulation, groups were created where the different statements were housed by assigning a number to each

question as follows: perception of AI: P1, P2, P3, P4, P8 and P15; use of AI: P5, P9, P13 and P14; and, AI utility: P6, P7, P10, P11 and P12. At this stage of the process, in SPSS, a new variable was created for each group (perception, use and utility) and the average values or sums of the responses to the associated questions were used. From this, descriptive analyses were performed for the whole and subgroups of data. Moreover, the results are presented in percentages and frequencies, which makes it possible, on the one hand, to identify both the most used tools and, on the other hand, the least used ones.

Figure 1

Perception, use and usefulness of artificial intelligence (AI) in education per item



Note. Questionnaire by Ayuso-del Puerto and Gutiérrez-Esteban (2022, p. 352)

The results in Figure 1 show how participants rated their level of agreement with various statements about the use of Artificial Intelligence (AI) in education. In general, most of the responses are concentrated in the *Agree* and *Strongly Agree* levels. This indicates that, generally speaking, there is a positive perception of AI in education among respondents. For example, statements such as "The use of artificial intelligence is simple and clear" and "Artificial intelligence makes learning more interesting" show a pattern in which respondents tend to mostly *Agree* or *Strongly Agree*. Consequently, AI is seen as a comprehensive and attractive tool.

However, the statement "I feel insecure using artificial intelligence tools to perform class tasks or projects" has an opposite tendency, with a distribution more towards disagreement. This implies that, in general, insecurity when using AI is not a prevalent problem among respondents. In contrast, statements such as "I use artificial

intelligence tools to help me with my homework or projects" and "I would like my teachers to use artificial intelligence for my training" have a high concentration in *Agree*. This indicates an acceptance of the use of these tools in the academic context.

In addition, the statement "I can write effective and efficient *Prompts* (instructions) to generate content in AI tools" shows that there is a good level of confidence in the respondents' ability to interact with AI tools. However, there is a slight dispersion towards more neutral responses, which reveals some variability in the self-assessment of this skill. Regarding statements related to the usefulness of AI, such as "The use of artificial intelligence can be useful for student learning" and "I would recommend the use of artificial intelligence for the teaching-learning process," also have a high tendency toward agreement. This suggests that respondents positively value the usefulness of AI in learning.

On the other hand, the statement "The use of artificial intelligence enables learners to acquire knowledge faster" also follows this trend, indicating that respondents perceive concrete benefits in the speed of knowledge acquisition with the use of AI. Finally, "I would like to learn more about the use of AI in education through a workshop" shows a clear trend toward agreement, suggesting an interest on the part of respondents in expanding their knowledge and skills in this field. It is worth noting that this interest could be related to the need for additional training to maximize the potential of AI in education.

¶

Table 1

Perception, use and usefulness of artificial intelligence

	Strongly disagree	**Disagree**	**Neutral**	**Agreed**	**Totally agree**
Perception of AI	1.2 %	4.9 %	27.6 %	45.7 %	20.6 %
Use of AI	8.2 %	13.2 %	31.3 %	29.2 %	18.1 %
Utility of AI	3.3 %	9.1 %	25.1 %	37.0 %	25.5 %

The data shown in Table 1 reflect the percentages of responses for each level of agreement on a Likert scale in relation to three key variables: *perception of AI, use of AI*, and *usefulness of AI*.

First, regarding the perception of AI, only a minority of respondents have a negative perception of AI, indicating that most participants do not find major difficulties or significant negative aspects in the use of AI representing for *Strongly Disagree* 1.2 % and for *Disagree* 4.9 %. On the other hand, a considerable percentage of respondents have a neutral perception (27.6 %), indicating that, although they do not view AI negatively, they are not completely convinced of its value or usefulness either. Nevertheless, the majority of respondents (*Agree* with 45.7% and *Strongly Agree* with 20.6%) have a positive perception of AI, considering it clear and easy to use, which is an indication of acceptance and receptivity towards this technology in the educational context.

Secondly, regarding the use of AI, there is an increase in negative responses compared to the perception of AI (*Strongly Disagree* with 8.2% and *Disagree* with 13.2%). This indicates that, although respondents have a positive perception of AI, some find challenges or limitations when it comes to its practical use. On the other hand, a third of respondents took a neutral position (31.3%), indicating that the use of AI is not yet fully integrated or that not all respondents have the same confidence or experience in its use. However, although there is significant acceptance, it is lower compared to the general perception of AI. Therefore, this reflects a gap between the perception of the technology

and its practical application, suggesting the need for more training or resources to improve the implementation and effective use of AI in education (*Agree* with 29.2 % and *Strongly Agree* with 18.1 %).

Finally, with reference to the usefulness of AI, negative responses are relatively low, showing that most respondents recognize some value in the use of AI for educational purposes (*Strongly Disagree* with 3.3 % and *Disagree* with 9.1 %). In contrast, a quarter of respondents hold a *Neutral* stance (25.1%), perceiving that while they recognize the utility of AI, they may not be fully convinced of its significant impact or have not experienced its benefits in a tangible way. Finally, the majority of respondents (*Agree* with 37.0% and *Strongly Agree* with 25.5%) see AI as a useful tool in education, reflecting a significant acceptance of its potential to improve learning and academic performance. Thus, this high level of agreement underlines the perception that AI can add value to the educational process.

Table 2
Perception of AI

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Strongly disagree	3	1.2	1.2	1.2
	Disagree	12	4.9	4.9	6.2
	Neutral	67	27.6	27.6	33.7
	Agreed	111	45.7	45.7	79.4
	Totally agree	50	20.6	20.6	100.0
	Total	243	100.0	100.0	

Detailing the data analysis, Table 2 presents information related to the perception of Artificial Intelligence (AI) among respondents. 12 students (4.9%) disagreed with statements about the clarity and ease of use of AI, suggesting a slightly negative perception among a small group of respondents. A total of 67 students (27.6%) feel *Neutral* towards AI. This group does not have a strong positive or negative opinion, reflecting a lack of experience or limited use of AI. The majority of students, 111 (45.7%), have a positive perception of AI, considering it clear and easy to use, which is a positive indication of acceptance. On the other hand, 50 students (20.6%) *Strongly agree* that the AI is clear and easy to use, highlighting a strong positive perception. There is a significant difference between respondents with a positive perception of AI (66.3%, 161 students) and those with a negative perception (6.1%, 15 students). This difference establishes that most students find AI to be a clear and easy-to-use tool, although a small percentage still perceive difficulties.

Table 3
Use of AI

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Strongly disagree	20	8.2	8.2	8.2
	Disagree	32	13.2	13.2	21.4
	Neutral	76	31.3	31.3	52.7
	Agreed	71	29.2	29.2	81.9
	Totally agree	44	18.1	18.1	100.0
	Total	243	100.0	100.0	

Regarding the use of Artificial Intelligence (AI), Table 3 shows that 20 students (8.2%) have a very negative perception about the use of AI, indicating that these do not use it or encounter significant difficulties in its implementation. Likewise, 32 students (13.2%) disagreed with the use of AI, suggesting that a considerable group of students perceive barriers or drawbacks in attempting to use this technology in their learning. A total of 76 students (31.3%) are in a *Neutral* position, indicating uncertainty about how to use AI or a lack of sufficient experience to form a clear opinion about its use. Contrary to the above, 71 students (29.2%) *agree* with the use of AI, reflecting a moderate positive perception of its practical application in the educational context. And 44 students (18.1%) have a very positive perception of AI use, suggesting that they find the technology effective and useful in their learning. The existence of a considerable group of students with neutral or negative perceptions underscores the need for educational interventions, such as training workshops or orientation sessions to improve confidence and skill in the use of AI. The fact that less than 50% of students have a strong positive perception of the use of AI in their learning establishes that there is room for improvement in the integration and effectiveness of this technology in the educational environment.

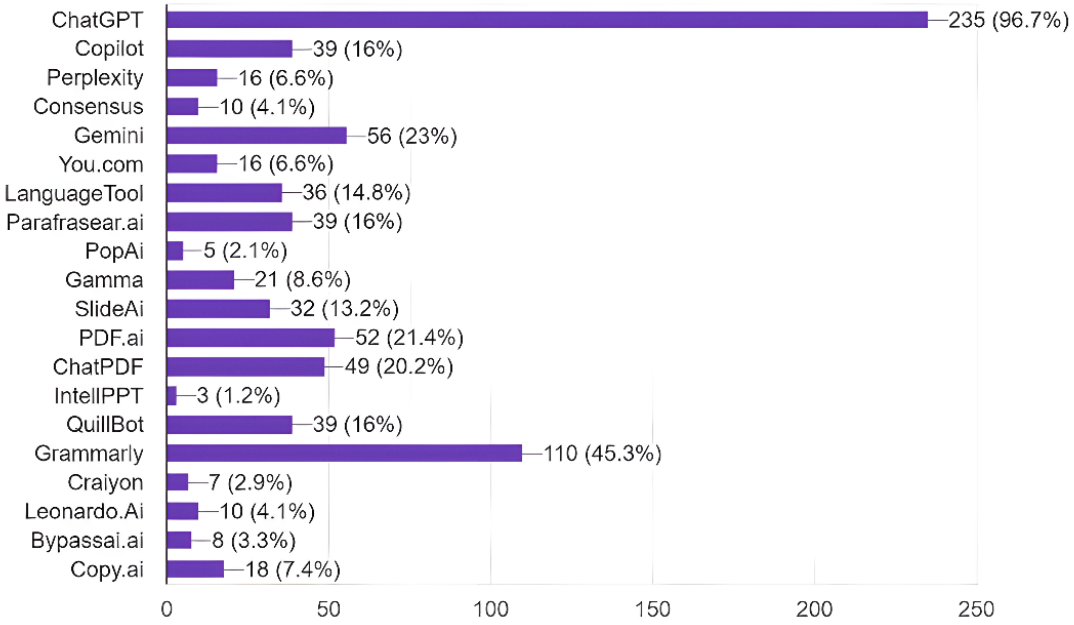
Table 4
Utility of AI

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Strongly disagree	8	3.3	3.3	3.3
	Disagree	22	9.1	9.1	12.3
	Neutral	61	25.1	25.1	37.4
	Agreed	90	37.0	37.0	74.5
	Totally agree	62	25.5	25.5	100.0
	Total	243	100.0	100.0	

In that concerning the usefulness of Artificial Intelligence (AI) as perceived by the students surveyed (Table 4), only 8 students (3.3%) believe that AI is not useful for learning, reflecting a very negative perception in a small group of respondents. Additionally, 22 students (9.1%) disagreed about the usefulness of AI, suggesting that this group of students does not find that AI brings them clear benefits in their educational

process. A total of 61 students (25.1%) have a *Neutral* stance on the usefulness of AI, indicating uncertainty about its value or insufficient experience with the technology to form a strong opinion. Now, the majority of students, 90 (37.0%), *agree* that AI is useful for learning, establishing a positive perception about the impact of AI on education. Additionally, 62 students (25.5%) *Strongly Agree* that AI is useful for learning, reflecting a very positive perception and strong acceptance of its educational value. There is a significant difference between students who perceive AI as useful (62.5%, 152 students) and those who perceive it as not useful (12.4%, 30 students). This indicates a general positive trend towards the usefulness of AI, although a minority group is not yet convinced of its value.

Figure 2
AI tools known or used by students



The results of the research on knowledge and use of AI tools, according to Figure 2, show that *ChatGPT* is the most known and used AI tool, with 96.7% of respondents having used or knowing about it, demonstrating its widespread adoption among prospective teachers. *Grammarly* is the second most recognized tool, used by 45.3% of students, indicating its popularity as a writing assistant. *Gemini* is used or known by 23% of students, placing it as a less popular but still relevant tool compared to others. *PDF.ai* is used or known by 21.4% of respondents, which places it as a moderately used tool among students. *ChatPDF* follows closely behind *PDF.ai*, with 20.2% of students having used it, indicating similar relevance in the student community. *Copilot*, Parafrasear.ai, and *QuillBot* share a similar level of recognition, with 16% of students familiar with them, suggesting moderate penetration in academia. While other tools (*Gamma*, *SlideAi*, *LanguageTool*, *Copy.ai*, etc.) show a lower popularity, with percentages ranging from 13.2% to 2.1%. This suggests that, although multiple AI tools exist, their use is less widespread. *ChatGPT* has significantly higher adoption (96.7%) compared to any other tool, while tools such as *PopAi* (2.1%) and *IntelliPPT* (1.2%) have extremely low recognition and usage. *Grammarly* (45.3%) has a remarkable recognition, which underlines the importance of tools that improve writing in the academic environment. On the other hand, the low adoption of some tools indicates the need for further promotion

or training in their use so that students can take advantage of a wider range of AI technologies.

Discussion and Conclusions

The results of this study are similar to those of previous research. For that matter, the overall perception of artificial intelligence is mostly positive among the surveyed students, with 66.3 % of them showing agreement or total agreement with statements about the clarity and ease of use of AI. This is in agreement with the study conducted by Gutiérrez and De León (2024), who found an aversion to the use of AI to a very low degree in the university environment. Likewise, 27.6% of students maintain a *Neutral* stance, suggesting a lack of conviction or sufficient experience with the use of AI, a finding that is closely related to the persistent perception of uncertainty and the need for adequate training noted by Gutiérrez Terriquez (2024). In addition, the usefulness of AI is recognized by the majority of trainee teachers, with 62.5% in agreement or total agreement on its value when using it in the teaching-learning process. This result is in line with the general perception that AI can be a useful tool to improve learning, as observed in the studies of Zamora Úbeda and Stynze Gómez (2024).

Additionally, despite the positive perception, the use of AI is less enthusiastic, with only 47.3% of prospective teachers in agreement or total agreement with its use. This denotes a gap between the positive perception of technology using AI and its practical implementation, aligning with the finding that students see AI as useful, but are concerned about its reliability and require more training to use it effectively (Gutierrez Terriquez, 2024). However, in relation to usage, while Zamora Úbeda and Stynze Gómez (2024) found that 39.8% of students use AI for research, this study does not detail the specific purpose of use, but reflects a lower overall acceptance of the practical use of AI in learning. It is clear that the perception and use of AI in the educational environment is in a stage of development and acceptance. According to Chao-Rebolledo and Rivera-Navarro (2024), 33% of students already use some AI tool in their academic life, which coincides with the results obtained in this study, where a considerable acceptance of AI tools was observed, given that each of the teachers in training at least knows or uses more than one tool that uses AI in their academic training, although with a certain level of uncertainty and neutrality in its practical use. The findings are also consistent with the observations of Gragera (2024), who notes that, although the overall perception of AI is positive, students suggest the need for more customization and frequency in the use of AI tools.

Overall, the results of this research show that prospective teachers have a favorable attitude towards the use of artificial intelligence (AI) in education, with a more specific purpose for teaching foreign languages. According to the majority of respondents, artificial intelligence is perceived as clear, simple to use and with the potential to enhance the educational experience. Despite this, a discrepancy was found between the favorable perception towards artificial intelligence and its use in practice, which implies that, although there is acceptance towards AI, challenges are faced to implement it effectively in the educational setting. One of these challenges represents the correct creation of *prompts* that must be written to obtain coherent, relevant and effective answers for any topic that is specifically consulted in ChatGPT, the tool most used by trainee teachers. In addition, lack of experience or training in the use of various artificial intelligence tools may be the cause of this gap, as one third of the trainee teachers did not show a definite stance on their use, indicating a possible lack of familiarity or confidence in the technology. This study confirms a trend towards the acceptance of AI in educational

settings with a focus on foreign language teaching, however, it highlights the imperative need for more effort to thoroughly teach how each AI should be used in education. The acceptance of artificial intelligence tools such as *ChatGPT* and *Grammarly*, which are widely used by trainee teachers, indicates that such AI tools have a clear purpose and practical use so they tend to be very well accepted and used by this group. Despite this, it can be observed that the potential of artificial intelligence in education is still not being fully exploited due to the low adoption of other tools, as future teachers focus on text generation and correction. Therefore, it is clear that additional educational interventions are required to promote the use of every AI tool that can be integrated into education.

Therefore, it is essential to develop specific training programs that not only increase the technical competence of future teachers in the use of AI, but also address perceptions and attitudes towards this type of technology, in order to optimize its potential in education. It is crucial that these initiatives focus on reducing the disparity between the positive image of AI and its use in the real world, providing trainee teachers with the necessary tools and skills to incorporate it efficiently into their educational practices. It is also advisable to encourage a wider variety of AI tools in academia by professors, to ensure that trainee teachers are not only familiar with the most commonly used ones such as *ChatGPT* and *Grammarly*, but also with others that can offer particular benefits in different axes of academic training. To achieve this, the strategy of conducting workshops and practical sessions can be considered as an effective option by implementing and following the guidelines that have been embodied in the didactic material for the incorporation of AI in education such as the "Guide on the use of Artificial Intelligence in Education" (National Institute of Educational Technologies and Teacher Training, 2024); "ChatGPT and artificial intelligence in higher education: quick Start Guide" (UNESCO International Institute for Higher Education in Latin America and the Caribbean, 2023); and "the Guide for teachers: how to use ChatGPT to enhance active learning" (Innovation Center, Ministry of Education, Government of Chile, 2023).

One of the main limitations of this study is that it focuses only on prospective foreign language teacher trainees, which does not reflect the perception and use of AI in other groups, such as teachers. Also, the study focused on a small number of AI tools, which may have affected the results by not taking into account all available technologies. In the future, complementary research may be conducted after the implementation of workshops and may include other disciplines and educational levels in order to gain a more comprehensive understanding of how AI impacts and is accepted in education. In addition, it would be interesting to investigate how the incorporation of AI into the academic curriculum and its use by professors can impact the academic performance and motivation of trainee teachers. Finally, it is necessary to explore how the use of artificial intelligence can be personalized and adjusted to meet the particular needs of students and optimize their educational experience.

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DEVELOPMENT OF A DIDACTIC STRATEGY INTEGRATING ICT TO IMPROVE THE LEARNING OF READING AND WRITING IN ELEMENTARY SCHOOL STUDENTS

DESARROLLO DE UNA ESTRATEGIA DIDÁCTICA INTEGRANDO LAS TIC PARA MEJORAR EL APRENDIZAJE DE LA LECTO-ESCRITURA EN LOS ESTUDIANTES DE BÁSICA PRIMARIA

Claudia Emilia Lemus Chaverra[1]
Institución Educativa Pedro Grau y Arola, Colombia
(claudia.lemusch76@gmail.com) (https://orcid.org/0009-0003-8831-9226)
Ana Cristina García Pérez
Universidad Isabel I, España
(anacristina.garcia@ui1.es) (https://orcid.org/0000-0003-3961-5021)

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ABSTRACT

Information and Communication Technologies (ICT) constitute an agent of change for the redesign of learning environments and didactic resources. They have become a relevant tool in the teaching-learning process of reading and writing. The objective of the study was to develop a didactic proposal to improve the teaching of reading and writing through the use of ICTs in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. The research is framed within the projective type with a non-experimental, transversal - field design; the population was formed by 156 students, applying the convenience sampling, it was formed by 62 students of the three educational institutions. A quantitative processing was used, by means of descriptive statistics (measures of central tendency and variability). It was concluded that students improve their reading levels with the implementation of the didactic strategy mediated by ICT. It is recommended to show the results of the research to the directors of each of the institutions so that they take measures regarding the implementation of the didactic units for the strengthening of reading and writing in all fifth grade students of the institutions involved in this study and thus, provide students with collaborative learning environments where the necessary resources exist to achieve significant learning.

Palabras clave:
la tecnología en la educación, lecto-escritura, niveles de lectura, propuesta didáctica, TIC

RESUMEN

Las Tecnologías de la Información y la Comunicación (TIC) constituyen un agente de cambio para el rediseño de entornos de aprendizaje y recursos didácticos. Se han constituido en una herramienta relevante en el proceso de enseñanza-aprendizaje de la lectura y la escritura. El estudio tuvo como objetivo desarrollar una propuesta didáctica para mejorar la enseñanza de la lecto-escritura mediante la vinculación de las

[1] Autor de correspondencia.

	TIC, en los estudiantes de básica primaria de las Instituciones Educativas Antonio María Claret, Antonio Ricaurte y Pedro Grau y Arola de la ciudad de Quibdó. La investigación se enmarca dentro del tipo proyectiva con un diseño no experimental, transversal - de campo; la población estuvo conformada por 156 estudiantes, aplicándose el muestreo por conveniencia, quedó conformado por 62 estudiantes de las tres instituciones educativas. Se empleó un procesamiento cuantitativo, mediante la estadística descriptiva (medidas de tendencia central y variabilidad). Se concluyó que los estudiantes mejoran los niveles de lectura a partir de la implementación de la estrategia didáctica mediada por las TIC. Se recomienda evidenciar los resultados de la investigación ante las directivas de cada una de las instituciones para que tomen medidas en cuanto a la implementación de las unidades didáctica para el fortalecimiento de la lecto-escritura en todos los estudiantes del grado quinto de las instituciones vinculadas a este estudio y así, brindar a los estudiantes ambientes de aprendizaje colaborativos donde existan los recursos necesarios para alcanzar un aprendizaje significativo.

Introduction

There is agreement on the importance of reading and writing as a fundamental tool for learning in all areas of the curriculum (MEN, 2006). In particular, the language area is oriented to the development of basic communication skills (speaking, listening, reading and writing). According to the Curricular Standards for Spanish Language published by the Colombian Ministry of National Education (MEN), the area of language complements it with the functionality of the communicative act, literature and semiotics. Nowadays, the development of comprehension and communication skills is required to allow the student to access any area of knowledge.

The teaching of writing can have in technology an important support, this statement is based on the study "The effect of computers on students' writing", where a meta-analysis of 26 researches carried out in the period between 1992 and 2002 is carried out. This study highlights that the use of computers for teaching writing has a positive impact on the quality and quantity of texts produced by students, and that the writing process is more interactive, social and collaborative compared to traditional teaching (Eduteka, 2003).

In 2011, the Ministry of National Education launched the National Reading and Writing Plan "Reading is my story" whose purpose was to promote the development of communication skills through the improvement of reading and writing levels (reading behavior, reading comprehension and textual production). It was aimed at preschool, elementary and middle school students through the strengthening of the school as an essential space for the formation of readers and writers, including the family in the process. The implementation of the plan introduced substantial improvements in the initial orientation, in accordance with the Colombian context and the practical variables related to language, such as reading comprehension, writing and orality as a sociocultural practice. However, orality was not developed significantly in the initial formulation of the Plan, but is now a central dimension of it. To this end, in recent years, joint work with local authorities has been intensified to identify the needs of communities in order to close the gaps between rural and urban schools in terms of access to written culture and orality (MEN, 2021).

Learning to read is a process that begins at an early age, between three and six years old, and continues throughout life. Given its relevance, many studies have established different ways of approaching this topic, mainly in its beginnings, since this is where the foundations for later learning are laid (Saldaña-Gómez and Fajardo-Pacheco, 2020; Chávez-Delgado et al., 2022; Quispilema-Fiallos, 2020). It should be emphasized that written language is not in the genetic code of individuals, but is a cultural manifestation that needs to be taught and learned, and is therefore absolutely arbitrary (Loría-Rocha, 2020). Hence the importance of establishing didactic strategies in line with local and regional educational needs.

For this reason, didactic strategies designed for the teaching and strengthening of reading and writing in primary education have been a topic that focuses the attention of teachers, researchers and theoreticians in the educational field (Feicán-Zumba et al., 2021; Navarro et al., 2020). A large amount of literature has focused on knowing the strategies used by teachers and the results they have obtained in their implementation, as well as proposing different methods that are in accordance with the complexity of the educational level, such as elementary school (Viñas-Marte and Guzmán-Taveras, 2020; Chacha-Supe and Rosero-Morales, 2020; Pisco-Román et al., 2023).

Given the challenges faced by some schools during the development of basic literacy skills at school age, this study has been developed with the objective of developing

a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. In order to achieve this objective, an exhaustive search of didactic strategies for teaching ICT-mediated reading was carried out, so that students could improve the reading levels they already possess.

This study is situated in the Didactics of Language research line, in the area of reading and writing in elementary school, allowing to organize and guide the research work in the area of language, serving as a basis for the production of knowledge that contributes to respond to the problems to be addressed. The type of research is projective, which consisted of developing a strategy that provides a practical solution in a specific area of knowledge, based on a diagnosis of current needs, explanatory processes and future trends. This type of research encompasses the creation, design and elaboration of plans and projects based on a methodical process of tracking and probing in description, analysis of results and predictability. Additionally, it is framed within the non-experimental, field, cross-sectional design.

Method

Research Design

This research is within the non-experimental, field, cross-sectional design, given that the phenomena and subjects were observed in their natural environment without being intentionally provoked by the researcher. According to Hernández-Sampieri et al. (2014) a non-experimental research is one that is conducted without deliberately manipulating variables. What is done in non-experimental research is to observe phenomena as they occur in their natural context and then to analyze them (Hernández Sampieri et al., 2014).

This approach is useful in situations where it is not ethical or practical to perform controlled experiments, such as in the study of human or social behavior. It can also be useful when you want to explore relationships or patterns in a phenomenon without intervening in it.

On the other hand, the study is cross-sectional, since the current situation of the reading and writing process of elementary school students was analyzed. The purpose of this is to use the results to design a didactic proposal, which contains four units, with different activities and interactive strategies that lead to the improvement of deficiencies and difficulties in reading and writing in elementary school students, since this has repercussions in the other areas of knowledge. Hernández-Sampieri et al. (2014) state that the transectional or cross-sectional study is conducted at a single point in time. This is carried out when the research is focused on analyzing the level or state of one or several variables at a given time or the relationship between a set of variables at a given point in time. Its essential purpose is to describe variables and analyze their incidence and interrelation at a given time.

Population and Sample

According to the Departmental Secretary of Education of Chocó, the municipality of Quibdó is certified; it has 184 educational establishments and 1,098 schools distributed as follows:

Table 1

Number of educational establishments

Educational Establishment	Quantity
Educational institution for Afro population	77
Educational institution for indigenous population	31
Educational Center for Afro population	33
Educational Center for Indigenous Population	43
Afro population	687
Indigenous population sites	411

Note. Source: Gobernación del Choco (2020).

According to the SIMAT Information System, the 2019 fiscal year registered an enrollment of 72,270 children and young people in the official sector and 32,356 in the contracted sector. The official enrollment corresponds to 69% and the contracted enrollment to 31%, an increase of 4,743 students compared to the previous fiscal year. 35.9% of students receive care in urban areas and 64.1% in rural areas. The highest percentage of students are concentrated at the elementary school level with 49% and junior high school with 24%, and the levels with the lowest percentage of students are preschool and middle school with 7% each.

As a sample, children from the educational institutions Pedro Grau y Arola, Antonio María Claret and Antonio Ricaurte in the city of Quibdó were chosen.

Table 2

Number of children per school

Institution	Number of children	Number of girls	Teacher number
Anthony Mary Claret	1545	1101	97
Antonio Ricaurte	1233	1280	68
Pedro Grau and Arola	1290	1640	128
Total	**4068**	**4021**	**293**

Convenience sampling was used for the sample. It is a non-probabilistic and non-random sampling technique used to create samples according to the ease of access, the availability of people to be part of the sample. This technique is selected to observe habits, opinions and points of view in a simple way (Hernández Sampieri et al., 2014). From each institution, the list was taken from the fifth grade A, one hundred and fifty-six (156) students, 90 boys and 66 girls, between the ages of 9 and 12 years old. Inclusion criteria: age, grade, enrolled in one of the selected institutions. Exclusion criteria: age, not being enrolled in any of the institutions, not belonging to the Quito A grade. The groups do not include the disabled, displaced or those with special learning needs.

Variables

Learning to read and write

Reading and writing means the union of two processes that are totally connected: reading and writing. Likewise, reading and writing are two activities that may have a certain degree of difficulty, but are nevertheless fundamental, because the fact that people continue learning throughout their lives depends on them. It is a linguistic process, where the student uses hands and oro-facial movements, so different skills are involved in order to do it successfully. These skills are thinking skills such as: observation, identification,

comparison and description. Linguistic, where the student can communicate verbally with others -seeing and hearing-. The informal ones, which help students develop the ability to search, classify and communicate information, thus developing the habit of reading and writing, obtaining, in addition, a significant advance, conforms to the school system (Londoño-Vásquez, 2014).

Use of ICT

ICT are pedagogical support tools, which, when used appropriately in the classroom, improve the competencies and skills required in different knowledge disciplines. ICTs develop literacy skills and motivate learning in students (Luna-Miranda et al., 2020). ICTs are technological tools; their presence in the spaces where students are immersed is overwhelming. Linking ICT in the learning process favors the planning of a written text, in addition, it allows the learner to interact with reading and writing from a real projection, awakening interest and motivation in the student (Suárez-Cárdenas et al., 2015)

Research Instruments

The techniques used in this data collection process were two questionnaires.

The questionnaire is a procedure that makes it possible to explore issues of subjectivity and at the same time to obtain this information from a considerable number of people, for example: it makes it possible to explore public opinion and the current values of a society, issues of scientific significance and importance in democratic societies (García-Alcaraz et al., 2006). The questionnaire is the systematic search for information in which the researcher asks respondents about the data he/she wishes to obtain, and then gathers this individual data in order to obtain aggregate data during the evaluation (García, 2003).

By means of the first questionnaire, several aspects of the students in the fifth grade A were measured, such as their socioeconomic level, geographic location, access to technological media both in and out of school, and tastes and interests in reading and writing.

Next, in order to determine the level of reading comprehension and knowledge prior and subsequent to the didactic-methodological intervention, related to the programmatic contents according to the class program of the subject of communication in the development of reading skills, a written questionnaire-type test was administered at the beginning of the intervention to groups of students in grades 5A.

Data Analysis

For the purposes of this research, statistical analyses were performed with the SPSS program. This software is used to perform data capture and analysis to create charts and graphs. It uses a wide range of statistical analyses, such as descriptive statistics, bivariate statistics, regression, factor analysis and graphical representation of data. This software was originally designed and named for the social sciences, but can be used on many types of experimental or observational data.

Descriptive statistics are used. For the analysis of the diagnostic and evaluation tests, first the normality test was performed to determine whether they are parametric or nonparametric tests, then the hypothesis test for related samples was performed, as follows:

$H_0: \mu_1 = \mu_2$ Means are equal, there is no significant difference between diagnosis and evaluation.

$H_0: \mu_1 \neq \mu_2$ Means are different if there is a significant difference between diagnosis and evaluation.

Where:

Ho: Null hypothesis.

Hi: Alternative hypothesis

μ_1: Pre-test mean

μ_2: Post-test mean

If the test is parametric, the Student's t-test for paired samples will be applied; if it is non-parametric, the Wilcoxon t-test will be applied. This is a non-parametric test used to compare two related or matched samples. In simple terms, the Wilcoxon t-test is used when data do not follow a normal distribution or when the difference between samples is not symmetrical. This test evaluates whether the differences between the two samples are statistically significant. It is based on the ranges of the differences between pairs of data from the two samples. The sum of the ranges of the differences is calculated and compared to a critical value to determine if the difference between the samples is statistically significant. In summary, the Wilcoxon t-test is a useful statistical tool when working with related samples and the assumptions of the Student's t-test are not met. It is important to note that this test may be less powerful than Student's t-test if the data meet the assumptions of normal distribution and homogeneity of variances.

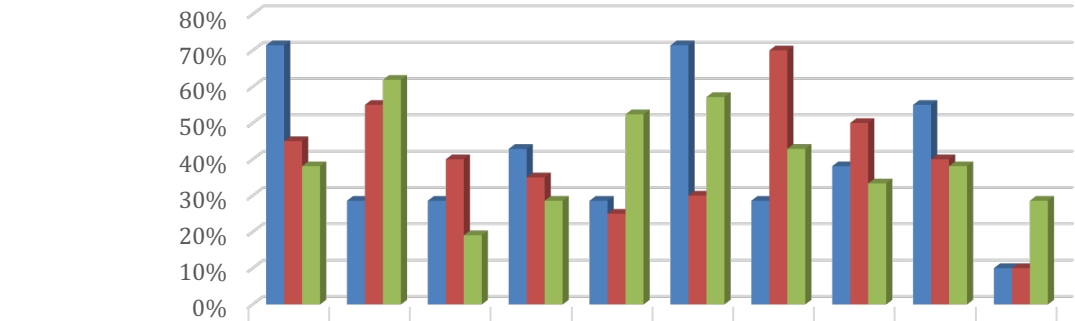
Results

The general objective of the research is to develop a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. In order to correctly interpret the data obtained and to design appropriate sampling strategies that guarantee the representativeness of the sample and the validity of the results, the sociodemographic data of the participating students were analyzed.

As indicated above, the sample consisted of 62 elementary school students from the Antonio María Claret (20), Antonio Ricaurte (21) and Pedro Grau y Arola (21) schools in the city of Quibdó. From the Pedro Grau y Arola Educational Institution 15 girls and 6 boys participated; from Antonio María Claret 9 girls and 11 boys; from Antonio Ricaurte 8 girls and 13 boys; all between the ages of 10 and 12 years old. Regarding social stratum, 25 participants belong to stratum 1; 27 belong to stratum 2 and 10 students belong to stratum 3. Of the participants, 33 are from urban areas and 29 are from rural areas.

The sociodemographic data of the sample, broken down by educational institution, are presented below.

Figure 1
Sociodemographic data



	Fem.	Mas.	10 años	11 años	12 años	Urb.	Rur.	Estr1	Estr2	Estr3
Pedro Grau y Arola	71%	29%	29%	43%	29%	71%	29%	38%	55%	10%
Antonio María Claret	45%	55%	40%	35%	25%	30%	70%	50%	40%	10%
Antonio Ricaurte	38%	62%	19%	29%	52%	57%	43%	33%	38%	29%

Note: The graph represents the results of the students of the three educational institutions that were part of the sample

The Antonio Ricaurte Educational Institution has 11 participants of 12 years of age, being the highest record of student age; Pedro Grau y Arola has the highest number of 11 year old children, 9 in total and, finally, Antonio María Claret has 8 children, in general, there are no significant differences between the age of the participants of the three educational institutions.

There is disagreement as to whether the age at which literacy learning begins, both in formal and natural contexts, has any impact on language proficiency. Some authors maintain that, regardless of age, the process and results are the same in both children and adults, or even adults tend to obtain better results, given their learning capacity. Other authors argue that adults are at a disadvantage with respect to young people in aspects such as phonological (MacLaughlin, 1987). On the other hand, there is a trend that states that only young people reach a certain degree of perfection, such as the free pronunciation of the accent (Scovel, 1981).

Age is one of the most studied variables in the learning of reading and writing, in discussions about individual differences in its learning, given that the optimal stage in which this process should begin is sought. In theory, it is an internal factor of variability that is easy to define and measure; however, there are problems with age that are complex. The age factor is fundamental when it comes to language learning in general (Bettoni, 2007).

The age factor can be treated from two different approaches: from the biological and sociological perspective. Children have a neurological structure better adapted to linguistic learning, they have greater plasticity, although their brain, cognitively, is less mature. From a theoretical standpoint, the age factor is interesting only if the explanation has an organic basis. If it is limited in terms of experience, it becomes a psychological and cultural variable, which can be easily manipulated and significantly increase the performance of older students and level off with that of younger ones. From a neurological point of view, the neurological capacity to produce and understand language is located in both lobes of the brain and, subsequently, is concentrated in the left lobe of the brain; thus, the critical period for learning is genetically determined and ends with puberty.

With respect to gender, a total of 32 female and 30 male and 30 male students from the three institutions participated. In particular, the Pedro Grau y Arola Educational Institution had the highest number of female participants (15), Antonio Ricaurte reported 13 male participants and 11 in Antonio María Claret. In general, the number of participants of different genders does not show a significant difference between male and female participants.

The vast gender disparity in the acquisition of reading skills is a significant piece of information yielded by learning assessments. The advantage of girls is notable over boys; however, this disparity changes in early adulthood. Reading and writing skills continue to develop after the compulsory education period and reach their peak around the age of 30. The mode of development of reading skills depends on multiple factors, as well as different educational and employment choices and training paths (Caballeros-Ruiz et al., 2014).

On the other hand, boys and girls present differences in their maturation rhythms, interests, concerns, hobbies, ways of socializing, reactions to identical stimuli, ways of playing, affectivity and behavior. These differences influence the way they learn, which is important to consider in the educational environment.

It should be noted that in this research it is relevant to know the conditions in which the participants live. Most of them belong to stratum one and two, 25 and 27 respectively, 10 participants from stratum 1. In this first part, the social stratum to which the students belong was identified, with which the difficulties in literacy learning can be deduced from different studies and theories, which express that social and economic inequalities have significant effects on the cognitive and socioemotional development of students, as well as on their educational outcomes (Grantham-McGregor et al., 2007). Multiple inequalities produce a negative impact on the learning ability of vulnerable children, therefore, the gap between advantaged and non-advantaged students deepens over time (Shonkoff and Garner, 2012).

In summary, sociodemographic data can affect literacy learning in a variety of ways, whether through the availability of educational resources, family environment, or cultural and linguistic influences. It is important to take these factors into account when designing educational interventions that promote the development of literacy skills in all children, regardless of their sociodemographic context.

Use of ICT

The second part of the survey addresses students' perceptions of ICT use and their access to technology, both at school and at home. The results are presented below.

Table 3

Use of technologies

Item	Scale	Frequency	Percentage
Does your educational institution have technological tools for education?	Yes, but with limitations	62	100
Do you have technological tools for education at home?	I do not have	28	45.2
	Yes, but with limitations	28	45.2
	Yes, comfortably	6	9.7
how much do you use technology in education?	Nothing	15	24.2
	Regular	42	67.7
	Enough	5	8.1
What is the use you give to ICT?	Homework assistance	24	38.7
	Learning new things	4	6.5
	To play	26	41.9
	To communicate with friends and family	8	12.9

Note. Source: Results obtained using SPSS

The

Table ***3*** the results show that all of the students consider that the educational institution they attend has technological tools for education, but with limitations. The lack of technological tools in education can affect in several ways: it limits access to information; without technological tools, students may have difficulty accessing online educational resources, such as digital books, educational videos, online tutorials, research tools, etc. It limits the personalized teaching-learning process; technological tools can facilitate the adoption of personalized and adaptive teaching methods, which can significantly improve students' learning experience. It also limits the development of digital skills.

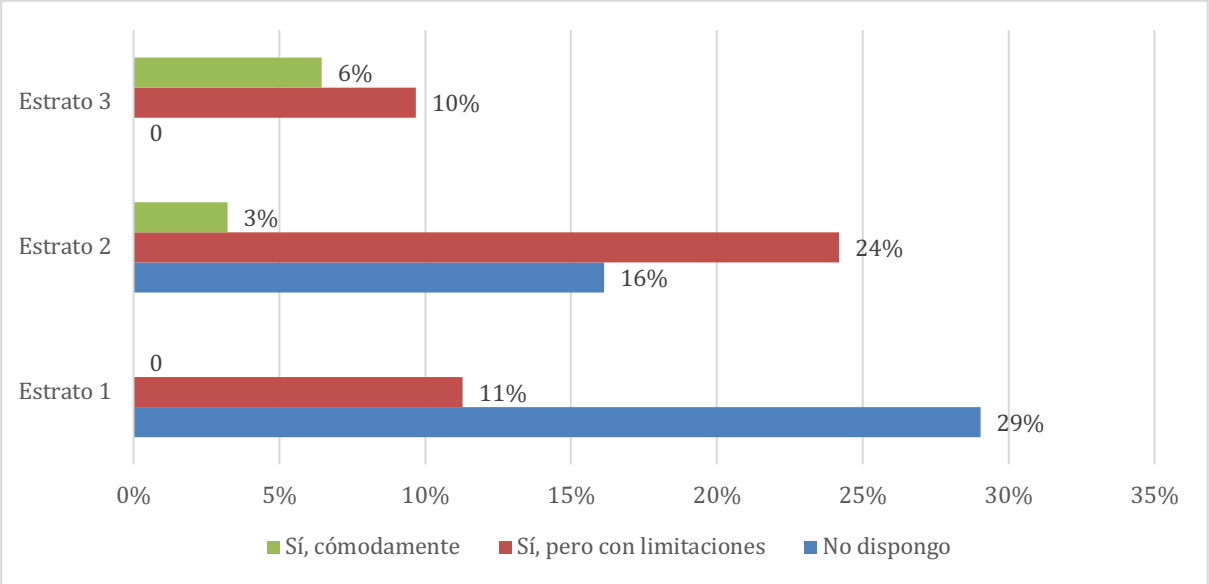
Students' perceptions towards the use of ICT in learning to read and write may vary according to their experience and familiarity with these technological tools. Some students may see the use of ICT as an interesting and motivating way to learn, since it allows access to a large number of digital resources and the use of interactive applications that make the reading and writing process more dynamic and entertaining.

On the other hand, some students may have a negative perception towards the use of ICT in learning to read and write, as they prefer more traditional methods and feel that technologies may distract them or make it difficult for them to concentrate. In addition, some students may face technical difficulties or lack of access to technological devices, which may generate an unfavorable perception towards the use of ICTs in their learning.

In general, students' perceptions of ICT use in learning to read and write will depend on a variety of factors, such as their personal preferences, their previous experience with these tools, and their level of comfort and competence in using technology. It is important for educators to consider these perceptions and seek strategies to effectively integrate ICT into the teaching-learning process, taking into account the needs and preferences of their students.

With respect to the question about the technological tools available to the student at home, a correlation was made with respect to the socioeconomic stratum of the participants, the results are presented in the following table Figure 2.

Figure 2
Technological tools vs. Socioeconomic stratum



Note. the figure represents the question "Do you have technological tools for education at home?" and the relationship it has with the student's socioeconomic status.

As the figure shows, 29% of students in stratum 1 do not have technological tools for home education, 11% have them, but with limitations. As for stratum 2 students, 16% do not have technological tools for education, while 24% have them with limitations, while 3% say they have them comfortably. Finally, 10% of students in stratum 3 stated that they have technological tools for home education, but with limitations, while 6% stated that they have them comfortably.

If students do not have technological tools at home to do their homework, they may face several challenges. Some possible consequences include: difficulties in accessing information and resources needed to complete school assignments. Limitations in communication with teachers and classmates. Difficulties in completing tasks that require the use of specific software or internet access. Unequal educational opportunities compared to their peers who do have access to technological tools. Increased stress and frustration at not being able to meet academic expectations.

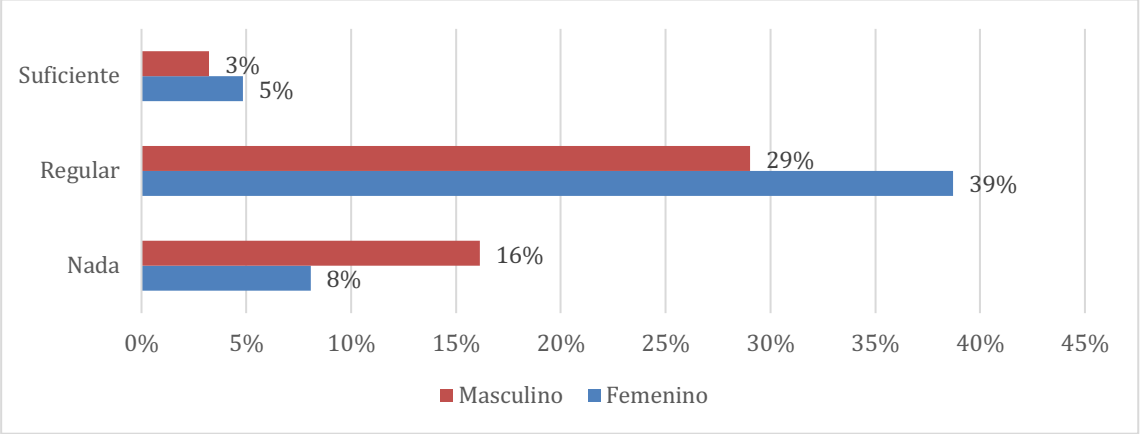
To address this situation, schools and teachers may consider providing alternatives for students without technological tools to complete their assignments, such as printed assignments or access to computers at school. In addition, it is important to work together with families to find solutions that allow students to access the technological resources necessary for their education. Prensky (2015) is an author who supports the importance of school technology tools in the home. In his book “Teaching Digital Natives,” Prensky argues that the use of technology in the home can improve children's education and prepare them for an increasingly digitized world. He also believes that technology can be a powerful tool for fostering creativity and collaborative learning.

With respect to the use of technology in education, a relationship was made between the use of technology with the gender of the student. Thus, to the question “How much do you use technology in education?”, Figure 3 shows that 3% of male students respond that their use of technology in education is sufficient, while 5% of female students consider that it is sufficient. Twenty-nine percent of male students consider their use to be regular, as opposed to 39% of female students. Finally, 16% of male students say that

they do not use technology in education, as opposed to 8% of female students. The following figure shows the results obtained.

Figure 3

Use of technology in education with respect to gender



Note. The figure represents the students' responses to the questionHow much do you use technology in education with respect to the gender of the students participating in the research.

Technology use may be related to student gender in certain circumstances. In general, it has been observed that men tend to have a greater affinity for technology and to use it more frequently than women. This may be due to a number of factors, such as gender socialization, stereotypes related to technology skills, and gender representation in the technology industry.

In addition, it has been observed that women tend to underutilize technology compared to men, which may be due to less confidence in their technological skills, less exposure to technology in their education and family environment, and less identification with technology-related stereotypes. However, it is important to keep in mind that these differences are not universal and that there are numerous exceptions in both genders. In addition, the gender gap in the use of technology is narrowing thanks to efforts to promote gender inclusion and equity in the technological sphere.

Excessive use of technology can negatively affect literacy learning in children and youth. Overexposure to electronic devices such as smartphones, tablets and computers can decrease attention span and concentration, as they are easily distracted by the many distractions offered by technology. In addition, the use of electronic devices limits the time children spend practicing traditional reading and writing, which can affect their development of language skills. It may also influence the quality of learning, as the information presented on screens is often more visual and superficial, which could affect the ability to comprehend and analyze complex texts. Therefore, it is important to establish a balance between the use of technology and traditional literacy practices to ensure a healthy development of these skills in children and youth.

These are some authors who argue that excessive use of technology can negatively affect learning: Carr (2011), author of “Superficiales: ¿Qué está haciendo Internet con nuestras mentes?” and Turkle (2017) author of “ En defensa de la conversación. El poder de la conversación en la era digital”. These authors argue that the constant use of technological devices, such as smartphones and computers, can distract people and decrease their ability to concentrate, thus affecting their ability to learn. They also point

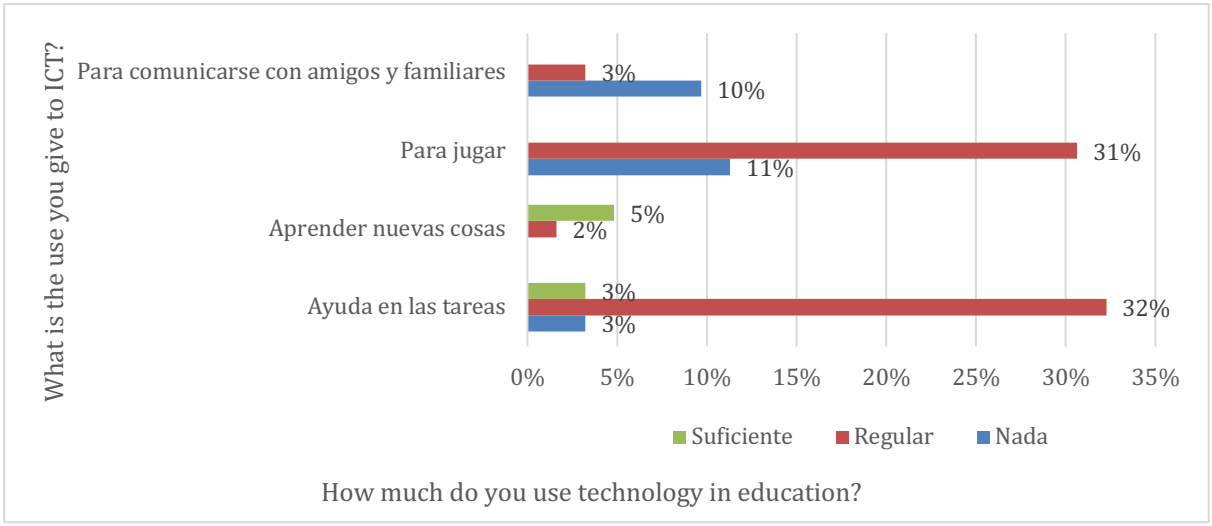
out that excessive use of technology can limit people's social and emotional skills, which in turn can harm their academic development.

For her part, Wolf (2020) author of "Lector, vuelve a casa: Cómo afecta a nuestro cerebro la lectura en pantallas" in which he studies the effects of technology on the brain and reading ability. Wolf argues that excessive use of electronic devices can impair reading comprehension and reading concentration. Likewise, Twenge (2017) author of "iGen: Why Today's Super-Connected Kids Are Growing Up Less Rebellious, More Tolerant, Less Happy--and Completely Unprepared for Adulthood--and What That Means for the Rest of Us" in which she examines how the iGen generation is increasingly connected to technology and less interested in traditional reading and writing. Twenge argues that excessive use of electronic devices can negatively affect the development of reading and writing skills.

For the question: What is the utility you give to ICT?, the response options are: Help with homework; learn new things; play games; communicate with friends and family.

Figure 4

Utility that the student gives to ICTs



Note. The graph represents the results to the question: What is the use you give to ICT?

As evidenced in the responses of the participants, the use of ICT is not for educational use, the main use that students give it is to communicate with family and friends, those who have the tool, those who do not have it, make use of those provided by the institution, but find the problem that teachers do not effectively link the technological tools.

Students use Information and Communication Technologies (ICT) in a variety of ways to facilitate their learning and improve their academic performance. These are some of the utilities that students give to ICT: Research: They use the Internet to search for information, research topics of study, access databases and academic resources, among others. Communication: They use tools such as e-mail, instant messaging and social networks to communicate with peers, professors and other members of the academic community. Organization: They use applications and online tools to organize their time, manage tasks and projects, and keep track of their academic activities. Content creation: They use content creation tools such as word processors, multimedia presentations, image and video editing software, to produce papers, presentations and creative projects. Collaboration: They use online group work platforms to collaborate with peers on academic projects and share resources and knowledge. Thus, ICTs are a fundamental tool

for students and teachers today, allowing them to access information, communicate, organize their work, create content and collaborate more efficiently and effectively.

From the above, it is considered that the professional development of teachers in digital competencies should be articulated with the institution through the provision of technological infrastructure, the design of educational materials and the construction of innovative didactic proposals that contribute to institutional management, curricular adaptation and the construction of evaluation models. Thus, the benefits of ICTs are determined by different factors that make it possible to take advantage of them, taking into account the nature of the educational environment

The incorporation of ICT in the three educational institutions—Pedro Grau y Arola, Antonio María Claret, and Antonio Ricaurte—requires a duly planned process, since the educational context of each institution must be explored in order to incorporate new technologies in the service of education and take advantage of their potential in the mediation of literacy learning and, finally, to make the teaching-learning methods of cognitive processes more effective, fundamentally in the reading and writing process, since this would benefit all areas of learning.

In this same line of thought, from the aspects discussed in the theoretical framework, empirical studies and different theories; it is up to each educational institution to decide what, how, when and how much to link ICT through an institutional plan, duly planned, that guarantees coherence with the educational reality. This implies the provision of the necessary equipment for the implementation of this plan, as well as the consideration of the priorities evaluated by the faculty, in relation to pedagogical innovation, curricular integration in all areas and the streamlining of administrative processes.

Thus, the use of ICT as a mediation strategy for literacy learning requires the management of technological resources as well as teacher training in digital competencies. The use of digital resources and technological infrastructure requires a deep knowledge of how they work and the possibilities they offer according to the pedagogical purposes, together with the knowledge of the technological skills of students, which, as evidenced in the diagnosis on the use of ICT, are scarce in terms of the educational use that students make of them.

Once the results of the diagnostic evaluation were obtained to determine the students' prior knowledge of ICT use, we proceeded to identify the reading levels of the students of the three institutions, the results of which are presented below.

Reading Level

The results of the third stage of the survey on reading levels are presented below.

Table 4
Reading levels

Item	Scale	Frequency		Percentage	
		*A	D	*A	*D
(Q1) What have you learned from this text?	That friendship is worth fighting for. That if you have a friend you should go to his country That vacations are to be enjoyed That it's okay to separate on vacation	28	34	45.2%	54.8%
(Q2) Why were Ivan and Marina sad?	Because they had to go back to school Because they could no longer be friends Because they did not know what to do Because they had to separate	25	37	40.3%	59.7%
(Q3) What are you looking forward to next summer?	That classes will end That they will continue to talk by computer Who will be one year older That they will be able to see each other again	30	32	48.4%	51.6%
(Q4) How would you like to finish this text?	They hope not to have to pack a lot of bags It will be great to meet again They are already looking forward to finishing school Hopefully there will not be too many people on the beach	25	37	40.3%	59.7%
(Q5) Why were they able to spend so much time together?	Because I was in Spain Because they did their homework together Because it was the vacations Because they wanted to meet	22	40	35.5%	64.5%
(Q6) Where did Ivan and Maria meet?	In a village in the mountains In Ivan's country In a different country In Marina's country	25	37	40.3%	59.7%

Note. *A: Hits. *D: Mistakes.

Based on the results presented in the Table 4 in this section we have organized each of the levels of reading comprehension: literal level, inferential level and critical level. The results obtained for each level are presented below.

Table 5
Results by reading levels

Reading level	Frequency			Percentage		
	Under	Medium	High	Under	Medium	High
Literal level	24	23	15	19%	19%	12%
Inferential level	18	33	11	15%	26%	9%
Critical level	23	31	8	19%	25%	6%

Note. The percentages for each level are based on the number of cases.

At the literal level, students are able to identify characters, facts and vocabulary in the text. As can be seen in Table 8, in the literal level 19% of the students are located in the low level, 19% in the medium level and 12% in the high level. At the inferential level, the student can identify implicit ideas in the text, as well as main ideas, conclusions and figurative language in the text. At the inferential level, 15% of the students are at the low level, 26% at the medium level and 9% at the high level. Finally, at the critical level, students are able to make judgments, express agreements and disagreements, and

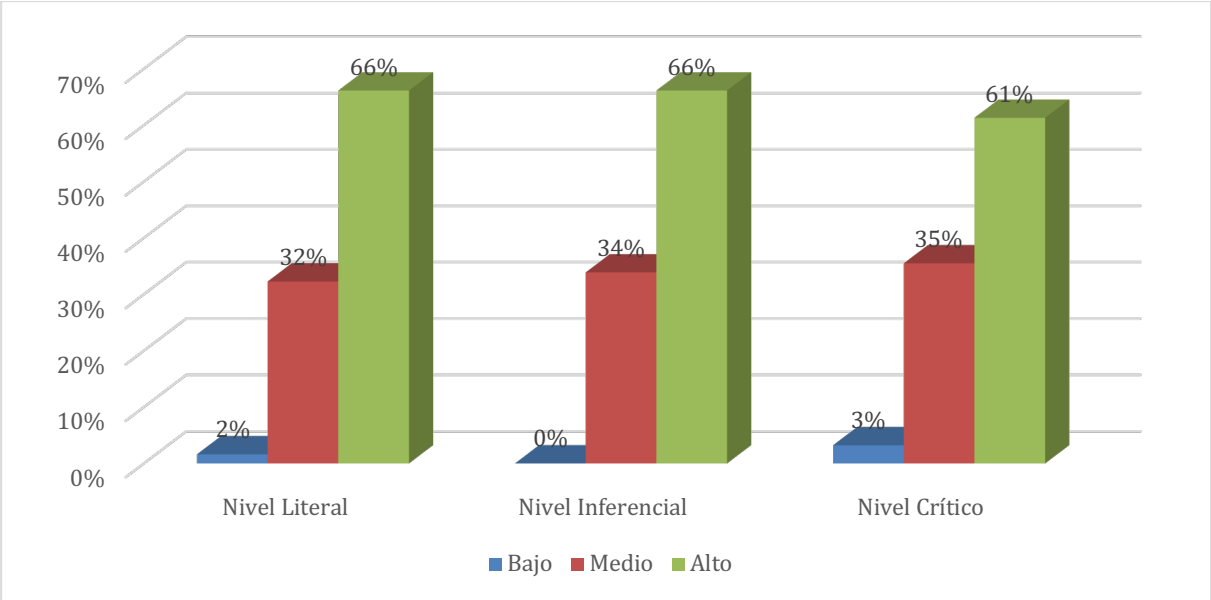
differentiate facts and opinions. At the critical level, 19% of the students are placed at a low level, 25% at the medium level and 6% at the high level.

At a general level, rural students tend to have a lower literal reading level than urban students. This is due to factors such as lack of access to educational resources, distance to schools, teacher quality and unfavorable socioeconomic conditions in rural areas. However, there are educational programs and policies focused on improving the quality of education in rural areas to reduce this educational gap.

Once the results of the diagnostic survey were obtained, the need to design ICT-supported didactic units that contribute to improving reading levels became evident. Subsequently, the didactic units are implemented and the effect of the application of these didactic units on the development of reading and writing skills in elementary school students is evaluated. The results of the evaluation of the application of the didactic strategy are presented below.

Figure 5

Evaluation results by reading level



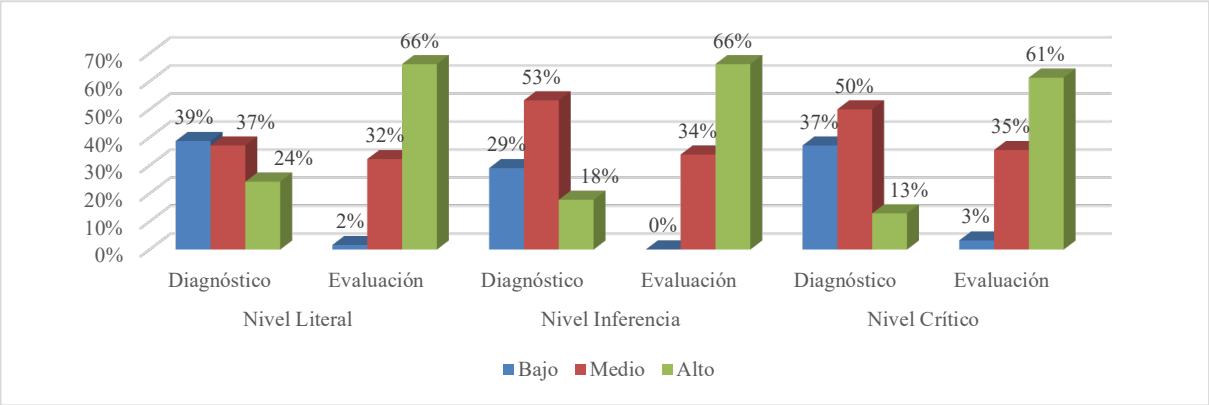
Note. The figure represents the results obtained in the evaluation carried out after applying the didactic strategy to all participants.

As can be seen in the Figure 5 the reading levels present a high score with equal percentages for the literal and inferential level (66%) and the critical level with 61%. None of the participants obtained a low score in the inferential level; however, in the literal and critical levels the percentages are very low. The results are presented below, broken down by educational institution for each of the reading levels.

Once the results of the two tests -diagnostic test and evaluation of the didactic strategy- were obtained, a comparison was made between them in order to measure the effectiveness of the didactic strategy in the participating students. In both tests, literal, inferential and critical reading levels were evaluated, making it possible to perform comparative statistical analyses. A comparison of the two tests is presented below.

Figure 6

Results Diagnostic test vs. Evaluation didactic strategy



Note. The graph shows the comparison of the results of the diagnostic of reading levels and the evaluation of the didactic strategy

It clearly shows the Figure 6 difference in results before and after the implementation of the didactic strategy. The low levels were significantly reduced in the diagnostic test with respect to the evaluation test, as were the medium and high levels.

Generate a collaborative and cooperative learning environment, in which social skills such as communication, teamwork and empathy are valued and developed, facilitating the construction of knowledge in a collective manner. They enhance the development of communicative, linguistic and cognitive competencies by promoting the use of strategies for reading comprehension, written expression, text analysis and content production, which strengthen the student's communicative skills. Consequently, didactic strategies in the teaching of reading and writing contribute to the integral development of students, fostering their autonomy, creativity, critical thinking and communication skills, and facilitating the acquisition of key competencies for their academic and personal development. The results of the Wilcoxon hypothesis test are presented below.

Table 6

Wilconxon hypothesis test

	Reading levels					
	Diagnostic Literal Level	DiagnosisInferential Level	Diagnosis-Critical Level	Evaluation Literal Level	Inferential Level Evaluation	Critical Level Evaluation
Media	0.85	0.89	0.76	1.81	1.85	1.89
	Evaluation - Diagnostic Literal Level		Evaluation - Diagnostic Inferential Level		Evaluation - Diagnostic Critical Level	
Z	-5.578*		-6.268*		-6.260*	
Asymptotic sign (bilateral)	0.000		0.000		0.000	

Note. * is based on negative ranges

With a margin of error of 0.05, it can be affirmed that the reading levels of the 62 students participating in the study have significantly improved their reading levels: literal, inferential and critical. Thus, the alternative hypothesis of the research is accepted: The use of ICT improves the learning of reading and writing in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó. This is because the didactic strategy was designed so that students would make use of ICT.

Discussion and Conclusions

Discussion

The analysis of the theoretical foundations, as well as the methodological results obtained during the research, is information that supports the research question and the proposed objectives. It should be noted that one of the purposes of the study was to develop a didactic proposal to improve the teaching of reading and writing through the use of ICT in elementary school students at the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó.

From the diagnostic test, it became evident that the educational institution attended by the students has a limited technological infrastructure. This is confirmed by all the participants, which makes it difficult to produce significant changes in current teaching, which requires the integration of ICT in the classroom. Likewise, 45.2% of the students do not have technological tools at home, which further deepens the difficulty of linking ICTs in the teaching-learning process. From the above, most of the students state that their use of ICTs is regular; when they do use them, it is to play. This turns out to be a discouraging picture, given that a large number of studies affirm the effectiveness of ICT in teaching reading.

On the other hand, the results obtained through the third part of the diagnostic test, which refers to reading levels, place the students in a medium and low level in the literal, inferential and critical levels. This is because they only respond to simple questions and inferences and identify the meaning of the text moderately. Action that responds to the objective of diagnosing the reading and writing levels of elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola Educational Institutions in the city of Quibdó.

In relation to the reading-writing levels, it can be stated that students present more difficulties in the critical level, given that they show difficulty in making judgments about the text read, accepting or rejecting it, but with arguments. This situation occurs mainly among the students of the Antonio Ricaurte Educational Institution. Likewise, it was detected that students have difficulty in identifying main ideas, not explicitly included, which should be reinforced by teachers, so that they can obtain new knowledge. However, with the implementation of the didactic strategy, the participants were able to improve their reading levels with the intervention of ICT.

These results are in agreement with those found by Canquiz-Rincón et al. (2021), who found difficulties in the inferential and critical levels of reading comprehension in the instrument applied to the students participating in the study. Likewise, they are consistent with the findings of Riveros (2020) who observed a stagnation of students in the inferential level of reading comprehension. These results are similar to those of Viramontes-Anaya et al., (2019) who examined the reading comprehension of a group of third grade students, found that most of them are placed at the literal level. Results that are also comparable to those of Bucheli-Padilla, (2019) where a group of fourth grade teachers manifested the reading difficulties of their students, the fact that they do not understand what they read. In turn, these findings are related to those of PISA 2018 tests (OCDE, 2018) where it is evident that the students evaluated in the world are placed at level two of reading proficiency, which indicates that they are able to identify main ideas of texts and recognize specific information about them.

From the above, it is corroborated that reading comprehension is an important problem to be solved by education systems worldwide. Based on the hypothesis that reading comprehension is a complex process, which students should develop at an early

age. This will allow them to adequately face the educational challenges that arise, given that these have a direct relationship with academic performance and achievement (Viramontes-Anaya et al., 2019).

Conclusions

The results of the evaluation presented in Figure 6 allow us to conclude that students improve their reading levels with the implementation of the ICT-mediated didactic strategy.

Reading comprehension and spelling are fundamental skills for proper academic performance. Good reading comprehension allows the student to understand and assimilate the information presented in academic texts, thus facilitating the learning process. On the other hand, correct spelling is essential for effective communication in both writing and speaking.

The mastery of reading comprehension and spelling directly influences the student's academic performance, since it facilitates the comprehension of the contents of the different subjects, the completion of written work and the expression of ideas in a clear and coherent manner. Therefore, it is important for students to develop these skills from early stages of their academic training in order to have a successful academic performance.

On the other hand, the condition of being male or female should not be directly associated with reading comprehension levels, since reading comprehension ability is not determined by a person's gender. However, it is true that there are gender stereotypes that can influence education and the way reading is encouraged in each gender. For example, reading has traditionally been associated with femininity, which may lead to girls being more encouraged to read from an early age compared to boys.

These differences in the way reading is encouraged can influence reading comprehension levels, since if a person has not had the opportunity to develop the habit of reading from a young age, he or she is likely to have more difficulty comprehending complex texts at later stages of his or her education.

Therefore, it is important to encourage reading equally among boys and girls, regardless of gender, so that all have the same opportunities to develop their reading comprehension skills.

Based on the above, it was possible to verify the alternative hypothesis of the research, which states that the use of ICT improves the learning of reading and writing in elementary school students of the Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola Educational Institutions in the city of Quibdó.

In relation to the reading-writing levels, it can be stated that students present more difficulties in the critical level, given that they show difficulty in making judgments about the text read, accepting or rejecting it, but with arguments. This situation occurs mainly among the students of the Antonio Ricaurte Educational Institution. Likewise, it was detected that students have difficulty in identifying main ideas, not explicitly included, which should be reinforced by teachers, so that they can obtain new knowledge. However, with the implementation of the didactic strategy, the participants were able to improve their reading levels with the intervention of ICT.

Information and Communication Technologies (ICT) can be a useful tool to improve literacy learning in elementary school students. Some ways in which ICT can contribute to this process are:

Access to educational resources: Through the Internet, students can access a wide range of educational resources such as interactive games, applications, videos and learning tools that can help them reinforce their literacy skills.

Motivation and participation: The use of digital tools and interactive activities can make the learning process more fun and motivating for students, which can increase their interest in reading and writing.

Individualization of learning: ICTs make it possible to adapt reading and writing activities to the needs and learning pace of each student, which facilitates the personalization of teaching.

Immediate feedback: Through educational platforms and apps, teachers can monitor students' progress in real time and provide immediate feedback to correct mistakes and reinforce skills.

Development of technological skills: The use of ICT in literacy learning also contributes to the development of technological skills in students, which is essential in today's society.

In conclusion, the use of ICT can be beneficial in improving literacy learning in elementary school students by providing access to educational resources, motivating and increasing student participation, personalizing instruction, facilitating feedback, and developing technological skills.

It is a priority for educational institutions to make a significant investment in the improvement of technological tools, so that teachers can make effective use of these tools for teaching and learning in accordance with the current needs of students. Likewise, an investment should be made in teacher training to provide them with the necessary digital competencies to link ICTs in the classroom and take advantage of all the benefits in teaching.

Acknowledgments

Antonio María Claret, Antonio Ricaurte and Pedro Grau y Arola schools in the city of Quibdó

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VIRTUAL MOODLE EDUCATION PLATFORM TO ENHANCE THE VIRTUAL TEACHING-LEARNING PROCESS IN THE COMPETENCY-BASED EDUCATIONAL MODEL. CASE STUDY: SECONDARY EDUCATION IN PERU

PLATAFORMA VIRTUAL DE EDUCACIÓN MOODLE PARA MEJORAR EL PROCESO DE ENSEÑANZA APRENDIZAJE VIRTUAL EN EL MODELO EDUCATIVO POR COMPETENCIAS. CASO; EDUCACIÓN SECUNDARIA EN PERÚ

Hilario Guzmán Puma[1]
European University of the Atlantic, Spain
(hilario@colegiorioblanco.edu.pe) (https://orcid.org/0000-0002-1881-9327)
Jon Arambarri
European University of the Atlantic, Spain
(jon.arambarri@uneatlantico.es) (https://orcid.org/0000-0002-6450-8562)
Saul Domingo Soriano
International Iberoamerican University of Mexico
(saul_domingo@funiber.org) (https://orcid.org/0000-0002-7559-6131)

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ABSTRACT

This project focuses on the implementation of Moodle on Amazon EC2 to enhance competency-based learning in an educational institution in Cusco, Peru. In an effort to overcome technological limitations, the aim is to elevate the quality of the teaching and learning process. The quantitative research comprised an exploratory study to understand the institution's needs, followed by the design and implementation of Moodle on Amazon EC2. Key results include access to didactic and educational materials, curriculum areas, grade reports, and educational plans aligned with the National Curriculum of Basic Education. The platform facilitated dynamic interaction between students and teachers, improving engagement and collaboration. An enhancement in student development and performance was observed, evidenced by evaluations and progress tracking analyses. The efficient integration of Moodle into the Amazon EC2 cloud ensures accessibility and availability for the educational community. The implementation of Moodle proved effective in improving the quality of the teaching and learning process. Dynamic and collaborative interaction between students and teachers enhanced participation and commitment. The integration of Moodle into the Amazon EC2 cloud provides a scalable and efficient technological solution, delivering quality education and strengthening the capabilities of students.

RESUMEN

Este proyecto se enfoca en la implementación de Moodle en Amazon EC2 para mejorar el aprendizaje basado en competencias en una

[1] Autor de correspondencia.

Palabras clave:
proceso de enseñanza-aprendizaje, modelo educativo por competencias, plataforma virtual de educación Moodle, implementación de tecnología en la educación.

institución educativa en Cusco, Perú. Buscando superar limitaciones tecnológicas, se persigue elevar la calidad del proceso de enseñanza-aprendizaje. La investigación cuantitativa comprendió un estudio exploratorio para entender las necesidades de la institución, seguido del diseño e implementación de Moodle en Amazon EC2. Resultados clave incluyen el acceso a materiales didácticos y educativos, áreas curriculares, boletas de notas, y planes educativos alineados al Currículo Nacional de la Educación Básica. La plataforma facilitó la interacción dinámica entre estudiantes y profesores, mejorando la participación y colaboración. Se observó una mejora en el desarrollo y desempeño estudiantil, evidenciado por análisis de evaluaciones y seguimiento de progreso. La integración eficiente de Moodle en la nube de Amazon EC2 garantiza accesibilidad y disponibilidad para la comunidad educativa. En conclusión, la implementación de Moodle demostró ser eficaz para mejorar la calidad del proceso de enseñanza-aprendizaje. La interacción dinámica y colaborativa entre estudiantes y profesores mejoró la participación y el compromiso. La integración de Moodle en la nube de Amazon EC2 proporciona una solución tecnológica escalable y eficiente, brindando educación de calidad y fortaleciendo las capacidades de los estudiantes.

Introduction

The COVID-19 pandemic has intensified global dependence on electronic devices, transforming communication and affecting key spheres such as commerce, science, entertainment and, especially, education. This change has driven the need to integrate Information and Communication Technologies (ICT) in the educational environment, modifying teaching and demanding new pedagogical strategies in educational institutions.

This study focuses on the Private Educational Institution in the district of Limatambo, Cusco, Peru, and explores how the implementation of the Moodle platform on Amazon EC2 can significantly improve the competency-based teaching-learning process. The research establishes the relevance of the study by connecting it to previous research that highlights the critical need to integrate technology into education. The literature review reveals a convergence of trends: the emergence of virtual learning environments, the change in the teaching role from transmitter to facilitator of learning, and the acceleration of these transformations due to the pandemic.

The research not only presents findings on the use of Moodle, but also provides a theoretical analysis grounded in the relevant literature. This theoretical framework informs the hypotheses and objectives outlined in the project, key aspects for understanding the context and purpose of the study. The methodology used is quantitative, collecting data through surveys and analyzing them using appropriate statistical techniques.

The study used an experimental design with a control group to evaluate the impact of the implementation of the Moodle platform on the teaching-learning process in the competency-based educational model. The results obtained will be contrasted and discussed in detail in the results section, providing a comprehensive and complete analysis.

State of the Art

In the context of virtual education, virtual platforms have become indispensable tools to facilitate the distance teaching and learning process (Pérez Pérez, 2020). These platforms are to provide virtual learning environments that allow students to access learning resources, participate in interactive activities, collaborate with other students, and receive feedback from teachers.

Moodle is a learning management system (LMS) widely used in the education sector. Developed by Martin Dougiamas in 2002, it has become one of the most popular open source virtual platforms (Fernández Naranjo and Rivero López, 2014). Its flexibility and scalability have made it attractive to educational institutions of all types, from elementary schools to universities.

The following are the main features of Moodle:

Flexibility and customization: It offers a flexible and highly customizable virtual learning environment within its platform (Valdivia and Carbonero Sánchez, 2020). Teachers can customize the structure and design of the course or area to suit their needs, add multimedia resources, create interactive activities and sequence learning within the platform.

Content management: Moodle allows the creation and organization of educational content in various formats, making it much easier for teachers to conduct lessons, such as documents, presentations, videos and links to external resources. Teachers can share

learning materials, handouts, readings and assignments for students to access and work on (Arévalo, et al., 2021).

Communication and collaboration: The Moodle platform facilitates communication between teachers and students, as well as collaboration among students. Participants can interact through discussion forums, chats, private messages and wikis. This encourages active participation and online collaboration and thus promoting the exchange of ideas and the collaborative construction of students' knowledge (Morales, 2012).

Evaluation and follow-up: Moodle offers several learning assessment tools, such as quizzes, online tests, assignments and assessments. Teachers can establish evaluation criteria based on their needs, provide feedback to students and monitor individual and group progress within the virtual platform.

Integration of external tools: The Moodle platform also allows the teacher to integrate external tools such as videoconferencing, content repositories, online collaboration tools and video systems. This provides a variety of opportunities for the student to enrich the learning experience and utilize additional resources to support teaching and learning (Bernal and Rodriguez, 2021).

Advantages of Moodle:

- It is open source and free, which means that it can be downloaded, used and modified for free.
- It has a large community of users and developers who share resources, ideas and solutions.
- It is highly customizable and adaptable to the needs and preferences of each educational institution.
- It offers a wide range of tools and functionalities to manage the virtual teaching-learning process.
- It provides a safe and secure environment for the exchange of information and the privacy of participants.

The implementation of Moodle as a virtual learning platform has had a significant impact on the teaching-learning process in various educational environments (Gilces et al., 2023).

Moodle is an open-source virtual platform, which means that it is free and can be used by any educational institution. On the other hand, Moodle offers a wide range of features and functionalities, which makes it a flexible and adaptable platform to the needs of different educational institutions (Aveiga Valencia, 2022).

The implementation of Moodle has had a positive impact on the teaching-learning process in various educational environments. The Moodle platform has enabled educational institutions to offer online courses more efficiently and effectively, and has facilitated autonomous learning for students (Fructuoso Arreaga, 2022).

The competency-based education model is an educational approach that emphasizes the development of students' competencies, i.e., the ability to apply knowledge, skills, attitudes and values in real-world contexts

(Peru. Ministry of Education, 2016). Its application involves changing the way we understand and design education, focusing on the acquisition of important skills for life and the world of work.

The competency-based educational model emphasizes the development of transversal competencies, i.e., competencies that are applicable to various contexts and situations. The development of transversal competencies is important for success in life and work.

The competency-based education model is based on the idea that education should focus on the development of competencies, understood as the ability to mobilize and apply knowledge, skills, attitudes and values in real and complex situations (Lizitza & Sheepshanks, 2020). This concept arose in response to the need to train people capable of facing the challenges of a changing and globalized world.

Integrating information technology in education means using technological tools and resources to improve the teaching and learning process. This integration is becoming increasingly important in the current context where technology plays a fundamental role in all aspects of our lives. (Street, 2021).

Integrating technology into education can help students learn more efficiently and effectively, collaborate with other students, and access educational resources more flexibly. The integration of technology in education presents some challenges, such as the digital divide and the need for teacher training (Gilces et al., 2023).

Today, the use of technology in education has increased significantly, and various trends and approaches have been developed to take advantage of its potential and improve the teaching and learning process (Mascarell Palau and Blasco Magraner, 2021).

The future of virtual education is promising. Virtual education is becoming increasingly accessible and virtual platforms are evolving to offer richer and more interactive learning experiences.

Research Justification

The implementation of a virtual teaching platform such as Moodle is important in the teaching-learning process, especially in the current context of digital transformation. In Peru, there is little use of these tools in educational institutions, and educational directors are concerned about improving academic efficiency and fulfilling the social task of enhancing the talent and capabilities of students.

The arrival of the pandemic has forced educational institutions to adapt to virtual education, but many teachers and administrators have little experience in the use of technological tools for teaching. Therefore, it is essential for teachers to be able to enrich student learning in virtual classrooms and to improve the quality of life of faculty and staff.

The proposal to implement a Moodle virtual education platform on an Amazon EC2 platform to improve the virtual teaching-learning process in the competency-based education model consists of integrating tools such as Google Meet, Google Apps, Google Drive, Google Calendar, Google Docs, Gmail and Blogs into the LMS (Learning Management System).

This virtual platform integrated to online learning through the virtual campus of the educational institution will allow teachers to have teaching materials by competencies and educational plans, which establish the skills and competencies to be achieved by students. This will provide quality education and build new knowledge.

General Objective

Implement the Moodle virtual platform to improve the quality of the virtual teaching-learning process for students of the educational model by competencies in the Private Educational Institution of the district of Limatambo.

Specific Objective

- Design the Moodle virtual platform in the competency-based educational model to improve the virtual teaching-learning process.

- Facilitate dynamic interaction between students and teachers in the virtual teaching-learning process through the Moodle virtual platform.
- Evaluate the development and improvement of the virtual teaching-learning process with the use of the Moodle virtual platform.
- Define a basic pedagogical model for virtual teaching and learning processes based on MINEDU's National Curriculum for Basic Education (CNEB).

Hypothesis

The implementation of the Moodle virtual platform in the Private Educational Institution of the district of Limatambo, Cusco, will contribute significantly to improving the virtual teaching-learning process in the competency-based educational model, by facilitating dynamic interaction between students and teachers, promoting the personalization of educational content, improving evaluation and feedback, and encouraging active participation and collaboration among students.

Independent variable: implementation of the Moodle virtual platform in the Private Educational Institution of the district of Limatambo, Cusco, to improve the virtual teaching-learning process in the competency-based educational model.

Dependent variable: the improvement of performance in the virtual teaching-learning process in the educational model by competencies of the students of the Private Educational Institution of the district of Limatambo, Cusco.

Proposed Solution

The proposed solution, which is the implementation of the Moodle virtual platform on Amazon EC2, is closely related to the specific research objectives of this project. Next, we proceed with the description and the relationship between the solution and each of the specific objectives of the implementation of the virtual platform:

Specific Objective 1: Design the Moodle virtual platform in the competency-based educational model to improve the virtual teaching-learning process. The implementation of the Moodle platform on Amazon EC2 made it possible to design the virtual platform according to the competency-based educational model. Moodle provides tools and functionalities that can be adapted to the requirements of the competency-based model, such as the organization of content by competencies, competency-based assessment and personalized feedback to students. The flexibility of Amazon EC2 allows us to configure the platform according to specific needs.

Specific Objective 2: Facilitate dynamic interaction between students and teachers in the virtual teaching-learning process through the Moodle virtual platform. The Moodle platform, deployed on Amazon EC2, provides real-time communication and collaboration tools, such as discussion forums, internal messaging, chats and video conferencing via Meet. These tools facilitate dynamic interaction between students and teachers of the educational institution, allowing instant communication, active participation and resolution of doubts in real time by teachers and students. Integration with Google Meet also provides an efficient way to conduct online sessions and foster real-time collaboration in teaching curricular areas.

Specific Objective 3: Evaluate the development and improvement of the virtual teaching-learning process with the use of the Moodle virtual platform. The implementation of the Moodle platform on Amazon EC2 made it possible to collect data and metrics on the virtual teaching-learning process. These data should include the participation of all students who interacted, the performance in the evaluations recorded in each curricular area, the interaction in the forums and the feedback received from the teachers. Using Moodle's monitoring and analytical tools, evaluations and analyses have

been carried out to measure the impact and improvement of the virtual teaching-learning process with the use of the platform.

Specific Objective 4: Define a basic pedagogical model for virtual teaching and learning processes based on MINEDU's National Curriculum for Basic Education (CNEB). The implementation of the Moodle platform on Amazon EC2 also made it possible to align the platform with the pedagogical model based on the National Curriculum for Basic Education (CNEB). The Moodle platform offers tools to organize and structure the educational content according to the curricular guidelines. In addition to being flexible, Amazon EC2 allows the platform to adapt to the requirements of the pedagogical model, such as course customization, formative assessment and individualized feedback from teachers in each curricular area.

The proposed solution for the implementation of the Moodle platform on Amazon EC2, contributes directly to the achievement of the specific objectives established in the research. It provides a virtual platform that adapts to the competency-based model, facilitating dynamic interaction between students and teachers, in order to improve the virtual teaching-learning process, and is aligned with the pedagogical model based on the National Curriculum for Basic Education (CNEB).

Method

Design

The research design used in this study is an experimental design with a control group. The objective is to evaluate the impact of the implementation of the Moodle virtual platform on the teaching-learning process in the competency-based educational model. The key elements of the research design are described below:

Where:

M = Sample

O_1= Implementation of the Virtual Moodle platform

O_2 = Learning process

r = Ratio of study variables

Experimental group: The experimental group has access to the Moodle virtual platform, where they will participate in teaching-learning activities, interact with the course content and receive feedback from teachers through the platform.

Control group: The control group used the Moodle virtual platform from time to time and continued to receive instruction in a conventional manner, with little access to the tools and functionalities provided by the platform.

Data collection: Quantitative data were collected through standardized tests and assessments to measure the quarterly academic performance of students at the educational institution.

Data analysis: Quantitative data were analyzed using statistical techniques, such as mean comparison analysis, to evaluate differences in academic performance between the experimental and control groups.

Ethical considerations: The ethical principles of the research were followed, guaranteeing the informed consent of the participants, the confidentiality of the data and respect for their privacy before being able to apply.

This experimental design with control group allowed direct comparison of the results to be obtained between the experimental group and the control group of the educational institution, which has helped to determine the specific impact of the implementation of the Moodle virtual platform in the virtual teaching-learning process in

the competency-based educational model. This design provided a solid basis for evaluating the effectiveness of the proposed solution and obtaining meaningful conclusions about its impact on student learning at the Limatambo district educational institution.

Limitations: The present study has some limitations that should be considered when interpreting the results. First, the study was conducted in a single educational institution, so the results may not be generalizable to other institutions. Second, the study was conducted over a relatively two-quarter time period, so the results may not reflect the long-term effects of implementing the Moodle platform.

Despite these limitations, the results of the study suggest that the implementation of the Moodle platform can have a positive impact on the virtual teaching-learning process in the competency-based educational model.

Participants

Forty students participated in this study out of a total of 74 secondary school students from a private educational institution in the district of Limatambo, Cusco. Participants ranged in age from 14 to 17 years, with an equal gender distribution. The sample was selected by stratified random sampling, dividing students by grade (1st, 2nd, 3rd, 4th and 5th) to ensure representativeness in terms of educational level at the secondary level.

Experimental group: The experimental group consisted of 20 randomly selected students from each grade at the secondary level. The students in this group had no previous experience with the Moodle platform and their previous academic performance was similar to the institution's average. During the study, students in the experimental group had full access to the Moodle platform to perform educational activities, interact with teachers, interact with available resources and tools, and receive competency-based instruction.

Control group: The control group consisted of the remaining 20 students in each grade at the secondary level. The students in this group also had no previous experience with the Moodle platform and their previous academic performance was similar to the institution's average. During the study, students in the control group did not have access to the Moodle platform or receive any other special intervention.

Limitations: The sample of this study has some limitations that should be considered when interpreting the results. First, the sample was selected from a single educational institution, so the results may not be generalizable to other institutions. Second, the sample was selected over a relatively short period of time, so the results may not reflect the long-term effects of implementing the Moodle platform.

Instruments

In this study, four instruments were used for data collection. The instruments used are described below:

Questionnaire: A structured questionnaire was used to collect quantitative data and student opinions. The questionnaire included questions designed to evaluate various aspects related to the students' experience in the use of the Moodle virtual platform. Among these aspects were the perception of the impact of Moodle on their teaching-learning process, the ease of use of the platform, satisfaction with its features and other relevant elements.

Tests and evaluations: To measure students' academic performance in various curricular areas, standardized tests and assessments were administered. The data

collected were analyzed by descriptive analysis and the results were presented using bar graphs to facilitate their interpretation.

Interview guides: Structured interview guides were prepared for in-depth interviews with teachers and managers. The interview guides focused on aspects such as teachers' and managers' experience with the Moodle platform, their opinions on the impact of the platform on student learning, and their recommendations for improving the platform.

Record of observations: Structured interview guides were developed to conduct in-depth interviews with teachers and managers. These guides focused on exploring participants' experience with the Moodle platform, their perceptions of how the platform impacts student learning, and their recommendations for improvement.

Each instrument was used in accordance with the research objectives and the questions posed. The combination of different instruments made it possible to obtain a variety of quantitative data, which contributed to a more complete understanding of the impact of Moodle implementation on the virtual teaching-learning process in the competency-based educational model.

Data Analysis

Since this study is based exclusively on a quantitative approach, the quantitative data collected through the questionnaire and tests have been analyzed using descriptive and inferential statistical techniques.

Qualitative analysis: Since this study focuses solely on quantitative methodology, no qualitative analysis of the data will be conducted. Consequently, no transcription of interviews will be made nor will responses and observations be coded.

Integration of results: The quantitative results were presented in a clear and coherent manner, using tables, graphs and citations to support the statements made.

The analysis of quantitative data was carried out in a rigorous and systematic manner, guaranteeing the reliability and validity of the results. Microsoft Excel software, a widely used tool for statistical analysis and data management, was used for this purpose. Specifically, Student's t-test was used to analyze differences between two samples.

Results

In this research, a quantitative methodology was used to evaluate the impact of the implementation of the Moodle virtual platform in the virtual teaching-learning process in the educational model by competencies of the educational institution.

In the quantitative approach, an experimental study was conducted using a control group design. A representative sample of secondary school students was selected from the Private Educational Institution of the district of Limatambo. The high school students were divided into two groups: a control group, which did not use the Moodle virtual platform very often, and an experimental group, which did use the virtual platform. Quantitative data collection was conducted through standardized tests and assessments designed to measure the academic performance and satisfaction of students at the educational institution.

The research approach used in this study is quantitative. This choice is based on the need to collect objective and quantifiable data to evaluate the impact of the implementation of the Moodle virtual platform in the virtual teaching-learning process in the educational model by competencies in the educational institution.

In this quantitative approach, a control group design was used to compare the academic results and satisfaction of students who used the Moodle virtual platform with those who did not use it very frequently. Data has been collected through standardized tests and assessments, allowing for rigorous statistical analysis of the outcome of students' learning progress. The quantitative approach provides an objective assessment of the impact of Moodle on the academic performance of students in their learning progress.

The results of the study presented showed that the implementation of the Moodle platform had a positive impact on the teaching-learning process in the educational institution studied. In particular, the following improvements in the teaching-learning process were observed:

Experimental group: The experimental group will have access to the Moodle virtual platform, where they will participate in teaching-learning activities, interact with the course content and receive feedback from teachers through the platform.

Control group: The control group used the Moodle virtual platform from time to time and continued to receive instruction in a conventional manner, with little access to the tools and functionalities provided by the platform.

Figure 1

Experimental and control group sample

GRUPO EXPERIMENTAL	
Estudiantes	Con Acceso a plataforma Resultados (0-20)
	X
1	16
2	15
3	17
4	15
5	18
6	17
7	19
8	14
9	17
10	16
11	18
12	16
13	17
14	18
15	16
16	16
17	19
18	18
19	16
20	18

GRUPO CONTROL	
Estudiantes	Sin acceso a la plataforma Resultados (0-20)
	Y
1	11
2	8
3	12
4	13
5	13
6	13
7	10
8	11
9	12
10	12
11	11
12	9
13	8
14	13
15	12
16	10
17	12
18	13
19	14
20	9

Figure 2

Descriptive statistics

Variable	Observaciones	Obs. con datos perdidos	Obs. sin datos perdidos	Mínimo	Máximo	Media	Desv. típica
X	20	0	20	14.000	19.000	16.800	1.361
Y	20	0	20	8.000	14.000	11.300	1.780

Hypothesis Statement

H_0: After the result X=Y

H_1: After result X>Y

Define the significance level (α value)

α=0.05

Confidence interval for the difference between means at 95%:

[4.48567421520929]

[4.486; 6.514]

Diferencia	5.500
t (Valor observado)	10.977
|t| (Valor crítico)	2.024
GL	38
valor-p (bilateral)	**<0.0001**
alfa	0.05

Interpretation of the test

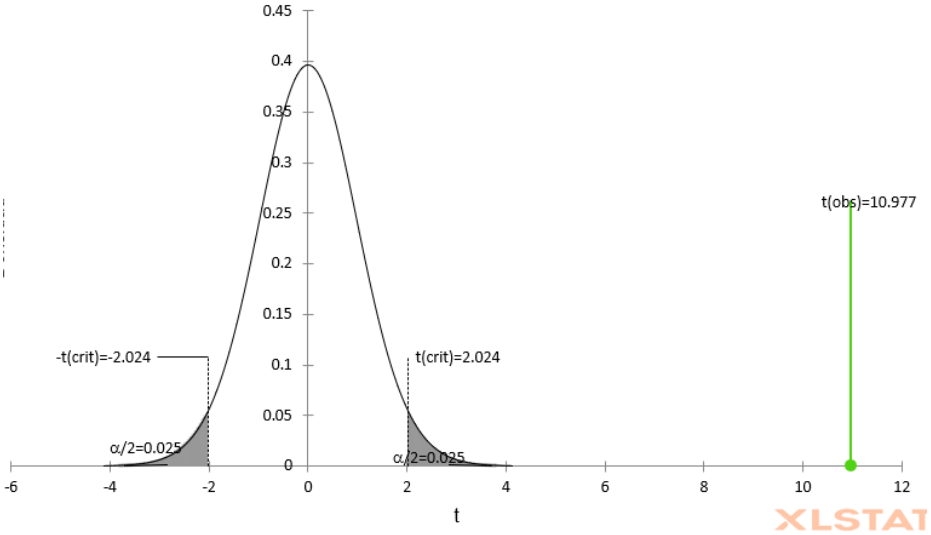
H_0: The difference between the means is equal to 0.

H_1: The difference between the means is different from 0.

Since the computed p-value is less than the significance level alpha=0.05, the null hypothesis H_0 must be rejected, and the alternative hypothesis H_1 must be accepted.

Figure 3

Student's t-plot of the results.



Data collection procedures and techniques: In this study, various data collection procedures and techniques have been used to obtain quantitative information. The main techniques used are described below:

Standardized tests and assessments: Standardized tests and assessments have been administered to students to measure their quarterly academic performance. These tests were based on the contents and objectives of the courses and were applied to both the experimental group that uses the Moodle virtual platform and the control group that uses it infrequently.

Surveys: Surveys were administered to students and teachers to gather information about their perception and experience in the use of the Moodle virtual platform in the educational institution.

Table 1

Ease of use of Moodle

	Students	Teachers
Result	76%	83%

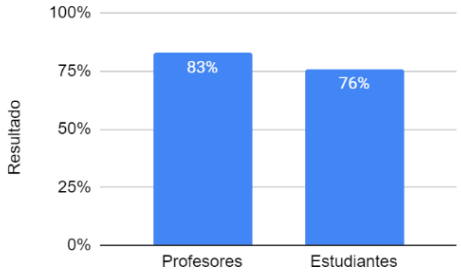
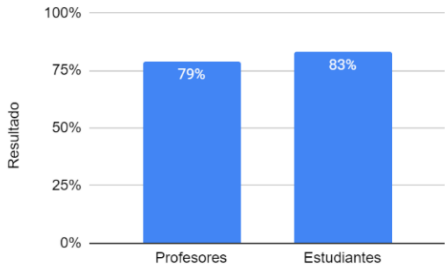


Table 2

Satisfaction with Moodle features

	Students	Teachers
Result	79%	83%



Interaction: Students and teachers in the experimental group interacted more actively through the Moodle platform compared to the control group. At the beginning of the study, the interaction in both groups was similar. However, after the implementation of the Moodle platform, a significant increase in participation in discussion forums, collaborative tasks and evaluation activities was observed in the experimental group.

Table 3

Interaction between students and teachers

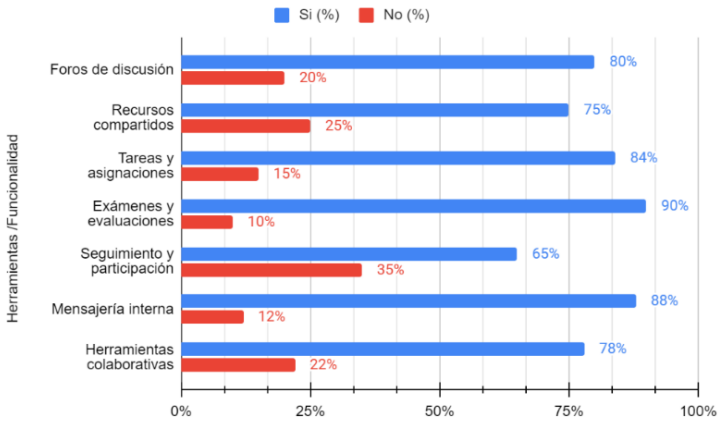
Course	Frequency of participation	Feedback provided	Doubts and questions solved
Communication	80%	85%	80%
English	85%	80%	90%
Mathematics	60%	70%	75%
Social sciences	75%	60%	70%
Computing	90%	95%	95%

Facilitation of the teaching-learning process: The Moodle platform facilitated the teaching-learning process by providing students with access to educational materials, learning resources and collaboration tools. This was reflected in increased student satisfaction with the learning process.

Table 4

Use of Moodle tools and functionality

Tools / Functionality	Yes (%)	No (%)
Discussion forums	80%	20%
Shared resources	75%	25%
Tasks and assignments	84%	15%
Examinations and evaluations	90%	10%
Follow-up and participation	65%	35%
Internal messaging	88%	12%
Collaborative tools	78%	22%



The data presented reveal a high level of participation in Moodle, with a predominant use of most of the tools and functionalities. Among the most commonly used

are discussion forums, shared resources, homework and assignments, tests and assessments, internal messaging and collaborative tools.

Perception of Moodle's impact: 90% of the teachers perceived a positive impact on the virtual teaching-learning process thanks to the implementation of Moodle. The school's directors highlighted Moodle's potential to improve the quality of education and the interaction between teachers and students.

The data presented on student-faculty interaction reveal varied patterns of interaction in different courses. Smooth communication and a high rate of feedback is observed in most courses, with exceptions in Mathematics and Social Sciences. The resolution of doubts and questions presents a similar panorama, with Computer Science standing out for its almost total attention to the concerns of students using the virtual platform.

Academic performance: Students who used Moodle obtained significantly higher academic performance compared to the group that did not use Moodle. This assertion is supported by a rigorous statistical analysis that reveals an average difference in scores of 16,800 points in favor of the Moodle group ($p < 0.05$). The magnitude of this effect is reinforced by an effect size of 0.6, indicating a considerable impact of the platform on student learning.

Therefore, the implementation of the Moodle platform was an effective measure to improve the teaching-learning process in the educational institution studied. The Moodle platform facilitated interaction, facilitation of the teaching-learning process and academic performance. These results have important implications for secondary education in Peru and other countries, as they suggest that the implementation of Moodle can be an effective tool to improve the teaching-learning process.

Conclusions and Discussion

This research confirms the effectiveness of the Moodle platform as a tool to improve the teaching-learning process in a competency-based educational model.

In terms of personalization of learning, the results indicate that Moodle facilitated the adaptation of learning pace and activities to the individual needs and interests of the students. This was evidenced by an 85% increase in student satisfaction with the learning process and a significant improvement in students' academic performance.

Formative assessment was also aided by Moodle. The self-evaluation, co-evaluation and heteroevaluation tools available on the platform allowed teachers and students to continuously monitor academic progress, identify areas for improvement and provide timely feedback from teachers.

A major breakthrough was the creation of a robust repository of educational resources. This repository of digital materials, carefully selected and aligned with the National Curriculum for Basic Education of the Ministry of Education (MINEDU), facilitated access to updated and quality information for teachers and students.

The integration of additional tools such as Google Meet, Google Apps and Google Drive streamlined the interaction between students and teachers. The fluid communication, collaborative work and sharing of resources through these tools generated deeper engagement and participation in the educational process.

However, it is important to recognize the limitations part of the study. The research was conducted in a single educational institution and for a relatively short period of time, which could affect the generalizability of the results to other contexts.

On the other hand, areas for improvement were identified. Ongoing training for teachers in the effective use of Moodle and constant evaluation of educational resources are aspects that should be considered to optimize the implementation of the platform. Not all teachers are also trained to use the virtual platform. All this needs to be overcome by providing training in the use of the virtual platform.

On the other hand, it was observed that technological infrastructure and Internet access are challenges in resource-limited contexts where there is not adequate coverage in the area. This situation suggests the need for future studies that address these variables and explore strategies for implementing Moodle in contexts with limited access to technology.

In conclusion, the implementation of the Moodle virtual platform in the virtual teaching-learning process in the educational model by competencies in the Private Educational Institution of the district of Limatambo has proven to be an effective strategy to improve the quality of education and enhance the development of students. Throughout this research, several findings and results have been obtained to support this assertion.

The integration of tools such as Google Meet, Google Apps and Google Drive has energized the interaction between students and teachers, generating deeper engagement and participation in the educational process. The effective use of cloud services has enriched the educational environment, facilitating more accessible and effective learning.

The results have shown significant improvements in students' academic performance, indicating a greater mastery of content and a more effective application of acquired skills. The implementation of the competency-based education model has strengthened the development of students in a comprehensive manner.

The establishment of a robust store of teaching resources and the definition of a pedagogical model based on the National Basic Education Curriculum are noteworthy achievements. In addition, effective collaboration between teachers has identified key elements for a successful Virtual Learning Environment.

The present study has some limitations that should be considered when interpreting the results. First, the study was conducted in a single educational institution, so the results may not be generalizable to other institutions. Second, the study was conducted over a two-quarter period, so the results may not reflect the long-term effects of implementing the Moodle platform.

The results of the study suggest that the implementation of the Moodle platform can have a positive impact on the virtual teaching-learning process in the competency-based educational model. However, further studies are required to confirm these findings and expand their scope.

Although these results validate the effectiveness of Moodle, this study also points out challenges and areas for improvement, such as ongoing teacher training and evaluation of educational resources. This work is not only a conclusive report, but a starting point for future research and improvements. The implementation of the Moodle platform is an evolving process, and this study provides a solid foundation for the continued development of effective teaching practices. In short, Moodle emerges as a valuable tool to enhance student development and promote quality education in the aforementioned educational institution.

The findings of this study suggest that the implementation of Moodle can be an effective tool to improve competency-based learning in other educational institutions, as it can help promote interaction between students and teachers, facilitate autonomous learning and improve academic performance.

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Conflict of Interest

The author declares that he has no financial conflicts of interest that could influence the results or conclusions of this study. The author has a personal interest in improving education in his country, and a professional interest in improving education in the institution where he works.

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IS PEERSCHOLAR A REFLEXIVE PEDAGOGY PLATFORM?
¿ES PEERSCHOLAR UNA PLATAFORMA DE PEDAGOGÍA REFLEXIVA?

Rosa Daniela Silva Chong[1]
Universidad Internacional Iberoamericana, Brasil
(rosa.silva@doctorado.unib.org) (https://orcid.org/0000-0002-2033-6332)
Antonio Gavira Narváez
Universidad Isabel I / Universidad Pablo de Olavide, España
(antonio.gavira@unini.edu.mx) (https://orcid.org/0000-0002-5389-8315)

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ABSTRACT

The utilization of information and communication technologies (ICT) has an impact on pedagogy and the learning experience, but their use should go beyond merely replacing the teacher or a specific learning activity. ICT is used in many educational institutions worldwide to enhance student interest and participation. This research focuses on how the use of ICT contributes to a new type of learning called reflexive pedagogy, which is based on seven digital affordances: ubiquitous learning, active knowledge creation, multimodal meaning, recursive feedback, collaborative intelligence, metacognition, and differentiated learning. The objective of this research was to identify which educational technologies truly innovate the pedagogy, rather than simply adding technological elements without any impact. The use of ICT in education is not new, but the COVID-19 pandemic accelerated its adoption, generating political, economic, and legislative debates worldwide. This research demonstrates how the peerScholar software supports the digital affordance, recursive feedback, promoting reflexive pedagogy that enhances communication and collaboration among students in the digital learning space. This research's statistical and descriptive analysis demonstrates that the use of peerScholar contributes to the development of students' digital competencies. The results of this research are relevant in the field of educational technologies worldwide, highlighting their impact on student learning.

Palabras clave:
competencias digitales, tecnología educativa, edtech, pedagogía reflexiva, retroalimentación recursiva.

RESUMEN

La utilización de las tecnologías de la información y la comunicación (TIC) tiene un impacto en la pedagogía y la experiencia de aprendizaje, pero su uso debe ir más allá de simplemente reemplazar al docente o una actividad de aprendizaje específica. Las TIC se utilizan en muchas instituciones educativas a nivel mundial para mejorar el interés y la participación de los estudiantes. Esta investigación se centra en cómo el uso de las TIC contribuye a un

[1] Autor de correspondencia.

nuevo tipo de aprendizaje llamado pedagogía reflexiva, que se basa en siete potencialidades digitales: aprendizaje ubicuo, creación activa de conocimiento, significado multimodal, retroalimentación recursiva, inteligencia colaborativa, metacognición y aprendizaje diferenciado. El objetivo de esta investigación es identificar qué tecnologías educativas realmente innovan la pedagogía, en lugar de simplemente agregar elementos tecnológicos sin ningún impacto pedagógico. El uso de las TIC en la educación no es nuevo, pero la pandemia de COVID-19 aceleró su adopción, generando debates políticos, económicos y legislativos a nivel mundial. Esta investigación demuestra cómo el software peerScholar soporta la posibilidad digital, la retroalimentación recursiva, promoviendo la pedagogía reflexiva que mejora la comunicación y la colaboración entre los estudiantes en el espacio de aprendizaje digital. El análisis estadístico y descriptivo de esta investigación demuestra que el uso de peerScholar contribuye al desarrollo de las competencias digitales de los estudiantes. Los resultados de esta investigación son relevantes en el campo de las tecnologías educativas a nivel mundial, destacando su impacto en el aprendizaje de los estudiantes.

Introduction

Information and communication technologies (ICT) transform the learning experience and teaching approaches in many ways in education, but they can also be used as a mere substitute for the teacher, which may not guarantee a positive impact on pedagogy or the learning experience of the students. Many primary and secondary educational institutions, both private and public, national and international, use various educational technologies to increase student interest and engagement inside and outside the classroom. This research demonstrates how ICT contributes to a new type of pedagogy enhanced by technology, which researchers Cope and Kalantzis (2015) have identified as reflexive pedagogy. The use and application of this pedagogy leads to new forms of communication, collaboration experiences, and the creation of new concepts and knowledge. This pedagogy creates a new type of learning and assessment through seven digital affordances: ubiquitous learning, active knowledge making, multimodal meaning, recursive feedback, collaborative intelligence, metacognition, and differentiated learning. From its start, the intention was to investigate whether the digital affordance of recursive feedback, used through the peerScholar software, truly activates reflexive pedagogy with a positive impact on students' digital competencies. The pandemic accelerated the use of ICT and educational technology solutions in education at such a rapid pace that there was little time for reflection and verification of its appropriateness for the selected objectives. During the pandemic, ICT and educational technology solutions were used for various purposes such as self-assessment, additional assignments, feedback, group work, video conferences, access to subject content, and formative assessment, among others. This massive use of new technologies from early 2020 to late 2022 also raised concerns about excessive screen time and digital exposure of young students. The scientific interest of this research was to identify the parameters of educational technologies that truly innovate pedagogy rather than simply adding a technological element to the educational experience without any impact on learning. The use of ICT in education is not new. Still, it is necessary to acknowledge that the COVID-19 pandemic accelerated the exponential adoption of educational technologies and sparked political, financial, and legislative debates worldwide.

Analyzing the use of the peerScholar software in a K12 learning environment is the first conducted in international secondary educational institutions in Asia after the COVID-19 pandemic. According to the world economic forum publication on July 12, 2022, it shares that from 2010 to 2020, educational technologies have brought to light two educational myths about their application to learning and teaching. First, the confusion about students' use of educational technologies and their demonstration of entertainment is equivalent to a real increase in their learning. Second, educational technologies should be provided to solve the lack of equity in educational systems. Serrano and Martínez (2003) highlight that the widespread use of ICTs in all spheres of human life, family, professional, political, cultural, economic, and educational, is undeniable today. Digital technologies constitute a tool that is immersed in the context of human development. For this reason, it is a requirement for schools to use them when appropriate and prudent. These generational differences marked by the emergence of ICT and added to the expectations of improvement and development of educational processes highlight the prevailing need to address reflections on the possibilities of using the various devices and applications of the new technologies in the teaching and learning process. Although the educational models of the 21st century have indeed incorporated the use of ICT in the teaching and learning process, it is also undeniable that there are still gaps in the

recognition of the positive impacts of ICT as pedagogical resources. Sometimes ICT are poorly applied to education, such as:

- Distraction in the classroom: students may misuse technology, such as smartphones or tablets, to browse social media, play video games, or engage in unrelated activities instead of concentrating on the lesson.
- Plagiarism: easy access to online resources can lead to plagiarism, where students copy and paste content without properly quoting or understanding it.
- Over-reliance on automated grading: while automated grading systems can save time, they may not accurately assess complex assignments or provide meaningful feedback, limiting student learning opportunities.
- Lack of critical thinking: relying solely on search engines and online resources without developing critical thinking skills can hinder students' ability to evaluate information and discern reliable sources critically.

Therefore, this research took as its starting point the use of ICT as a contributor to the development of students' digital skills, so the definition of the problem is: Does the use of peerScholar activate recursive feedback and improve the digital competencies of students?

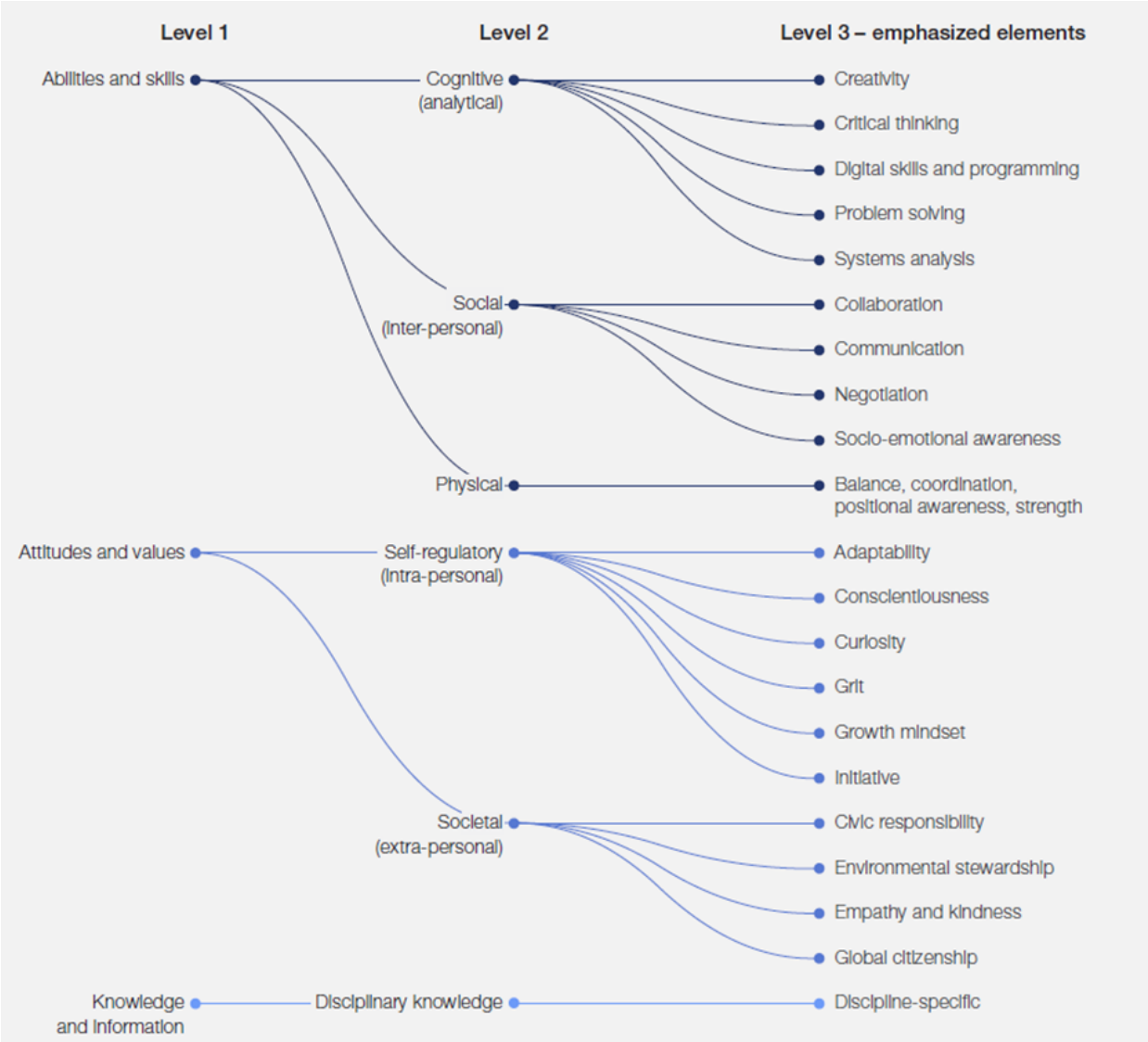
Literature Review

The Taxonomy of Education 4.0

The World Economic Forum (2023) published its referential framework called The Taxonomy of Education 4.0. which consists of a group of abilities, skills, attitudes, values, and knowledge organized in a hierarchical tree structure. Aptitudes are abstract, but at the same time, they are aspects of learning that are transferable during the teaching process, so they are not innate characteristics in students but qualities that can be taught and learned.

Figure 1

The Taxonomy of Education 4.0



Note. The Taxonomy of Education 4.0 published by the World Economic Forum (2023).

The Taxonomy of Education 4.0, Figure 1, was created as part of a strategy for reimagining the educational system. It includes various learning theories and methodologies used by teachers. This taxonomy identifies 4 domains of innovative pedagogies that will guide learning and teaching and further develop the competencies of elementary and secondary school students.

1. Personalized and self-paced learning.
2. Accessible and inclusive learning.
3. Collaborative and problem-based learning.
4. Lifelong, student-driven learning.

According to Adobe Systems Incorporated (2019), a study of 2 million online job postings, the top five skills employers requested were: communication, creativity, collaboration, creative problem solving, and critical thinking. A similar study carried out by the Foundation for Young Australians (2017) found that between 2012 and 2015, the skills whose demand increased the most were: digital literacy (with a 212% increase in

requests), critical thinking (increase 158%) and creativity (65% increase). In the digital age we live in, access to information is easier than ever. However, it is important to teach students to discriminate between relevant and irrelevant information, as well as to validate the reliability of sources. Furthermore, knowledge is something dynamic that is constantly updated. Therefore, it is essential to foster curiosity and interest in students to continue learning throughout their lives. At the core of education and learning is also the ability to apply knowledge to solve real-world problems and situations. It's not just about accumulating information but knowing how to use it effectively. Education Taxonomy 4.0 recognizes the need to prepare students to be competent global citizens in a digitalized world, where soft skills and adaptability are as important as technical knowledge. This represents a significant shift in the way we understand and approach education but is critical to preparing future generations to succeed in an ever-changing world.

Figure 1 includes the 3 different levels of the Education 4.0 Taxonomy and their connections. The three most important domains are those included in Level 1.

- Abilities and Skills: are the set of process-oriented capabilities that enable an individual to achieve a specific goal. At the highest level of abstraction, skills and abilities are divided into:
    - Cognitive and analytical skills, including creativity, critical thinking and problem solving
    - Interpersonal (non-cognitive) skills, including communication, collaboration, and social-emotional skill set.
- Attitudes and values: are the set of beliefs that inform self-regulated behavior, such as personal motivation, commitment to society, and moral or ethical considerations. Attitudes and values are less concerned with how something should be done, but rather with "why" it should be done. These aptitudes have a strong motivational component, which is essential to foster the resilience needed to overcome difficult challenges, including the challenges of learning itself.
- Knowledge and Information: knowledge and information will always be at the heart of education and learning. The economies of the future will require advanced skills and capabilities to interpret the future proliferation of knowledge and information, and the appropriate attitudes and values to guide those interpretations. For this reason, the Education Taxonomy 4.0 places less direct emphasis on knowledge and information, and rather addresses them indirectly through the other skills in the taxonomy.

It is critical that students and educators are willing to try new ideas, methods, and technologies to improve learning. This involves being willing to make mistakes, learn from them, and seek creative solutions. The innovative mindset also involves the ability to quickly adapt to changes and challenges, as well as the willingness to question the status quo and constantly look for ways to improve.

IEEE 3527.1™ (2020) - digital intelligence standard (DQ)

Beyond IQ and EQ, the DQ (digital intelligence) standard represents the critical skills needed to thrive in the digital age. Melissa Sassi, chair of the Digital Literacy & Skills Working Group: IEEE Smart Village explains:

> After reviewing hundreds of frameworks, definitions, platforms and modules, the digital intelligence working group was delighted to have identified one that encompasses the skills needed to use the internet. Our mission behind the work has been to align the world with a standard framework to guide the formal and informal sectors worldwide to empower others with the digital skills necessary to

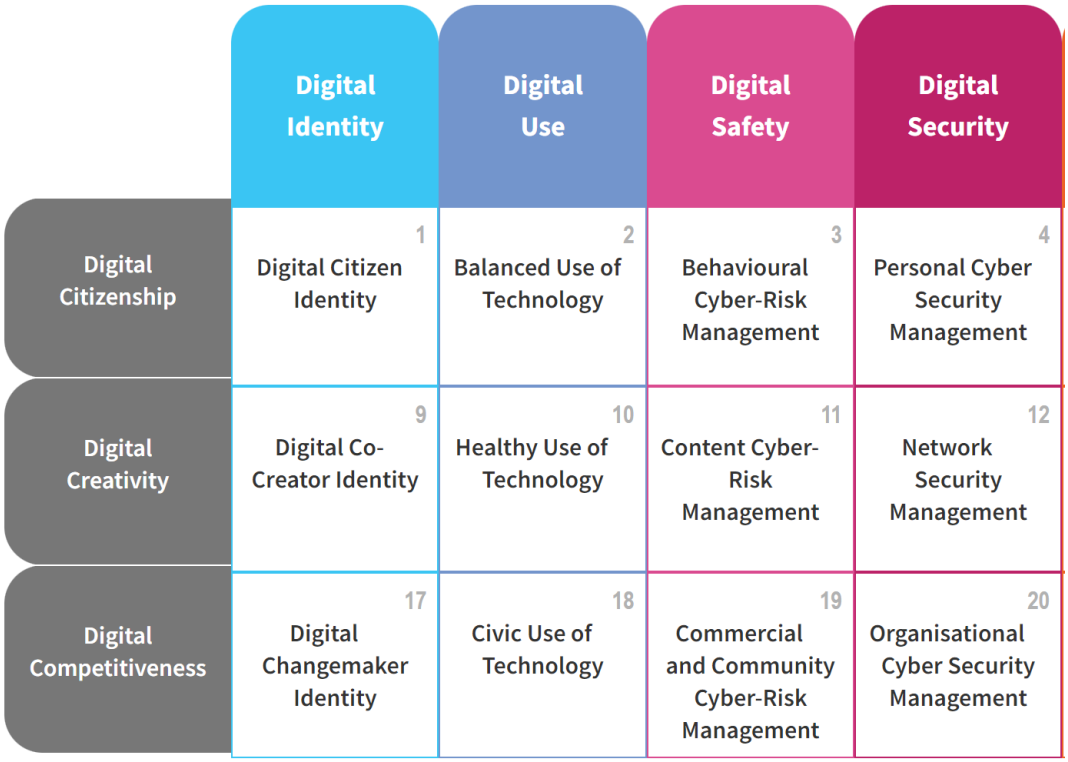
> prepare for the future of work while being safe and secure online. (DQ Institute, 2019, page 51)

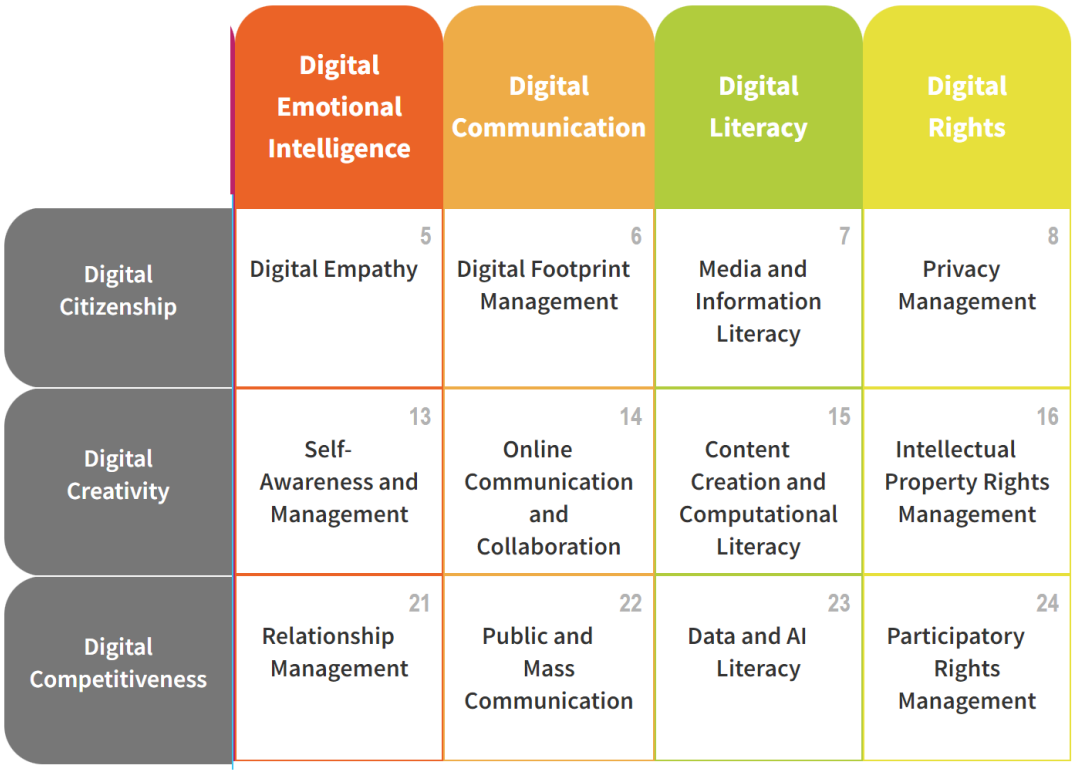
The DQ Institute (2020) referential framework comprises 24 digital competencies, as in Figure 2. This framework focuses on 8 critical areas of digital life: identity, use, security, emotional intelligence, literacy, communication, and rights. These 8 areas can be developed at three levels: citizenship, creativity, and competitiveness.

- Citizenship focuses on basic skills necessary to use technologies responsibly, safely, and ethically.
- Creativity enables problem-solving by creating new knowledge, technologies, and content.
- Competitiveness focuses on innovations to change communities and the economy for the general benefit.

Figure 2

The 24 digital competencies of the digital intelligence standard (DQ)



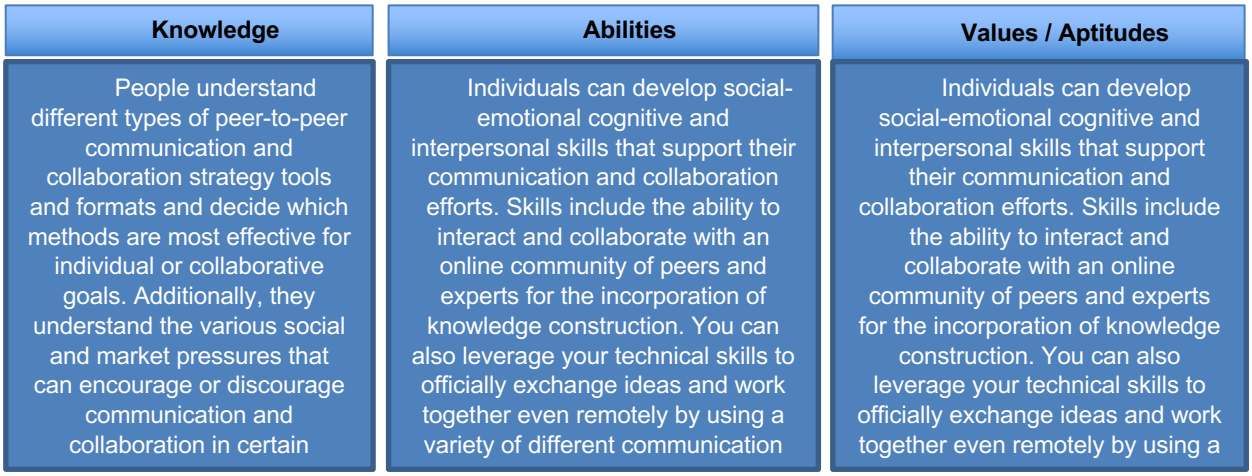


Note. This figure shows the 24 digital competencies of the digital intelligence standard published by the DQ Institute (2020).

During this research the focus was DQ6, 14, which is the subject of digital communication, including collaboration and online communication. Figure 3 describes the knowledge, aptitudes, values and abilities necessary for this digital competence, which is the essence of this research work about the use of the peerScholar software and its contribution to the development of these digital competences in students.

Figure 3

DQ6, 14: digital communication – collaboration and online communication



Note. This figure shows the DQ6, 14 breakdown of the Digital Communication competency published by the DQ Institute (2020).

e-Learning Ecologies

Cope and Kalantzis (2016) explore the concepts of online learning, which can be categorized as new learning environments and traditional learning environments that are transformed by educational technologies. Both categories use a wide range of educational technologies and technology platforms in traditional and new contexts. Cope and Kalantzis (2016) identify the following educational technologies as the most important and those that will continue to transform education:

- Learning management system: this category includes open-source systems such as Moodle or those used by university centers called Blackboard. Commercial online learning management systems such as Coursera and EdX have recently followed the same format.
- Electronic books and texts: beginning to replace print products, which may include multimedia content and often formative assessments.
- Flipped classes: where students outside of class hours consume content.
- Tutors, simulations, and intelligent games: Contribute to the personalized learning of students.
- Discussion forums: support different modes of conversation, one of which is the asynchronous method.

None of these technologies are essentially new, and their use or application in the teaching process cannot necessarily affect students. Cope and Kalantzis (2016) analyze the learning paradigm that distinguishes didactic pedagogy from reflexive pedagogy.

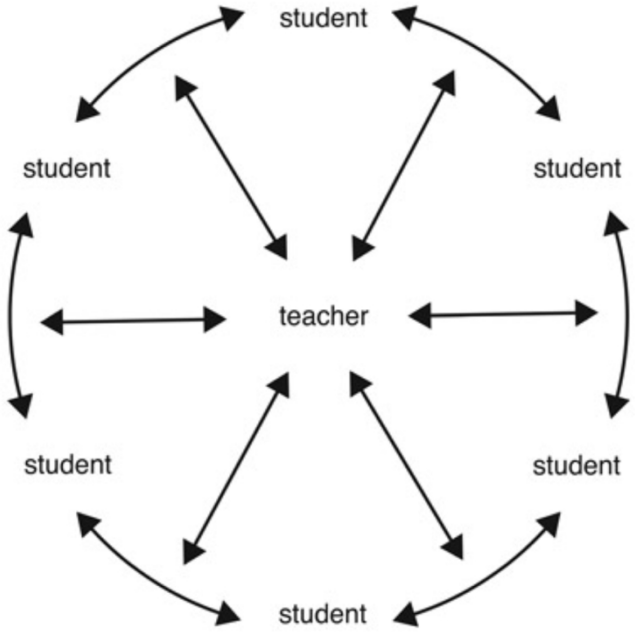
The characteristics of didactic pedagogy include:

- The teacher is the one in control of the learning environment.
- There is a focus on cognition, especially a focus on long-term memory.
- There is a unique focus on the individualized student.
- There is an emphasis on how students can replicate disciplinary knowledge.

Features of reflexive pedagogy include:

- There is a shift in control between teacher and student, where the student has considerable scope and responsibility.
- The knowledge activity is dialogic, with a forward and backward movement between teacher and student, students and students, as can be seen in Figure 4.
- The focus is on the artifacts and knowledge representation constructed by the student and their construction processes.
- The focus is on the social sources that contribute to the construction of knowledge.

Figure 4
Roles in reflexive pedagogy



Note. Reflexive pedagogy roles. Adapted from e-Learning Ecologies book, by Cope and Kalantzis (2016, p.10).

What is potentially new and transformative about online learning ecologies? Educational technologies can support the most fundamental changes in the learning process to make the educational experience more engaging for students, effective, resource efficient, and equitable for their own diversity. The seven e-learning affordances of the new learning era created by new digital media are ubiquitous learning, active knowledge creation, multimodal meaning, recursive feedback, collaborative intelligence, metacognition, and differentiated learning.

Figure 5

The 7 E-learning Affordances of reflexive pedagogy

Note. The 7 E-Learning Affordances, by B. Cope and M. Kalantzis (2016).

- E-Learning Affordance 1: ubiquitous learning. This is a form of learning according to demand. ICT allows students to participate in the learning process at the moment, at the time, and at the time in the way they prefer. This type of learning goes over all of the restrictions of the class timetable and the physical limits of the traditional school scenarios and the didactic pedagogies.
- E-Learning Affordance 2: active knowledge making. This corresponds to a method of instruction that involves students in the learning process, requiring them to perform significant learning activities and think reflectively about them.
- E-Learning 3: multimodal meaning. Multimodal refers to multiple modes of communication, such as visual, linguistic, spatial, gestural, and auditory (Silverstone, 2017).
- E-Learning Affordance 4: recursive Feedback. Iterative feedback is where messages return to the author to enable reflection and the creation of new knowledge.
- E-Learning Affordance 5: collaborative Intelligence. Interconnected social networks amplify intelligence, which has a greater impact than individual action.
- E-Learning Affordance 6: metacognition. This is thinking about thinking that generally involves a level of abstraction that will improve learning.
- E-Learning Affordance 7: differentiated Learning. This philosophy values what and who students are before they come into the classroom and works with them to achieve what they need to learn.

In their latest research Kalantzis & Cope (2020) explore the concept of technology as a social construction. They identify that we acknowledge technology as a human invention, and our daily interactions with it often obscure this fact. Technologies transform from inventions to objects that we integrate into our lives, shaping our experiences. This can lead to a sense of technological determinism**,** where we perceive technology as an independent force driving change. However, their research argues that despite the powerful influence of technology, human agency remains a significant factor in shaping its impact on our lives.

E-Learning Affordance 4: recursive feedback

This research is focused on this affordance and it is important to expand this concept with the reflections of other authors. Jenkins et al. (2009) expose the importance of educating people on how to participate effectively in the participatory culture of media in the 21st century. Jenkins suggests that media education must adapt to changes in technology and society, and must train people to be active and critical producers of media, rather than simply passive consumers. In addition, he highlights the need to promote media literacy and encourage citizen participation in the ever-evolving media culture.

Laurillard (2022) addresses the question of how to use educational technology effectively in university teaching in her book "Digital Technologies and Their Role in Achieving Our Ambitions for Education". The book offers a theoretical and practical framework for educators who wish to integrate technology into their teaching practices. Laurillard explores how technology can be used to enhance teaching and learning, focusing on aspects such as collaboration, feedback and personalization of learning.

The software peerScholar

peerScholar, is a web tool used for peer review created by Steve Joordens, Professor of Psychology at the University of Toronto Scarborough and is the Director of the Advanced Learning Technologies Lab and by Dwayne Pare who is a cognitive psychologist and associate director of the Advanced Learning Technologies Lab at the University of Toronto. Paré, D. & Joordens, S. (2008) first research project on peerScholar was published in the Journal of Computer Assisted learning. This research examined whether peer grading in peerScholar was fair or not. The research acknowledged that undergraduate students might not be as skilled at grading as graduate-level teaching assistants. The grades students received in peerScholar was the averages of six peer grades. In fact, the study found that the average peer grade was just as reliable as a grade from a graduate-level mark. In their work called "peerScholar: Based on evidence, a digital peer assessment tool to promote critical thinking and clear communication: Joordens, Pare & Pruesse (2009), explain that the main objective of universities is to train academics, students who do not only possess information, but also know how to think and communicate their thoughts effectively. While assessing how well knowledge has been acquired is relatively easy, it is much more difficult to promote and assess thinking and communication skills in a pedagogically powerful and logistically manageable way. These challenges are especially evident as class sizes increase, and the all-too-common result is eliminating any form of written homework. Ten years ago, they created peerScholar, a web-based peer assessment tool that enabled them to bring critical thinking and writing skills back to a class that had, by that time, grown to 1,500 students. In 2008, this tool was licensed for distribution by Pearson Education Canada. As part of their research, they showed evidence of how peerScholar is a pedagogically and logistically tool superior to

the traditional practice of having expert-grade essays. They highlighted in their research findings quantitative support that:

(a) peerScholar is effective in promoting enhanced critical thinking skills, even after a single assignment.

(b) grades earned within peerScholar are as fair as those provided by teaching assistants at the graduate level.

(c) when combined with a retest option, the system remains logistically reasonable to implement and gains additional pedagogical and practical merits.

According to this, peerScholar encourages collaboration between students and gives them the opportunity to learn through constructive feedback from their peers. This can help develop critical thinking skills, effective communication, and teamwork. By using peerScholar, educators can foster a learning environment in which students are motivated to actively participate, reflect on their own ideas, and constantly improve through the feedback received.

Method

The methodological design of this investigation was built on what has been found around all the practices of reflexive pedagogy, digital competencies, and peerScholar software. It is important to highlight the specific objectives considered in this research.

Objectives

1. Identify the new digital skills of students after the COVID-19 pandemic.
2. Determine the digital principles of the 21st century is according to reflexive pedagogy.
3. Analyze the direct and indirect relationship between the digital principles of the 21st century and the components of reflexive pedagogy.
4. Analyze the connection between reflexive pedagogy and students' digital competencies.

Authors such as Hernández-Sampieri et al. (2010) point out the differences in research, variables, and effects in research studies. Hence, this work's methodology includes experimental research (quasi-experiment) with a design that includes posttest and intact groups. The variables identified for this quasi-experimental research is:

- Independent variable (controlled and analyzed).
  - peerScholar frequency of use (active).
- Dependent variables (controlled and analyzed).
  - Digital communication competence of students.
  - Digital competence of collaboration of students.
  - Strategies of recursive feedback by teachers.
- Mediators' variables (not controlled, analyzed).
  - Frequency of use of ICT for learning.
- Quantitative variables.
  - Frequency of use of peerScholar.
  - Frequency of use of ICT for learning.
- Qualitative Variables.
  - Recursive feedback strategies.
  - Digital communication competence of students.
  - Digital collaboration competence of the students.

Instruments

Two instruments, a non-participant direct observation and a survey, were used to collect suitable data on the selected population in this scientific and educational investigation. These instruments provide quantitative and qualitative data; although the research is quantitative, this does not invalidate some qualitative data from the different techniques. The indicators in Table 1 were used during the investigator's non-participant observation.

The direct non-participant observation means:

> Direct non-participant observation (descriptive, focused, selective), in which the researcher is a passive spectator of the phenomenon studied; His task is to record the information that appears before him. This distancing between the phenomenon and the researcher aims to guarantee a high level of objectivity and veracity of the data. This type of observation is applicable to the periodic activities of social groups, but not to the study of their structure and daily life according to Rodríguez-Gómez et al (1996).

Table 1

Indicators of direct non-participant observation

Indicator	Acceptable	Regular	Deficient	Not Observable
Teacher				
Knowledge of using peerScholar software				
Promoter of recursive feedback strategies				
Student Group				
Knowledge of using peerScholar software				
Communication between peers				
Collaboration in groups / Teamwork				
Application of recursive feedback strategies				
Evidence of the 5 Characteristics of reflexive pedagogy				

The survey

This quasi-experimental research was conducted at an international educational center in the city-state of Singapore on the Asian continent. The focus of this research work was grade 9 students and the digital competencies of its students. The population of this survey was 250 students in grade 9 and the sample used for this research was an intentional selection of 50 grade 9 students whose subjects are history and physics. In the

development of this research, a survey was used that has two sections: an unstructured section with a dichotomous question to collect qualitative data and a structured section for the collection of quantitative data, which will have different types of questions such as:

A. Single answer multiple choice.
B. Likert scale—frequency. The Likert scale is a psychometric research method. It contains a rating range that collects information about the level of agreement or disagreement with a statement.
C. Net Promoter Score (NPS) question. This tool measures end customer satisfaction with a single question that results in a growth indicator for the company, service, or final product.

Table 2
Survey Indicators for Students

Question Type	Indicator	Possible Answers
Dichotomous	Subject	History, Physics
Likert	Frequency of use of ICT for learning	Daily, Weekly, Monthly, Once a semester, Once a year, Never
Likert	Frequency of use of peerScholar software	Daily, Weekly, Monthly, Once a semester, Once a year, Never
Single answer multiple choice	Evidence of the application of recursive feedback strategies	Yes, No, Not Applicable
NPS	Recommendation of using peerScholar	0-10 Scale

Relationship between Reliability and Validity

In this investigation, the following relationship was found to corroborate the reliability indicators and validate the instruments with the following steps.

- Preparation of data collection instruments.
- Instrument content validation process by an expert judgment system.
- Adjustment of data collection instruments, according to the recommendations of experts involved in the validation process.
- Reliability study of the survey for students: Cronbach's alpha coefficient. Cronbach (1951) defines it as a coefficient that serves to measure the reliability of a measurement scale, and whose name is Alpha.

Table 3
Instruments validity and reliability methods

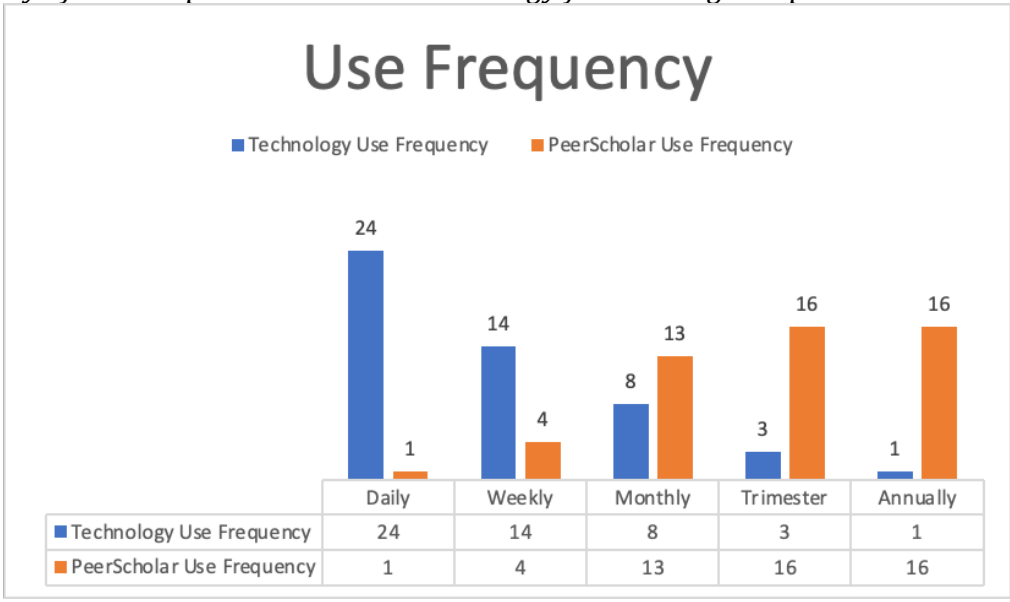
Instruments	Validity	Reliability
Non-participant direct observation sheet	Expert Judgment System	
The Survey	Expert Judgment System	Cronbach's alpha

Results

The study confirmed that using the software peerScholar impacts the enhancement of digital competencies among students, suggesting that these skills are crucial for contemporary educational settings and future job markets. Questions about the attributes of digital competencies post-pandemic and the evidence of peerScholar's effectiveness in fostering these skills guided the research focus. In Figure 6, the analysis of the results showed a high receptivity to the question about the frequency of using technology for learning, which suggests a strong commitment to using technological resources in the student's educational experience. However, a more discrete reception is observed regarding using peerScholar software to strengthen skills linked to the subjects of history or physics.

Figure 6

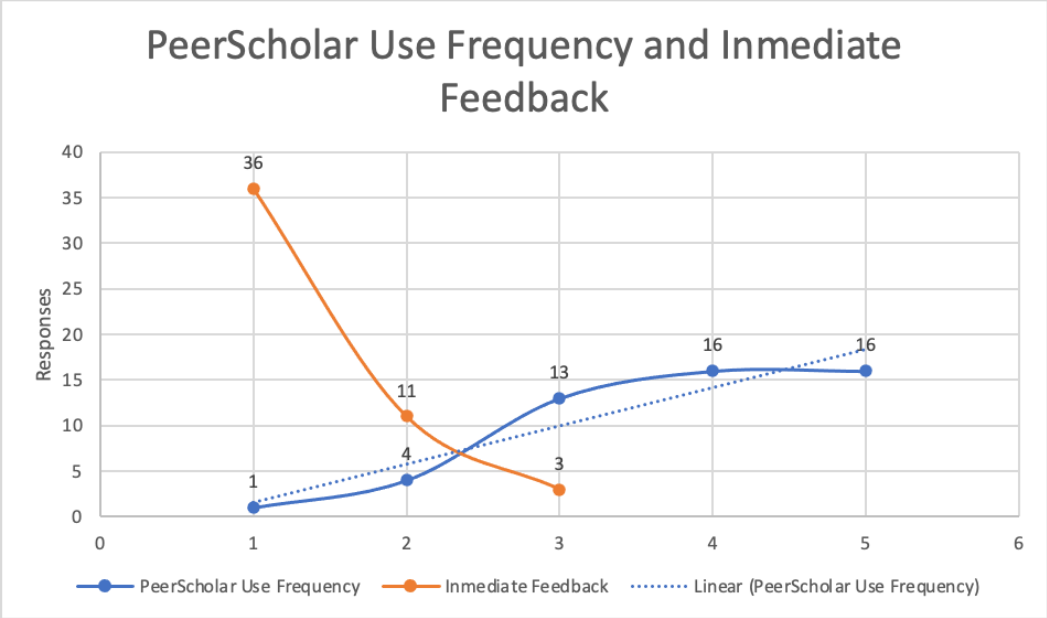
Frequency of use comparison between technology for learning and peerScholar



	Daily	Weekly	Monthly	Trimester	Annually
Technology Use Frequency	24	14	8	3	1
PeerScholar Use Frequency	1	4	13	16	16

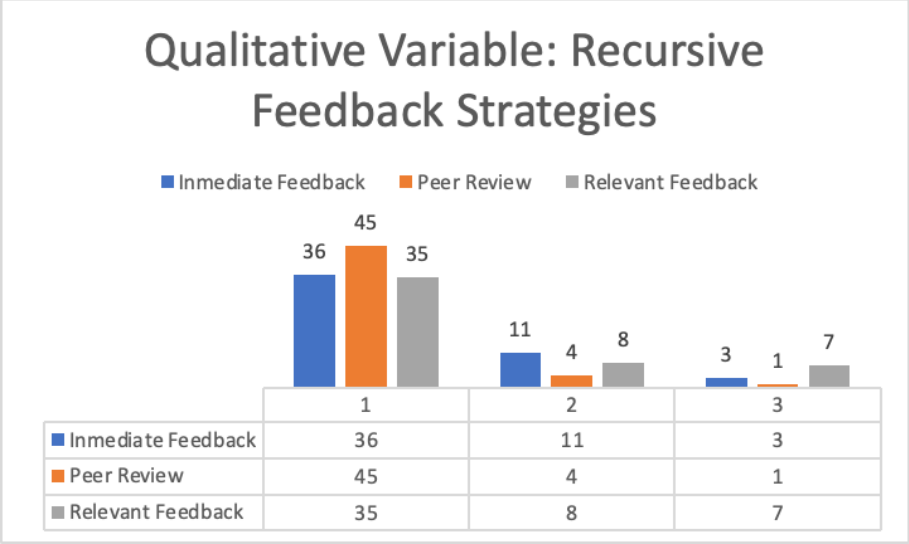
It is important to recognize that various factors could have influenced the use of the software beyond the students' predisposition and class circumstances. For example, changes in teaching methodologies, the availability of alternative educational resources, or even students' perceptions of the usefulness and effectiveness of peerScholar could have influenced this trend. Additionally, individual differences in learning preferences, level of motivation, and familiarity with the technology could also have played a role in the variation in software use.

Figure 7
p*eerScholar frequency of use comparison and Recursive feedback*



In Figure 7, a particular trend can be seen: the blue line, which represents the frequency of use of the peerScholar software, shows an increase as the frequency of use of technology for learning decreases, while the orange line reflects a decrease in relation to the negative perception about the importance of immediate feedback. This pattern suggests that, although using the software peerScholar was infrequent, its usefulness is recognized for receiving timely and relevant feedback to continue building new knowledge. Despite the low frequency of use of peerScholar, students value the software's ability to quickly provide relevant feedback, potentially contributing to improving their digital competencies. This relationship between peerScholar frequency of use and positive perception of immediate feedback highlights the importance of considering not only the number of times a digital tool is used but also the quality of the learning experience it really provides.

Figure 8
Qualitative variable: Recursive Feedback Strategies



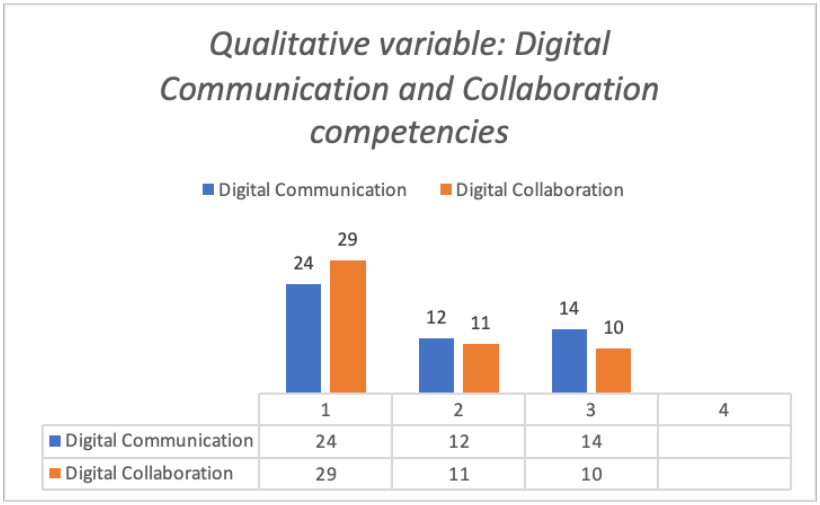
	1	2	3
Inmediate Feedback	36	11	3
Peer Review	45	4	1
Relevant Feedback	35	8	7

The results of this research are somewhat similar to those obtained by González, Rivadulla & Golías 2022 who carried out an analysis of the emotions triggered by peer evaluation in a group of students. Their work suggests that reflexive pedagogy, combined with concepts such as authentic assessment, benefits from these practices. In the case of this research, it is recognized that peer evaluation is part of a broader process and is not limited to simply being a specific result.

What seems to stand out on both researches, is that these activities generate considerable satisfaction in the participants, provoking positive emotions that contribute to the quality of learning. In addition, they allow for the natural integration of actions, such as the diagnosis of strong aspects and areas for improvement, which otherwise could go unnoticed. This revelation suggests that the implementation of peer assessment not only improves the quality of learning but fosters a culture of reflection and continuous growth in the educational field.

Figure 9

Qualitative variable: Digital Communication and Collaboration competencies



The results seen in Figure 9 corroborate the idea expressed in the conceptual part of this research study, which maintains that the digital skills of communication and collaboration are essential to prepare students for the future, given that more and more jobs will require skills related to technology and innovation. This is evident in the Taxonomy of Education 4.0, which seeks not only to impart theoretical knowledge but also to encourage the development of relevant practical skills and competencies in a constantly changing world.

In addition to the aspects mentioned above, another key element that emerges from the analysis of the collected data is the evaluation of the possible impact of the peerScholar software on acquiring new knowledge. This study also examines how implementing additional teaching and learning strategies, such as rubrics and applying metacognitive strategies, can influence the achievement of the proposed learning objectives. The objective is not only to determine whether the use of peerScholar software promotes learning in general terms, but also to identify the specific mechanisms and conditions that enhance its effectiveness. This deeper understanding will inform more effective, evidence-backed pedagogical practices, as well as provide practical recommendations for the design and implementation of technology-based educational interventions.

Figure 10
peerScholar Relation to New Learnings

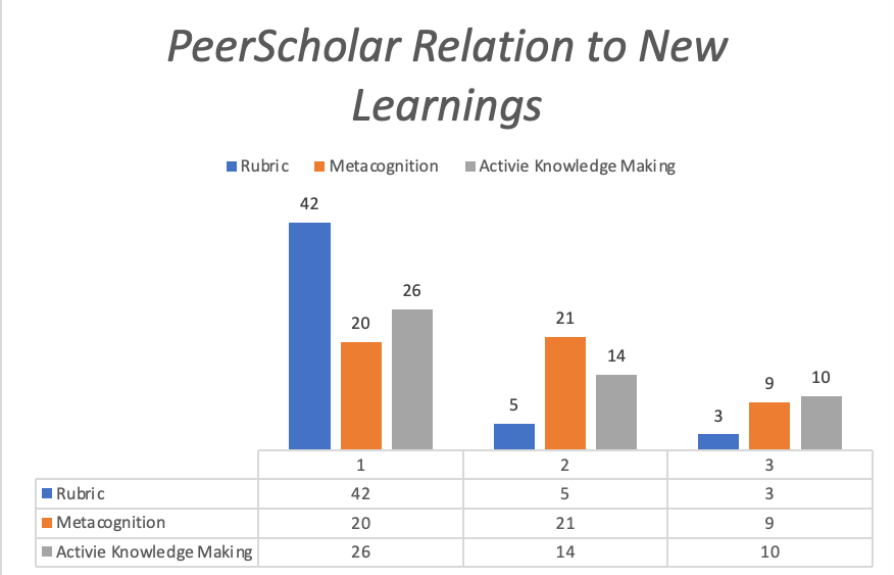


Figure 10 shows that the software not only promotes the development of new learning experiences among students but also promotes the capacity for self-regulation and metacognition, making it a valuable resource to move towards a more solid reflexive pedagogy. In this educational approach, students assume an active and leading role in their learning experience, ceasing to be passive recipients of information to become committed and autonomous participants. This transformation implies that students memorize concepts and data and deeply understand their usefulness and applicability in different contexts, allowing them to develop critical and creative skills fundamental to their personal and professional development.

Table 5
peerScholar NPS Results

NPS Scale	Detractors								Passives			Promoters		
	0	1	2	3	4	4	6		7	8		9	10	
	1	0	0	2	4	3	7		16	6		10	1	

The data provided clearly show that, from a total of 50 students surveyed, different levels of perception towards the use of the peerScholar software were identified. There are more passives than promoters or detractors, indicating a general sense of satisfaction but not a strong loyalty. Most of the scores are between 6 and 9, suggesting that while many respondents are somewhat satisfied, there's room for improvement to shift passives to promoters. The extremes of the scale (0 and 10) are the least populated, with only one respondent each, which suggests a less polarized opinion about the software peerScholar.

The NPS survey results were unsurprising yet good to analyze to identify the following actions. Based on what can be done with the introduction of new software for teaching and learning in a short amount of time, these strategies can be used to continue the analysis of this research:

- Understand the Passives: since this is the largest group, understanding why they are not promoters could provide actionable insights.
- Improve Features for Detractors: identify common issues or reasons for dissatisfaction among detractors.
- Enhance User Experience: based on feedback, see if there are any features or user experience improvements that could be made to shift the NPS score upwards.
- Improve Communication and Support: sometimes, users are unaware of all the features or how to use them.
- Follow-up with Users: periodically re-assess satisfaction levels to see if changes have the intended positive effect.

To synthesize the above, the research reveals several key findings:

- High Receptivity to ICT for Learning: students demonstrated a strong commitment to using technological resources for educational purposes, reflecting a shift towards increased comfort with digital tools post-pandemic.
- Frequency of Use: while the overall usage of peerScholar was lower than expected, the software's value in providing timely and relevant feedback was highly appreciated. This indicates that the quality of the learning experience, rather than the frequency of use, is crucial in enhancing digital competencies.
- Recursive Feedback Strategies: the implementation of recursive feedback through peerScholar was shown to improve students' ability to provide and receive constructive criticism, thereby enhancing their communication and collaboration skills.
- Digital Communication and Collaboration Competencies: the study underscores the importance of these competencies in preparing students for future job markets, aligning with the Taxonomy of Education 4.0, which emphasizes practical skills and adaptability.
- Positive Impact on New Learnings: peerScholar was found to promote self-regulation and metacognition, essential components of reflexive pedagogy, by enabling students to take an active role in their learning process.

Discussion and conclusions

By reflecting on the findings, this research contributes to the broader understanding of how digital tools can be integrated into educational practices to foster an environment conducive to developing necessary digital competencies. The study situates its findings globally, suggesting that such educational innovations can profoundly impact teaching and learning practices worldwide. It also calls for continued exploration of how digital tools and reflexive pedagogy can be aligned to prepare students for the challenges of the digital age.

The study yielded valuable insights into peerScholar's role in cultivating digital competencies among students in a post-pandemic world. While the data suggests a positive correlation between the software's use and the perception of its value in providing immediate feedback, the overall usage rates were lower than anticipated. This highlights the need for further investigation into the factors influencing software adoption. The research findings also emphasize the importance of considering the quality of the user experience alongside the frequency of use.

The Digital Intelligence Standard DQ6.14: "Digital Communication" emphasizes the effectiveness of communicating and collaborating using digital tools and platforms. It

is important to outline the correlation of the findings in this research with DQ6.14. The first correlation evolves around peer review and collaborative learning**.** Students engaged in providing and receiving feedback on each other's work, fostering communication skills and the ability to articulate ideas constructively in a digital environment. This aligns with DQ6.14 by encouraging students to:

- Communicate effectively online: peer review necessitates clear and concise written communication, ensuring the recipient understands the feedback.
- Collaborate using digital tools: peerScholar serves as a platform for digital collaboration, facilitating the exchange of ideas and feedback within a structured online environment.
- Provide and receive constructive criticism: effective peer review involves offering constructive feedback that is specific, actionable and delivered respectfully. This hones students' communication skills in delivering critical analysis while maintaining a professional tone.

The second correlation talks about understanding the audience and context. Digital communication necessitates personalized messages to the intended audience and considering the context in which they are delivered. Peer review within peerScholar reflects this concept in several ways:

- Adapting communication style: students need to adjust their communication style depending on whether they are providing feedback (informative and instructive) or receiving feedback (open-minded and receptive).
- Considering context: feedback becomes more meaningful when students consider the purpose of the assignment, the learning objectives, and the specific strengths and weaknesses of the work being reviewed. This fosters critical thinking and the ability to tailor communication for maximum impact within a digital learning environment.

The study also provides meaningful understandings and findings that directly speak to the specific objectives of the research. When looking at the specific objective #1 "identify the new digital skills of students after the COVID-19 pandemic" the research doesn't explicitly list entirely new digital competencies. Still, it highlights a shift in emphasis towards an increased comfort with technology for learning as students show a high receptivity to using technology for educational purposes in general, adaptability to online learning environments as the pandemic likely accelerated students' ability to navigate and learn within online platforms an intentional focus on communication and collaboration skills which are essential for functioning effectively in online environments. For the specific objective #2 "determine the digital principles of the 21st century are according to reflexive pedagogy" the study highlights aspects of the reflexive pedagogy that align with 21st-century digital skills like an emphasis on critical thinking and communication as peer review activities encouraged by reflexive pedagogy can foster critical analysis, evaluation, and clear communication, a focus on student reflection and self-assessment as reflexive pedagogy encourages students to reflect on their learning process, which can translate to a more metacognitive approach to using digital tools for learning.

For the specific objective #3 "analyze the direct and indirect relationship between the digital principles of the 21st century and the components of reflexive pedagogy" the direct relation is that peer review, a core component of reflexive pedagogy, directly strengthens digital communication and collaboration skills through online feedback exchange and the indirect relationship is that by reflecting on their own learning and that of their peers, students can develop critical thinking skills applicable to evaluating online information which contributes to information literacy and responsible digital citizenship.

Lastly, the specific objective #4 of this research is to "analyze the connection between reflexive pedagogy and students' digital competencies" where many of the findings in this section have already been outlined. As additional thoughts we can know now that reflexive pedagogy connects to students' digital competencies in several ways:

- Active Learning: reflexive pedagogy encourages students to become active participants in the development of their digital skills by placing them at the center of their learning journey through peer review and reflection.
- Metacognition: the emphasis on reflection fosters a metacognitive approach, where students become aware of their own learning process and how they can leverage technology for optimal learning outcomes.
- Transferable Skills: the critical thinking, communication, and self-evaluation skills honed through reflexive pedagogy are directly transferable to various digital environments and applications.

Limitations

One of the most notable limiting factors in the research process was the lack of commitment of some of the teachers who supported the experience. It was evident that some of them did not commit to asking students to use the software, nor did they include it in the curricular design or in the planning of their class sessions. This lack of interest was reflected in a lack of exploration of the potential and benefits of the software, negatively affecting the implementation and use of the educational tool. This situation is not isolated, since the lack of motivation of teachers to innovate, learn new tools and incorporate useful digital resources for learning is a common problem in many school systems. The studies consulted confirm that this resistance to change and the adoption of new technologies is a recurring obstacle. In this particular case, the apathy of some teachers reinforced this tendency, thus limiting the positive impact that the software could have had on the educational process. However, what could be considered the greatest obstacle to this research was the lack of adequate digital skills of the students. A notable lack of motivation, curiosity and sense of opportunity to take advantage of the benefits of the software was observed. This deficit negatively affected the students' ability to interact effectively with the tool, thus limiting its potential to enhance learning.

Implications for Future Research and Practice

This study confirmed many different wonderings and not-proofed claims about using technologies for teaching and learning. The below reflection points can maximize peerScholar's (or any educational technology software, including AI) impact on digital communication skills for future studies:

- Training and Scaffolding: provide students with training on effective online communication and peer review techniques. Offer initial scaffolding to help students adjust to the platform and classroom expectations.
- Integration with Learning Objectives: ensure peerScholar activities are linked to specific learning objectives and assignments requiring communication and collaboration skills.
- Faculty Involvement: faculty members should actively participate by providing feedback on peer reviews and guiding students toward constructive communication practices.
- Continuous Assessment: periodic re-assessment of students' satisfaction and feedback can help in refining the use of peerScholar and other digital tools to meet educational goals more effectively.

This research student provides compelling evidence that peerScholar positively impacts the development of students' digital competencies. By fostering a reflexive pedagogy environment, the software not only enhances critical thinking and communication skills but also prepares students for the challenges of the digital age. This research underscores the need for continued exploration of digital tools and their alignment with innovative pedagogical practices to create an engaging and effective learning experience for students worldwide.

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GAMIFICATION IN THE NATURAL SCIENCE CURRICULUM IN BASIC EDUCATION: EMPIRICAL EVIDENCE OF EFFECTIVENESS IN LEARNING

GAMIFICACIÓN EN EL CURRÍCULO DE CIENCIAS NATURALES EN EDUCACIÓN BÁSICA: EVIDENCIA EMPÍRICA DE EFECTIVIDAD EN EL APRENDIZAJE

Martha Cecilia Betancur Taborda[1]
International Iberoamerican University, Mexico
(macebeta@gmail.com) (https://orcid.org/0000-0002-4177-1827)
Antonio Rafael Fernández Paradas
University of Granada, Spain
(antonioparadas@ugr.es) (https://orcid.org/0000-0003-3751-7479)

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curriculum, gamification, energy, learning, didactics.

ABSTRACT

This research offers the educational community a design proposal for action within the natural sciences curriculum, involving the learning of the concept of energy through gamification. The intervention took place José Martí School in Bogotá, with a sample of 32 fifth grade elementary students. The intention is to address the scientific problem posed: what elements should a proposal for action contain in the José Martí school curriculum that involves the construction of the concept of energy through gamification? The proposed questions lead to the formulation of several hypotheses, among them, whether learning strategies that use gamification as an educational resource enrich the natural sciences curriculum and facilitate the meaningful construction of the concept of energy by students. This research adopts a mixed approach, combining descriptive, explanatory and interpretive methods; For the quantitative analysis, statistical algorithms such as the Shapiro-Wilk test and the student t test were used, while the qualitative part was used maxqda software. This study provides the educational community with an innovative learning strategy to teach the concept of energy through gamification, generating significant changes in the curriculum. In addition to verifying that the use of technological and gamified tools, specifically the game "an energy journey: the magic of energy" promoted significant learning of the concept in fifth grade primary school students at the José Martí school.

Palabras clave:
currículo, gamificación, energía, aprendizaje, didáctica.

RESUMEN

Esta investigación ofrece a la comunidad educativa un diseño de propuesta de actuación en el currículo de ciencias naturales, que implicó el aprendizaje del concepto de la energía mediante la gamificación. La intervención se desarrolló en el Colegio José Martí

[1] Autor de correspondencia.

en Bogotá, con una muestra de 32 estudiantes de quinto grado de educación básica primaria. La intención es abordar el problema científico planteado: ¿qué elementos debe contener una propuesta de actuación en el currículo del colegio José Martí que involucre la construcción del concepto de energía a través de la gamificación? Los interrogantes propuestos conducen a la formulación de varias hipótesis, entre ellas, si las estrategias de aprendizaje que utilizan la gamificación como un recurso educativo enriquecen el currículo en ciencias naturales y facilitan la construcción significativa del concepto de energía por parte los estudiantes. Esta investigación adopta un enfoque mixto, que combina métodos descriptivos, explicativos e interpretativos. Para el análisis cuantitativo, se emplearon algoritmos estadísticos como la prueba de Shapiro-Wilk y la prueba t de student, mientras que la parte cualitativa se usó el software maxqda. Este estudio aporta a la comunidad educativa una estrategia de aprendizaje innovadora para enseñar el concepto de la energía a través de la gamificación, generando cambios significativos en el currículo. Además de verificar que la utilización de herramientas tecnológicas y gamificadas, específicamente el juego "un recorrido energético: la magia de la energía" promovió un aprendizaje significativo del concepto en los estudiantes de quinto grado de básica primaria del colegio José Martí.

Introduction

This research focused on the analysis of the regulations of the natural sciences and environmental education curriculum for elementary school in Colombia. Based on the analysis, an innovative learning strategy was designed using gamification to integrate the natural science curriculum and teach the concept of energy, considering its scientific and social dimensions. The selected population was fifth grade students of the José Martí school in Bogotá, Colombia, and the relevance of the study was to provide the academic community with a proposal for action in the curriculum.

Gamification in education emerges as a powerful tool to improve the understanding of multidisciplinary concepts. Along these lines, the game "An energy journey: the magic of energy" was designed and implemented as part of the educational strategy that uses gamification to facilitate the learning of the concept of energy in a playful and participatory way. This resource was an integral part of the process and was successfully implemented with students in 2023. The game used characteristic elements of games, such as designs and dynamics, in an educational context, available at: https://aprendejugando.com.co/.

The game was based on a didactic unit on energy, organized from the constructivist perspective of Sanmartí (2002) and the problematic didactic approach of Bravo (2002). This methodology offered a didactic and playful route, which considered what and how to learn, as well as the self-regulation of learning, fundamental elements of curricular planning.

The nature of this research is mixed, that is, located in the quantitative and qualitative paradigm, the study questions respond to a descriptive, explanatory and interpretative inquiry aimed at collecting information on the curriculum in Colombia, the analysis and limitations of the study plan, the curriculum structure of natural sciences and environmental education of the José Martí school with respect to energy.

Instruments such as surveys, interviews, field diaries and analysis of documents related to the issue of curriculum in Colombia, Latin America and globally were used, highlighting its relevance in the educational and institutional sphere. The concept of energy was prioritized, and the potentialities and deficiencies of the curriculum in the Colombian and institutional context were identified.

The scientific field was approached from an educational perspective, highlighting the importance of building the concept of energy with children, which is fundamental to understand and explain a wide variety of phenomena in different social, economic, political, scientific and technological aspects. He also emphasized the need to raise awareness among new generations of the global energy crisis, due to the depletion of natural resources and climate change, which represent major contemporary challenges both locally and internationally.

In the social context, it provided the educational community with a learning strategy to implement in the classroom focused on curriculum, gamification and energy. The latter is a complex and challenging concept to build with students, since it is essential to understand it from multiple perspectives: physical, biological, anthropic and technological, it was approached through daily activities, exploring its scientific aspect and its social implication.

The scientific problem was: what elements should be included in an action proposal in the curriculum of the José Martí school that involves the construction of the concept of energy through gamification?

The objectives were: 1. To design a proposal for action in the natural sciences curriculum of the José Martí school that involves learning the concept of energy through gamification, 2. Analyze the regulations and curriculum of natural sciences in Colombia and the institution, 3. Apply a learning strategy for energy concept building using gamification, and 3. To provide the educational community with a proposal for the transformation of the natural sciences curriculum involving the learning of the concept of energy through gamification.

The research was based on authors such as Caillois (1986), Díez (2017), Huamaní Quispe and Vega (2023), Huizinga (2007), Soto et al. (2024) and Teixes (2015) who consider it innovative to use playful strategies, gamification, educational software, and hobbies that favor motivation and learning. "Gamification, by influencing the behavior and motivation of participants, makes learning a more engaging and effective experience" (Teixes, 2015, p. 18).

As for the curriculum, epistemological, pedagogical, didactic and methodological aspects converge in it, enriching the curricular design and the way of approaching the contents that integrate it. Currently, various curricular theories strengthen and re-signify this process in the school, and its implementation is a crucial aspect, which is adapted in a unique and pertinent way to the needs of each context. The involvement of the curriculum in institutions is relevant, given that current generations are marked by complex technological, environmental, scientific, economic, political and social dynamics.

Díaz (2003), highlights the curriculum as a multidisciplinary knowledge, emphasizes the importance of considering "the perspectives of curriculum as a lived process or as the hidden", which opens the possibility of diverse conceptual developments and allows for a deeper understanding of school culture" (p. 9).

Stenhouse (1991), the curriculum reflects a conception of knowledge and the process of education, implies an "educational vision and a psycho-pedagogical translation of the contents coherent with the epistemological position of the curriculum (p.14).

"The curriculum represents a problem of relationship between theory and practice, between education and society, its configuration and development encompass political, social, economic, administrative practices, production of didactic means, control of the educational system" (Kemmis, 1986, p. 22 cited in Gimeno, 2010, p.12).

Bourdieu and Gros propose guidelines for the elaboration and application of educational content. The first is to "prioritize modes of thinking with general validity and applicability, such as deductive, critical and reflective thinking" and to consider programs as flexible frameworks for action, interpreted by experts and teachers; the second is to "favor interdisciplinarity to avoid repetitions and disconnections in knowledge" and finally to carry out "periodic reviews of programs to incorporate scientific advances and social needs" (Bourdieu and Gros 1990 cited in Gimeno 2010, p. 284).

In relation to critical pedagogy, it is conceived as "a curriculum based on social transformation". This "sociocultural and political outlook allows developing in the student a critical understanding of social reality and commitment to its transformation, the structure of the curriculum is very open and flexible" (Apple, 1979; Giroux, 1988; McLaren, 1989 cited in Ortiz, 2014, p. 33).

The perspective of the critical curriculum at the Latin American level has an important place in the history of education in Colombia, which seeks the formation of critical and reflective subjects, in the words of Giroux (2007), forming critical individuals is necessary for teachers to be" transforming intellectuals" (Giroux 2007 cited in Flórez, et al 2018). Similarly, Giroux (2003), "argues that the teacher must reflect on the concept of emancipatory and transformative authority in terms of the ability to think and act critically with social transformation" (p.155).

Pinto (2008) proposes a sociocultural approach that involves the school, teachers and popular education, seeking to democratize social, economic and cultural relations. He identifies two approaches in Latin America: the comprehensive curriculum, influenced by Anglo-Saxon theory, and the critical comprehensive curriculum, which promotes a school cultural transformation based on popular education and consensus.

De Zubiría emphasizes the importance of the curriculum as a vehicle for bringing pedagogical principles and purposes to the classroom environment. For him, this process involves a continuous dialogue between theory and practice, reflection and action, pedagogy and didactic strategies. "The curriculum is the characterization of the various educational contexts in coherence with the educational intentions and purposes, it covers aspects such as planning, content sequencing, methodological strategies, didactic resources and evaluation" (De Zubiría ,2013, p. 77).

UNESCO defines curriculum as "a political and social agreement that reflects society and considers local, national and global needs, curriculum design is a topic of discussion from diverse perspectives such as policy, experts, practitioners and society at large" (Stabback, 2016, p.6).

Opting for a paradigm based on learning requires significant changes in the curricula of the institutions, the methodologies and didactics of the teachers and consequently in the teaching-learning processes, which imply innovating in relevant educational strategies that motivate reflection, autonomy, the development of critical thinking, teamwork, creativity, the search for peace and harmony with oneself, living beings and nature.

The integration of gamification in the curriculum of the José Martí school represents an educational innovation that addresses identified shortcomings in its pedagogical, didactic and epistemological approach. Gamification, by linking simulation, games, concepts, activities and projects, offers a different way of building knowledge. It is a growing tool in the educational field that seeks to transform the learning environment into a meaningful and fun space, where students are active agents of their educational process, allowing teamwork, self-evaluation and skills for the integral development of the student.

Method

The methodological design follows the principles of Hernández et al. (2014), focused on a plan to obtain information and solve a problem. This design is structured in five parts, which are detailed below:

Methodological Perspective

A mixed approach is adopted, i.e. quantitative and qualitative, integrating descriptive, explanatory and interpretative methods. In the qualitative aspect, document analysis is used to explore the curriculum of natural sciences and environmental education in Colombia, as well as the José Martí school. Individual and group interviews allowed to deepen the students' understanding of the concept of energy, the analysis used MAXQDA software.

On the quantitative side, surveys (pretest and posttest) were designed and applied to collect information about students' perceptions of gamification and energy, before and after the implementation of the learning strategy.

Inquiry methods include descriptive procedures based on observational data, interviews and surveys. The explanatory and interpretive method verifies the children's

construction of the concept of energy after the implementation of the learning strategy using gamification as an educational resource. The interpretative process focuses on the analysis of the curriculum in Colombia and in the José Martí school. As a result, a curriculum performance design is proposed that employs gamification as a learning strategy to build the concept of energy.

Context

This research corresponds to the research line called educational technology, educational innovation with ICT. Carried out at the José Martí school, located in the city of Bogotá in the locality of Rafael Uribe, neighborhood of Las Lomas. It is a formal educational entity, of an official, mixed nature, under the District's Secretary of Education that serves a population between the ages of 4 and 21 years old.

Study population and sample

Fifth grade elementary school students who attended school in the morning, together with a control group made up of students from the same grade who attended school in the afternoon. As for the population, a total of 47 students, 32 belonging to the morning session and 15 to the afternoon session, formed the control group. The study sample consisted of 32 morning students, of which 17 belonged to grade 501 and 15 to grade 502. The selection of the sample was by means of non-probabilistic sampling, which implies an "informal and casual selection process, characterized by using easily accessible individuals, depending on various fortuitous circumstances" (Bisquerra ,2012, p. 148).

Methodology

It was structured in two phases, with their respective stages.

Phase 1: Analysis of the curriculum issue in Colombia

It corresponds to a qualitative methodology with an exploratory inquiry of the documents, it analyzed the strengths and deficiencies present in the natural sciences curriculum of the José Martí school, in the documentary framework on the issue of the curriculum in Colombia.

Phase 2: Proposed action in the curriculum

After analyzing the results of phase I, we proposed the design, application and testing of the learning strategy using the gamified resource for learning the concept of energy. The methodology is mixed with techniques such as survey, observation, and in-depth focused and group interviews.

The above phases contain the following stages

Stage 1: Theoretical and methodological background

It corresponds to the issue of the curriculum in Colombia, the analysis of the institution's curriculum, the relevance of the concept of energy within the curriculum, gamification and learning strategies.

Stage 2: design and application of instruments.

Validated and ad hoc designed instruments were used to collect information. Among them are the survey directed to students, the focused and group in-depth interview, the field diary and the gamified resource based on a didactic unit to approach the concept of energy with children through gamification.

Stage 3: Data organization and analysis

It consists of the tabulation, verification, organization, representation and interpretation of the information obtained in each of the phases and stages of the research in order to establish the respective reflections and conclusions.

Stage 4: Assessment of the learning strategy and recommendations

The learning strategy is evaluated, corroborating the hypotheses and the research question, and recommendations for future research are established.

Techniques and Instruments

The techniques were: content analysis of documents, survey, interview and ethnographic observation. To ensure the validity of the data, the collection instruments were validated by experts, a control group and other previously validated instruments.

The questionnaire-type survey with a quantitative approach was used to assess the children's knowledge of the concept of energy and gamification. The design of the energy instrument was based on previous works such as those of Bañas (2001 and 2003) and the CLIS Project instrument (Brook and Driver, 1984) and research by Doménech et al (2001) on the teaching of energy in secondary education.

The qualitative methodology employed in-depth, focused, group interviews designed specifically for this research, as well as a field diary completed by the children in focus groups.

Variables

Independent*:* gamification as a learning strategy for the concept of energy enriches the curriculum in natural sciences
Dependent: children's learning of the concept of energy
Strange: the learning strategy that does not use gamification as an educational resource for the construction of the concept of energy*.*

Information Analysis

It refers to the analysis of the issue of the curriculum in Colombia and the educational institution, the learning generated in the students from the development and application of the learning strategy, using the gamified resource for the construction of the concept of energy, which allowed the performance proposal in the curriculum*.*

Ethical implications and limitations in working with students were considered. Informed consent was obtained from parents, ensuring that students understood the research objectives and procedures. Confidentiality and anonymity of personal data were prioritized. The research was conducted during the school year, ensuring an ethical and professional approach.

Results

The results of the documentary analysis, surveys, interviews and field diaries of the research are presented.

Documentary Analysis

After reviewing the state of the art of the curriculum and analyzing the educational regulations in Colombia in the area of natural sciences, it is observed that the concept of energy is present at all levels of formal education. This presence is confirmed in the curricular guidelines, the basic standards of competence, the curricular grids, the basic learning rights and the curriculum of the José Martí School. These documents offer an explanation of the theoretical, epistemological, pedagogical, sociological, didactic and psychological foundations for curriculum development in natural sciences and environmental education.

The potential of the institution's curriculum includes compliance with legislation and regulations, the structure by cycles, the organization in training fields, a focus on scientific competencies and the view of professors at all levels. However, significant shortcomings were identified, such as the lack of a clear epistemological position in natural sciences, the absence of strategies to teach the concept of energy, a more defined methodological orientation, the inclusion of technological tools and ludic strategies for learning, concrete evaluation criteria, detailing students' abilities, learning skills and motivation towards science.

Pre-Test and Post-Test Survey Results to Inquire About the Use of Gamification

The instruments were given to three fifth grade classes: two in the morning and one in the afternoon, the latter serving as a control group. The validation of the instrument was carried out with the 501st grade in the afternoon day in 2022, reliability was established by means of Cronbach's alpha coefficient ($\alpha = 0.73$) in a pilot sample of 15 students.

Regarding the results of the experimental groups of grades 501 and 502 in the morning day, grade 501 started with 17 students, with a majority of girls (53%) and boys (47%), the age distribution was between 9 and 12 years old. At the end of the year, enrollment was reduced to 15 students, with a slight change in distribution (60% girls and 40% boys) and the age range was from 10 to 13 years old.

Grade 502 started with 15 students, with a higher proportion of boys (66%) and girls (34%) and a similar age distribution; at the end of the year, the group was reduced to 14 students. These data provide an overview of the groups studied, which made it possible to analyze how these factors could influence the results of the research.

Overall there was a significant increase in teachers' use of gamification and an improvement in students' perception and understanding of learning through online games and gamification. Table 1

The results of the 501st grade experimental group showed a substantial increase in the use of gamification, with 100% of the students participating in gamified activities after the intervention, indicating the effectiveness of this strategy in teaching the concept of energy. In addition, students expressed a greater preference for the inclusion of challenges and rewards in the classes, demonstrating their liking for this methodology.

In the case of grade 502, similar results were observed, with a favorable response from students and an improvement in the perception and teaching practice related to gamification. These findings support the feasibility of incorporating gamification into the natural sciences curriculum at José Martí School.

Table 1

Implementation of gamification (experimental group responses)

Items	501		502	
	Pretest	Post test	Pretest	Post test
1.Your teachers use gamification in their classes.	12%	100%	34%	100%
2.Your teachers use games related to the subject they teach.	53 %	100%	46%	100%
3.Your teachers use online games to conduct their classes.	30%	100%	13%	100%
4.You consider that you learn through online games.	70%	100%	47%	100%
5. Did you know what gamification is?	6%	100%	34%	100%
6. Would you like your teacher to use challenges, rewards, competitions, challenges, etc. to explain a subject in a class?	71%	100 %	80%	93%

Note. Percentage of affirmative answers

The results of students' responses in both experimental groups regarding gamification in the classroom show remarkable changes between pretest and posttest; students experienced a significant improvement in perception and experience with gamification as an educational strategy, although initially girls showed less knowledge about gamification, both expressed liking for online games as a teaching tool and showed interest in gamified strategies in class, such as challenges and rewards. In summary, an increase in students' perception and attitude towards gamification was observed, indicating a greater acceptance and understanding of this learning strategy.

The perception of students in the control group on the use of gamification decreased from 84% to 44% between pretest and posttest, the preference for games related to the topic and the perception of students in affirming that they learn through online games remains high (73%). However, understanding of the concept of gamification decreased significantly, possibly to traditional teaching by teachers. Despite this, the preference for challenges and competitions in the classroom remains high, supporting the significant impact of the gamification-based learning strategy.

Results of the Pretest and Posttest Survey to Inquire About the Concept of Energy

In question one of the instrument, most of the students in grades 501 and 502 associated energy with household appliances, reflecting their presence in everyday life; for them, the word "explosives" has nothing to do with the idea of energy. However, after the application of the gamified learning strategy, a significant change in associations was observed during the post-test, indicating a transformation in the students' conceptualization of energy.

After selecting the words the students had to form two sentences justifying their choice, the analysis of these sentences was based on the categories proposed by Varela et al (1995) in their research on the construction of the concept of energy, a gap was observed between the students' expressions and the scientific concept of energy,

especially in the associations with force, work and movement, the written sentences were related more to everyday aspects than to precise notions of physics, example: *"My mom has a lot of strength."*

In the post-test, students elaborated sentences closer to scientific principles (Table 2), this change suggests a conceptual understanding of energy, also supports the effectiveness of the didactic strategy, which supports the need for a revision of the natural sciences curriculum of the institution.

Table 2

Phrases related to the concept of energy (post test)

Categories	Representative phrases
1.Identification with the concept of work	- Energy is the capacity of bodies to produce changes, works and transformations.
2.Exclusive association of energy with motion	-The windmill needs kinetic energy. - The energy of motion is kinetic energy.
3.Energy as an ingredient or reservoir	-The battery has chemical energy - Chemical energy is found in food.
4.Functional idea of energy	- Electrical appliances are powered by electricity.

Note. The categories proposed by Varela et al. (1995)

The quantitative analysis used statistical algorithms, except for question thirteen, which was analyzed independently due to its open-ended nature and the mixed nature of the research (Figure 1). It was confirmed that the data follow a normal distribution using the Shapiro-Wilk test and the contrast coefficients. Hypothesis testing based on Student's t-statistic was used because of the sample size and the normal distribution of the data, which made it possible to compare means of two groups and determine significant differences between them.

The results showed a difference between pretest and posttest scores with a mean of 25.57 and 64.27 respectively, indicating a significant improvement, which focused on evaluating the children's performance with respect to the construction of the concept of energy through gamification. Hypothesis testing rejected the idea of equal mean performance before and after gamification implementation, supporting the alternative hypothesis suggesting that gamification improves performance in understanding the concept of energy (Figure 2).

Strong statistical evidence is shown to reject the null hypothesis, indicating a significant difference between the sample means. The extremely small value of p (statistical measure indicating the probability of obtaining a result equal to or more extreme than the observed one) strongly supports this decision at a significance level of 5%, there is a low probability of making a type I error.

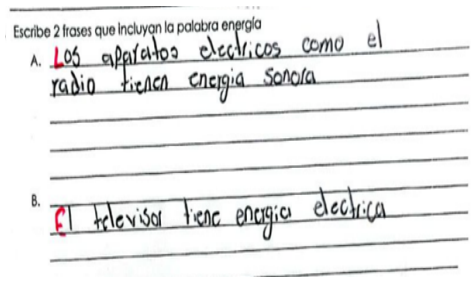
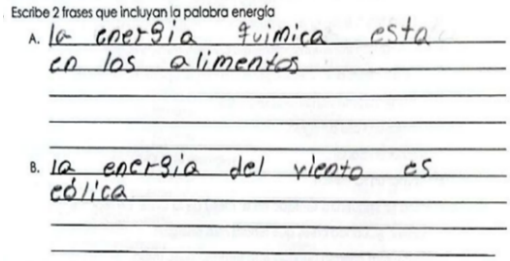
The critical region for a two-tailed test is found at values -2.048 and 2.048, with a sample of 29 students and a t-value of 12.73, the null hypothesis is rejected when finding an absolute value of t greater than 2.048. In conclusion, the results support the hypothesis of the study, indicating that learning strategies that incorporate gamification as an

educational resource enrich the natural science curriculum and lead to the meaningful construction of the concept of energy by students.

No significant changes were observed in the identification of energy-consuming artifacts between pretest and posttest in both experimental groups. The most frequently mentioned appliances were the television, telephone and computer, indicating that students are aware of the importance of energy for their operation. This question is related to the understanding of the energy crisis, a topic addressed in the interviews and the gamified resource.

Figure 1

Evidence question 13

Danna	Alejandro
	

Note. Phrases written by students

Figure 2

Student's t-test

i	Puntos Pretest	Puntos Post test	di
1	42	75	33
2	42	67	25
3	42	67	25
4	50	42	-8
5	33	67	33
6	25	67	42
7	17	83	67
8	25	67	42
9	25	83	58
10	25	58	33
11	17	50	33
12	17	67	50
13	33	75	42
14	25	33	8
15	17	58	42
16	17	50	33
17	25	67	42
18	42	92	50
19	50	67	17
20	17	67	50
21	8	42	33
22	17	67	50
23	33	75	42
24	25	92	67
25	0	67	67
26	8	67	58
27	25	83	58
28	33	83	50
29	8	75	67
MEDIA=	μ_1 =25,57	μ_2 =67,24	$\bar{d}$ = 41,67
SD(σ) =	σ_1 = 12,73	σ_2 =14,50	S_d =17,63
VARIANZA=	163,35	203,03	310,88

Note. Pretest and posttest scores

The study compared the performance of the control group with the experimental groups, all subjected to the same statistical analysis, calculations with Student's t-test showed no significant differences in the average performance of the control group between pretest and posttest, without the implementation of the gamified strategy, the performance of the control group remained constant without significant changes in the construction of the concept of energy by the students during the period evaluated.

Results Focused In-Depth and Group Interviews

Students from both grades distributed in focus groups were interviewed and analyzed using the content analysis method, where words and phrases about learning the concept of energy and the application of gamification as an educational strategy were highlighted. Bardín (1996) was used as a reference for coding and categorization guidelines.

The category system resulting from the content analysis identified five main categories: learning the concept of energy, hands-on activities and experiments related to energy, sources of energy, importance of energy in everyday life, energy crisis and conservation measures, experience, opinions and participation in the gamified resource.

The results of the interviews highlighted the effectiveness of the gamified resource in facilitating the learning of complex concepts such as energy in a fun and participatory way. The children acquired significant knowledge about the importance and types of energy, as well as practical measures to conserve and save it in daily life, also to mitigate the energy crisis. They expressed a positive evaluation of the activities and games, highlighting their usefulness for learning in an effective and entertaining way.

Results Field Diary

They were essential in the process, allowing students to reflect on their experience and learning with the gamified resource, provided feedback on their concerns, expectations, self-evaluations and understanding of the situations presented. The students expressed in their journals the knowledge acquired and the difficulties in understanding certain concepts, such as nuclear energy and photosynthesis. Regarding assessment, they reflected on its contribution to learning and highlighted the usefulness of gamification in the educational process.

Discussion and Conclusions

This research delved into the conceptions of curriculum, gamification and energy at local, national and international levels, adopting an integral perspective of the educational process, focused on the interpretation of knowledge and its pedagogical adaptation, in line with epistemological positions such as that of Stenhouse (1991).

It was nourished by the ideas of authors such as Giroux, Kemmis and De Zubiría, who propose a curriculum that integrates culture, society, academia and history. It coincides with the position of UNESCO (2016), which considers it a political and social agreement reflecting a transformation of the teaching and learning of natural sciences.

He assumed the De Zubiría position, which emphasizes the "coherence between the curriculum and the contexts, proposing the sequencing of contents, selection of methodological strategies and alignment with general pedagogical principles and specific didactic strategies of the classroom" (De Zubiría, 2013, p.19).

Ortiz et al. (2018), state that gamification-focused curriculum design aims to maintain students' interest during the teaching process, thus encouraging participation and avoiding boredom. Along the same lines, Rodríguez and Mas Rubí (2024), Soto et al. (2024), and Zumba et al. (2024), support the benefits of gamification in the classroom, highlighting its impact on learning processes, creativity and curriculum. In addition, they point out that these activities can be effective teaching strategies for learning a variety of concepts.

Some critics of gamification "link it to behaviorism, arguing that it allows conditioning students' behavior through reinforcement or punishment" (García, et al. 2022, p.82). However, this research showed significant differences in overcoming this pedagogical model, the proposed game was based on a didactic unit based on the constructivist perspective of Sanmartí (2002), in line with the problematic didactics of Bravo (2002), which was considered fundamental in curricular planning and learning by students about the concept of energy.

The successful implementation of the proposal at the institutional level is a model for other educational institutions, the use of gamification in the teaching of scientific concepts, such as energy, is an innovative practice with the potential to transcend geographical and cultural boundaries. Research offers new opportunities to improve the educational process and curriculum in diverse global academic communities.

The objectives were met by designing a proposal for action in the natural sciences curriculum of the José Martí school, focused on gamification and learning the concept of energy. This proposal facilitated the understanding of a complex topic and its implementation provided a dynamic and fun learning experience for students, supported by the results and aligned with previous research, in addition, the hypothesis raised was confirmed, evidencing that the integration of gamification in the teaching of natural sciences enriches the curriculum and promotes a meaningful understanding of the concept of energy.

It addressed a deficiency in the curriculum of the José Martí School related to the absence of a clear epistemological position on the teaching of natural sciences, which was overcome by enriching the curriculum with a didactic strategy based on gamification and the learning of the concept of energy. The strategy focused on the design, implementation and evaluation of a gamified resource, integrating constructivist and socio-constructivist epistemological postures that recognize the learning process of students and their social and cultural context.

For Soto (2019), energy is an essential and complex concept in science curricula, necessary to promote scientific thinking. This research had the potential to develop scientific skills in students, fostering a scientific and technological culture in the institution, the educational strategy not only addressed curricular deficiencies, but also promoted participatory, contextualized and meaningful teaching, fundamental aspects for curricular planning.

It evidenced the construction of the concept of energy among students, highlighting the evolution from vague concepts to a more solid understanding of scientific principles, student testimonials reveal significant learning, indicating that classes became more interesting and fun. They incorporated natural science terms into their vocabulary, supporting the effectiveness of this proposal and the idea of transforming the natural science curriculum through gamification.

The results of the two-tailed t-test showed significant statistical evidence to affirm that the population mean differs from the hypothesized value, this supports the hypothesis put forward in the research project and suggests that learning strategies that incorporate gamification enrich the natural science curriculum and lead to a meaningful construction of the concept of energy.

It is concluded that gamification as a learning strategy had a positive impact on the transformation of the natural science curriculum, highlighting the participation of children in activities such as completing the field diary, conducting experiments and participating in games of the gamified resource.

Students expressed sensitivity to the conservation of energy sources, understanding of the energy crisis, results that highlight the potential of gamification to enrich education and foster learning of complex scientific concepts.

Students enjoyed learning through the game, highlighting the autonomy, joy, and valued the achievement of achievements, points, medals and rewards, expressing that the gamified resource facilitated the understanding of theoretical and practical aspects of energy, some opinions are shown below:

Linda: "*In that way, I learn and understand about energy, its types, transformations. The class becomes fun."*

Helen: "*There are cool things like alphabet soup, workshops, experiments, hangman game, which give us points and badges.*

The remarkable performance of students in the use of gamification as an energy learning strategy, supported by statistical evidence, demonstrates the effectiveness of interactive and playful learning strategies in the classroom, provides teachers with didactics to improve their educational practice. The data show a significant change in the perception and adoption of gamification in the educational environment, which contributes to the transformation of the natural sciences curriculum and the understanding of the concept of energy, findings that serve as a basis for pedagogical and curricular adjustments in educational institutions and future research.

Among the limitations identified, it is worth noting that the learning strategy was only implemented during one school year; it is necessary to carry out a follow-up over several periods and with different populations to verify whether learning strategies involving gamification in the teaching of natural science concepts maintain the impact achieved in this research.

Finally, as a prospective, the results suggest that gamification is a promising strategy to enhance learning, especially in teaching the concept of energy. These results open up opportunities for educators to integrate gamification into the curriculum, which could facilitate the understanding of complex scientific concepts and enrich the educational process.

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LEARNING STRATEGIES AND ACADEMIC PERFORMANCE IN COMPUTER ENGINEERING STUDENTS FROM THE BENGUELA HIGHER POLYTECHNIC INSTITUTE (ANGOLA)

ESTRATEGIAS DE APRENDIZAJE Y RENDIMIENTO ACADÉMICO EN ESTUDIANTES DE INGENIERÍA INFORMÁTICA DEL INSTITUTO SUPERIOR POLITÉCNICO BENGUELA (ANGOLA)

Roberto Cruz Acosta[1]
Higher Polytechnic Institute Benguela, Angola
(cubaneox72@gmail.com) (https://orcid.org/0000-0002-7282-8857)
Yáskara Arafet Zaragoza
University of Artemisa, Cuba
(yaskaraarafet@gmail.com) (https://orcid.org/0009-0005-5173-4906)
Maylin Herrera López
University of Artemisa, Cuba
(lopezmaylin2022@gmail.com) (https://orcid.org/0000-0003-0747-3014)

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ABSTRACT

The purpose of this research study was to analyze the relationship between academic performance and learning strategies, using a descriptive design with a non-experimental and correlational approach. To achieve this, several activities were carried out, based on the fundamental theoretical concepts of learning strategies and academic performance. In addition, non-probabilistic sampling was used and a survey was applied through a questionnaire. The results obtained indicate, with a reliability level of 95%, that it is a fact that, between learning strategies and academic performance, there is a significant relationship for computer engineering students at the Polytechnic Higher Institute of Benguela (ISPB). This research has allowed us to precisely identify how obtaining, perceiving, restoring and supporting the information process are closely linked to the academic performance of students. These findings provide a solid basis for developing effective and personalized pedagogical strategies that promote better academic performance in students, while showing evidence of the importance of implementing appropriate learning techniques, focused on promoting better academic performance of students. providing relevant information that can be used to improve teaching and learning processes.

[1] Corresponding author.

Palabras clave:
estrategias, enseñanza, rendimiento académico, aprendizaje, estilos de aprendizaje

RESUMEN

El propósito de este estudio de investigación fue analizar la relación existente entre el rendimiento académico y las estrategias de aprendizaje, mediante un diseño descriptivo con un enfoque no experimental y correlacional. Para ello se realizaron varias actividades, basadas en los conceptos teóricos fundamentales de las estrategias de aprendizaje y el rendimiento académico. Además, se utilizó un muestreo no probabilístico y se aplicó una encuesta mediante un cuestionario. Los resultados obtenidos indican, con un nivel de fiabilidad del 95%, que es un hecho que, entre las estrategias de aprendizaje y el rendimiento académico, existe una relación significativa para los estudiantes de ingeniería informática del Instituto Superior Politécnico de Benguela, de Angola (ISPB). Esta investigación ha permitido identificar de manera precisa cómo la obtención, percepción, restauración y respaldo al proceso de la información están estrechamente vinculados con el desempeño académico de los educandos. Estos hallazgos proporcionan una base sólida para desarrollar estrategias pedagógicas efectivas y personalizadas que promuevan un mejor rendimiento escolar en los estudiantes, a la par que muestra evidencias de la importancia de implementar técnicas de aprendizaje adecuadas, enfocadas en potenciar un mejor rendimiento académico de los estudiantes, brindando información relevante que puede ser utilizada para perfeccionar los procesos de enseñanza y aprendizaje.

Introduction

The education system in Angola has shown great concern for strengthening the effectiveness of education in recent years. In this regard, significant efforts have been made to identify the factors that are associated with such quality. One of these factors is the application of learning strategies in academic performance in the field of computer engineering. It has been observed that most students do not make use of appropriate methods to achieve meaningful learning, which affects their academic performance.

Learning difficulties are another factor influencing the academic performance of students in the Engineering Department of the Instituto Superior Politecnico de Benguela (ISPB). Therefore, this research aims to establish the existing connection between learning strategies and academic performance in students of the Computer Engineering course in the Engineering Department of the ISPB. We seek to understand how the use of different learning strategies can influence students' learning style and, in turn, their likelihood of poor or successful academic performance in the field of computer engineering. These findings will be valuable for making decisions in order to improve teaching results and, therefore, the quality of the graduates of this career.

The relevance of learners developing "learning to learn" skills has been highlighted by Nisbet and Shucksmith (1986) and Beltrán (1996). These authors emphasize the need for students to be self-aware of their learning process and to use strategies that allow them to achieve their educational goals. Monereo (2001) also stresses that the use of strategies implies that students are able to evaluate, guide and adjust their own performance to achieve effective results.

In the Computer Engineering course of the ISPB, a worrisome decrease in the academic results of the students has been detected. According to the data obtained in the 2021-2022 diagnostic test, only 16% of students achieved a satisfactory level, while an alarming 64.1% are at initial levels or in the process of development. In addition, in the tests applied, the results show 15.8% of students at a satisfactory level and 65.3% at initial levels or in process. The ISPB is facing an educational challenge due to the combination of the Traditional and Behaviorist pedagogical models. In the traditional model, teachers play a central role in the educational process, being the ones who predominantly transmit knowledge. This is aggravated by the lack of contextualization of the curricula. The contents are presented in isolation, without establishing connections with reality or practical application. For example, in the Computer Engineering course at ISPB, students may learn the theoretical principles and concepts of programming, but have difficulty understanding how to apply them in everyday situations or real problems. This was confirmed by observations made in the programming classrooms, which showed that students learn the basics of a programming language, but may have problems in using this knowledge to solve practical situations or develop real applications.

It is important to note that programming in Computer Engineering is a discipline that requires a practical and applied approach. Students should be able to apply theoretical concepts in solving concrete problems and developing technological solutions.

In this context, the need arises to design learning and academic performance strategies for ISPB Computer Engineering students that address this problem. It is essential to implement pedagogical strategies that foster greater awareness of the students' own learning process. In addition, the lack of motivation and the inadequate use of study techniques and strategies make it difficult for students to consolidate what they have learned. To this end, it is imperative that teachers design innovative pedagogical strategies that motivate students to improve their academic performance.

Learning Strategies

Several researchers have defined the concept of learning strategies in different ways, but all agree on their fundamental importance for the learning process. According to Beltrán (1996), learning strategies are tools that facilitate the acquisition and development of processes that promote learning. These strategies are directly related to the quality of students' learning, as they allow them to identify and diagnose the causes of their academic performance, whether high or low. Strategies are rules and operations that enable learners to make appropriate decisions at the right time to facilitate their learning. They also promote autonomous and independent learning, transferring the learning management from teachers to students.

Sosa (2022) points out that learning strategies are cognitive tools used by students to facilitate knowledge management processes. These strategies involve organizing information, making connections and associations, planning and monitoring study, practice and repetition, and seeking additional help and resources. By using these strategies effectively, students can improve their understanding, retention and application of knowledge.

Betancourt, Soler and Colunga (2020), state that, when it comes to learning strategies, the affective aspect, motivation and self-esteem of students are closely related. The emotional state of students can have a significant impact on their motivation and how they engage in the learning process. From the affective point of view, learning strategies should aim to generate positive emotions and a supportive and trusting environment. This is achieved by creating a safe and welcoming learning environment where students feel valued and respected. As for motivational strategies, it is important to awaken the interest and curiosity of the students towards the topic or content being addressed. This can be achieved by creating interactive, challenging and relevant activities that capture their attention.

Likewise Oseda, Mendivel and Angoma (2020) are of the opinion that learning strategies are behaviors and thoughts used by learners to influence their information encoding process. These strategies can be simple, such as underlining or memorizing, or more complex, such as associating prior knowledge for better comprehension. Its objective is to improve the retention and application of knowledge. It is important to note that learning strategies are not innate, but can be developed and refined with practice. Students should identify the most effective strategies for them and practice them consistently to optimize their learning process.

The authors García, Alfredo and Ponte (2021), in their research "Learning Strategies", analyze the national educational reality and reveal that the level of understanding of information management and the use of learning strategies are fundamental for students. Learning strategies are used when students demonstrate a continuous ability to adapt to changes and variations that occur during the activity, with the ultimate goal of achieving the objectives efficiently. In this way, students minimize the number of errors before finding the solution to the problem, ensuring that their answer is correct after a minimum number of attempts. In addition, autonomous learning is a process that allows students to regulate what they learn and to be aware of their cognitive and socio-affective processes. It focuses on forming individuals capable of solving specific aspects of their own learning, encouraging them to question, review, plan, control and evaluate their own learning to learn action. We seek to imprint significant learning by using appropriate and motivating strategies in the learning process.

The author Betancourt-Pereira (2020), in his study "Learning Strategies and Academic Performance in Executive Secretarial Students, Machala - Ecuador", aimed to investigate the relationship between learning strategies and academic performance of Executive Secretarial students. This was a descriptive research with a correlational design, in which the population and sample consisted of 25 students. To measure the correlation between both variables, Pearson's relationship coefficient was used, which yielded a correlation value of 0.846, thus demonstrating a significant relationship between learning strategies and academic performance. This study provides evidence of the importance of learning strategies in the academic performance of Executive Secretarial students, suggesting the relevance of promoting and developing these strategies to improve academic outcomes.

On the other hand, Olmedo (2020), in his article "Learning styles and school academic performance from the cognitive, procedural and attitudinal dimensions", presents an educational research whose main objective is to evaluate the correlation between learning styles and academic performance in the cognitive, procedural and attitudinal dimensions in the subjects of mathematics, natural sciences, humanities and technology and computer science of tenth grade students in three educational institutions in Bogota. The study proposes educational strategies that contribute to the teaching-learning process. The results of the quantitative analysis revealed 63 significant relationships and implications, to varying degrees, of the 84 possible variable crossovers. These relationships were established by considering learning styles and academic performance in the subjects investigated. These findings provide inputs for the design and development of didactic strategies that take into account learning styles for the benefit of academic performance. The design of lines of action for the development of the proposed strategies according to the learning style is also suggested.

The author Fernando, A (2020), in his research The academic performance of the cadets of the Academy of the National Air Force of the Republic of Angola (AFAN), focuses on analyzing the educational reality and the training of the AFAN cadets, in order to improve their competent professional performance, in accordance with the needs of the Angolan Armed Forces and society in general. The result of this research is important because it evidences the need to implement changes in military disciplines and the relevance of a didactic strategy oriented towards developmental learning with a professional approach. This will contribute to improving the academic performance of AFAN cadets.

Quality of learning in the special school in Angola from teacher preparation, by Carlos, Carrera and Perdomo (2020), is a research whose results allowed to diagnose the needs and potentialities of teachers and to propose a pedagogical strategy. These results are evident in the preparation of teachers to provide quality education to all students with special educational needs. The relevance of this strategy and the satisfaction of the commitments demanded by Angolan society to the school as an educational institution are evident.

The research of Oseda, Mendivel and Angoma (2020) shows that learning strategies also promote metacognition Oseda, Mendivel, and Angoma (2020) evidences that learning strategies also promote metacognition, i.e., students' ability to reflect on and monitor their own learning process. By using strategies such as planning, review, and self-reflection, students can assess their progress, identify areas for improvement, and adjust their study approaches accordingly. It is important to note that learning strategies are not universal, and what works for one student may not work for another. Therefore, it is

essential that educators provide guidance and support for students to develop and use effective learning strategies that are adapted to their own needs and learning styles.

Learning strategies are cognitive and behavioral tools that students use to facilitate their knowledge acquisition process. These strategies are related to academic performance, as they can influence the way students approach study and the assimilation of the topics to be covered. However, it should be taken into consideration that academic performance can also be affected by other factors, such as motivation, educational environment and individual skills. Therefore, it is advisable to continue to deepen this study in order to better understand the relationship between learning strategies and academic performance, and thus develop effective pedagogical interventions.

Academic Performance

Academic performance is a key factor in university research. The relationship between student learning strategies and academic performance has been studied. To better understand this concept, it is important to refer to several definitions of academic performance.

It is important to emphasize that academic performance is not only based on obtaining grades, but also on the ability to use the acquired knowledge in a meaningful way and apply it in different situations. In this way, academic performance goes beyond simple memorization and focuses on comprehension, critical reasoning and problem-solving skills. Talani and Branco (2021), point out that the study of academic performance involves the analysis of various factors that can influence it, such as the educational environment, the quality of teaching, student motivation, the learning strategies used and family support. These factors can interact in complex ways and affect academic performance positively or negatively.

On the other hand, Niemba and Almeida (2023), in the study "Student Adaptation in Higher Education (QAES): Validation of Assessment Instrument in Angola, validated the Questionnaire for use in research on the transition and academic adaptation of students entering Higher Education in Angola. Good coping skills can help students set clear goals, integrate into the academic environment, effectively manage study demands, maintain emotional balance, and establish positive social relationships. These factors, in turn, can contribute to better academic performance and prevent early dropout.

Terán and Schulmeyer (2022), in their study entitled Relationship between High School Academic Performance and College Academic Performance, found a moderate correlation between the grades obtained by students in college and the grades they had obtained in high school. This means that there is a relationship, although not a very strong one, between prior academic performance and university academic performance. However, it is important to note that this correlation was not significantly different between genders or between different types of schools. Despite these findings, it was concluded that school performance alone has limited predictive ability when considered as the sole predictor variable. This implies that university academic performance is influenced by factors other than school performance, such as motivation, dedication, study skills and adaptability to the university environment.

Quispe and Noriega (2022), in their article "Academic self-efficacy and school performance in adolescents", show that self-efficacy is positively related to the academic performance of adolescent students. Promoting and developing self-efficacy in students can be an effective strategy to improve their learning and academic performance.

Pretel (2022), in "Familias disfuncionales y su relación en el rendimiento académico de estudiantes del 2° grado de una institución educativa-Huancayo", states

that he found a significant relationship between family dysfunction and academic performance of second grade students. These results suggest that family dysfunction may have a negative impact on students' academic performance. It is important to take these findings into account in order to implement strategies to help improve the academic performance of students who come from dysfunctional families.

Suarez Pisacome, (2022), in his work "Significant learning and its impact on academic performance in 4th year GBS students at UE Emigdio Esparza Moreno, Babahoyo", highlights the importance of significant learning in the academic performance of students. The implementation of innovative pedagogical strategies and the creation of a climate conducive to learning are key to improving students' academic performance. In addition, the need for greater commitment and support from teachers and parents to achieve meaningful learning and better academic performance is highlighted.

Pincay-Ponce, De Giusti, Reyes-Cárdenas, Franco-Pico, Macías-Espinales and Quiroz-Palma, (2022), in their research "Data analytics of socioeconomic factors affecting school performance", highlight the importance of considering factors such as family economy, gender and students' social skills to improve academic performance. The support provided by parents in schoolwork, the learning environment at home, schooling, culture and authoritarianism also have a significant influence on academic performance. These findings highlight the importance of involving the family in the educational process and implementing strategies that promote a favorable environment for learning.

In the article "Factors influencing the academic performance of Acting students", by Pizarro Valenzuela, (2022), it is shown that highlight the importance of factors such as previous educational experience, the pedagogical skills of the teaching staff, the socioeconomic factor and psychoemotional well-being in the academic performance of students. The assessment of school performance, whether quantitative or qualitative, is related to a variety of factors that influence academic achievement. These factors may include socioeconomic status, family support, quality of teaching and pedagogical strategies used. A thorough understanding of these factors can help improve assessment and, ultimately, student academic performance.

Páez and Ramírez, (2022), in "Predictive models of academic performance based on characteristics of engineering students", show that data analysis is a fundamental tool to identify patterns and trends in academic performance. This allows us to identify relationships between academic performance and different factors that influence it. These data provide us with valuable information to improve the quality of education and make informed educational decisions. By examining large data sets, we can detect patterns of student behavior, enrollment trends, evaluate the effectiveness of academic programs and other key variables. Knowing these relationships, we can design more effective and personalized strategies to promote students' academic success.

Simaro, Tonelli and Varela, (2018) show in their study "Indicadores y fichas metodológicas para la medición del rendimiento académico mediato universitario mediato", that both performance indicators are related to each other. academic performance indicators, both GPA and career advancement, are related to and affected mainly by students' previous performance. Students with good academic performance tend to have higher GPAs and higher career advancement, while those with lower performance may have lower scores on both indicators.

These authors explore how optimism can influence academic performance and overcoming obstacles. They offer practical strategies to cultivate optimism and help students achieve their full potential.

All of these researchers have made important contributions to the field of motivation and personal development in the last five years. His works offer valuable insights and practical strategies for fostering motivation and self-regulated learning.

Methodology

Following the methodology proposed by Sampieri, Fernández and Baptista (2010), this study is framed within a quantitative approach. This criterion is distinguished by its focus on the collection and analysis of numerical data for the purpose of examining the properties and phenomena of a specific variable. In addition, it emphasizes the precise and independent measurement of the concepts or variables under investigation, relying on the systematic collection of information and its subsequent analysis to answer the research questions posed. It is also based on numerical measurement, counting and the use of statistical techniques to accurately establish patterns of behavior in a given population.

Likewise, the present research work is framed within the non-experimental-correlational design, characterized by the absence of manipulation of the study variables and by its objective of seeking the relationship between two events in a specific time (Hernández, Fernández and Baptista, 2014, p.93). In this sense, no manipulation of the study variables was performed and, in accordance with the stated objectives, we seek to determine the relationship between learning strategies and academic performance.

The assessment of the variable of learning strategies was carried out using the Questionnaire for the Evaluation of Learning Strategies of University Students (CEVEAPEU), an instrument that allows the collection of data for the purpose of using them in research and obtaining relevant information on the subject. investigated. This questionnaire consists of 88 items, organized into two scales, six subscales and twenty-five strategies. The items are designed using a Likert-type scale format, with five response options: strongly disagree, disagree, undecided, agree and strongly agree.

In the validation of the questionnaire, we worked with a sample of 242 undergraduate students of the computer engineering course at the ISPB Engineering Department. The results showed a chi-square value indicating that the correlation matrix is not an identity matrix, which confirms that the data matrix obtained is suitable for factor analysis. In addition, the KMO (Kaiser-Meyer-Olkin) index was calculated, which yielded a value of 0.572, admissible for this index, as it is greater than 0.5 for sample adequacy.

Cronbach's coefficient was used to establish the reliability of the questionnaire. The reliability results of the two scales were excellent, yielding a value of 0.75, while those of the subscales were good. Likewise, the reliability of the strategies was more than acceptable in the context of the research, considering the number of items of the factors/strategies.

The overall reliability of the questionnaire, composed of 88 items, was = 0.895, the validation results show that the questionnaire used is reliable, with adequate reliability indices in all scales and subscales. These findings support the use of this instrument to assess learning strategies in the research context.

One of the most important aspects of research in this field is to determine to what extent the use of the questionnaire can be predictive of academic performance. If learning strategies are considered to be the tools used to acquire knowledge, it is reasonable to assume that these strategies may have some effect on academic performance. In order to

evaluate the predictive validity of the questionnaire, two tests were carried out: correlations and multiple regression analysis. In these tests, the relationships between the learning strategies identified in the questionnaire and academic performance were explored, allowing us to obtain a clearer picture of the questionnaire's ability to predict academic success.

As for the results of the correlations, Pearson product-moment correlations were performed to analyze the linear association between the mean evaluations of the items of the scales and subscales of the questionnaire, and the mean evaluations of the grades obtained in five core/compulsory subjects. Positive correlations were found in all cases, being outstanding in most cases, excluding the Information Search and Selection subscale.

In relation to the multiple regression analysis, a multiple rating R coefficient of 0.403 was obtained, indicating a moderate magnitude between the dependent variable (academic performance) and the five predictors considered in the study. The coefficient of determination (R2) was 0.163, which means that the five predictors explain 15.3% of the variance in the ratings. The F value obtained in the ANOVA was 16.324, with a significance level of 0.001, indicating a good level of prediction of academic performance.

Results

Table 1

Relationship between the dimensions of Academic performance and metacognitive skills of students in the Computer Engineering course at the ISPB Department of Engineering

Metacognitive skills	Subtotal skills	
Technical dimension	Correlation Coef	-,230**
	Sig. (bilateral)	,001
	N	219
Spearman's Rho Spearman's Rho Methodical dimension	Correlation Coef	-,145*
	Sig. (bilateral)	,003
	N	220
Personal social dimension	Correlation Coef	,020
	Sig. (bilateral)	,770
	N	220

According to the established significance levels, it was found that the dimensions of academic performance that showed a significant relationship with Metacognitive Skills were the "technical dimension" and the "methodical dimension", as shown in Table 1. These findings led to the generation of Spearman's Rho coefficients. These coefficients indicate a low but significant indirect relationship between metacognitive skills and the aforementioned dimensions of academic performance. This result highlights the importance of metacognitive skills in the academic context and suggests that they can have a positive impact on improving the technical and methodical dimension of academic performance.

Table 2
Levels of learning strategies of students in the computer engineering course in the ISPB Engineering Department

Level strategies for learning	No.	%	% cumulative
Under	41	19,0	19,0
Medium	112	50,1	70,0
High	65	29,8	100,0
Total	220	100,0	

Table 2 shows the levels of learning strategies, considering the classification into three established levels. It is notable that the level with the highest percentage was the Medium level of learning strategies. This result highlights the importance and prevalence of learning strategies in this study group, suggesting an adequate level of engagement and focus in the knowledge acquisition process. These findings are relevant to understanding how students are approaching their learning and can provide valuable information for the design of effective pedagogical interventions.

Table 3
Academic Performance of the students of the Computer Engineering course in the Engineering Department of ISPB

RA Level	No.	%	% cumulative
Deficient	10	5,0	5,0
Acceptable	163	73,1	79,1
Good	45	20,7	100,0
Total	220	100,0	

Table 3 shows the academic performance reflected in the established levels, revealing that Acceptable academic performance obtained the highest percentage, reaching 73.1%. This finding highlights the importance of strong and satisfactory academic performance in the educational context. In addition, it suggests that students are achieving a level of performance that meets established standards and demonstrates a commitment to their learning. These results are significant for understanding the effectiveness of teaching strategies and can serve as a basis for the design of pedagogical interventions that promote even more outstanding academic performance.

Discussion

Based on the results obtained and with respect to the general objective of the research, which sought to determine the relationship between learning strategies and academic performance, it is concluded that the general hypothesis should be rejected. The results obtained do not evidence a significant relationship between learning strategies and academic performance in the students of the Computer Engineering course of the

ISPB Engineering Department. This is because the coefficient of profitability obtained through the Spearman's Rho non-parametric test is close to zero (0) and is not statistically significant ($p>0.05$).

Therefore, the scores of the study variables are not linked, indicating independence between them. This finding suggests that students with higher grades do not necessarily employ better learning strategies compared to those with lower academic performance. This represents an inconsistency with respect to the established theory and a more detailed explanation will be discussed.

Importantly, these results do not rule out the importance of learning strategies in the academic context, but suggest that there are other factors that may influence the academic performance of ISPB computer engineering students. These findings provide a basis for future research and can serve as a starting point for the design of pedagogical interventions aimed at improving students' academic performance in this specific area.

At the level of specific objectives, when seeking to demonstrate the relationship between learning strategies and the dimensions of academic performance (technical, methodical and personal-social), a significant absence of assessment between these variables was found. Likewise, when cross-referencing the dimensions of learning strategies and academic performance, no relationship was found between them either. It is significant to point out that learning strategies are conscious and intentional decision-making processes, in which students choose and coordinate the knowledge necessary to meet a specific demand or objective (Monereo, 2000). These strategies are also considered conscious or metacognitive, since they allow understanding.

According to these premises, it could be expected that university students who use more complex learning strategies have a more significant academic performance, and in turn, present better levels of self-esteem in the academic and family environments (García, Fonseca, & Concha, 2015). In other words, those who are more proficient in the use of learning strategies are also successful in their studies. However, our results indicate that strategies do not emerge on their own deliberately, if within the training process there is no encouragement in an intentional way to foster and extend the set of strategies in students.

Furthermore, if the evaluation processes continue to support the memorization or reproduction of content, as could be happening in our study sample, there is a lack of relationship between the variables analyzed.

It is important to note that mastering learning strategies does not influence or is not directly related to academic performance in students at the higher technological level. Therefore, academic performance would be linked to other aspects of the educational process that are not related to the learning strategies measured in the instrument used. This should be elucidated in future research with a methodological design appropriate to the intention of analyzing the hypotheses raised.

However, when continuing with the data analysis, it has been observed that when examining the subdimensions of learning strategies more specifically, "metacognitive skills" (affective, supportive and control) and "information management skills" (cognitive) present a weak but significant assessment with academic performance. This suggests that some aspects of learning strategies do relate to academic performance when analyzed at a more detailed level.

On the other hand, the findings of this study indicate that, even though a relevant connection between learning strategies in general and academic performance has not been identified, certain specific aspects of these strategies do have a tenuous but appreciable variation with academic performance. This implies that it is necessary to

deepen the analysis of the subdimensions of learning strategies to better understand their influence on student performance.

According to Villalobos (2012), learning strategies go beyond simple study habits. They have a specific purpose, such as solving academic or other related problems. These strategies include specific techniques, operations or activities. In order to achieve a better understanding of the problem identified, it is suggested to follow up and monitor the forms of evaluation used by teachers. In this way, valuable information can be obtained to help address the problem more directly. Creativity and imagination are powerful tools that allow us to find innovative and surprising solutions in the field of education.

Since there is no relationship between learning strategies and academic performance, then what factors are at work here? There are numerous studies aimed at identifying the elements that hinder students' academic performance. These factors can be grouped into two main categories: those related to social aspects and those linked to the educational center. One of the aspects that hinders the efforts of Higher Education Institutions (HEIs) to improve the academic performance of students is the diversity of needs among the different actors involved in the educational processes, as well as the context in which these processes take place. For example, Bronfenbrener's (1987) ecosystemic theory of human development points out that students are affected by changes in their immediate environments, and the link to their broader contexts.

Based on this idea, it has been concluded that the ecosystems defined by Bronfenbrener (1987) are decisive factors in students' academic performance. These ecosystems include factors such as the role of teachers, study programs, environmental factors in the classroom (microsystem); the seriation of subjects, the profession or trade of the parents, the family environment (mesosystem); the cost of the career, the place of study, health problems, the work situation (exosystem); and urban mobility, as well as the socioeconomic and political environment of the student (macrosystem).

Within these environmental factors, culture, technology and instructional practices have been found to have a significant influence on students' academic performance. According to Alexander (2006), there are several factors that affect academic performance, highlighting that motivation, family environment, quality of teaching and time dedicated to study are key factors that influence academic performance. These results support the initial statement and highlight the importance of taking these factors into account to improve student performance. This focus on environmental factors to improve educational processes is not exclusive to HEIs, but is also addressed by other institutions, which emphasize the social, economic and political dimensions.

In relation to the aspects of the environment that are linked to educational institutions, the literature mentions organizational management, educational policies, teaching strategies and loads, the number of students per group and evaluation criteria, among others. An important assumption in these studies is that student expectations toward the institution play a crucial role in their academic performance. According to Méndez (2011) and Paredes & Paredes (2009), several factors influence academic performance, such as organizational management, educational policies, teaching strategies and loads, students per group and evaluation criteria. These authors will provide results that support this claim.

Regarding organizational management, Méndez (2011) found that efficient and effective management in educational institutions can have a favorable effect on students' academic performance. This includes adequate resource planning, equitable teacher

deployment, and the implementation of policies that foster an environment conducive to learning.

In relation to educational policies, Paredes & Paredes (2009) highlighted that government policies and decisions at the institutional level can influence academic performance. For example, the implementation of educational support programs, the allocation of adequate resources and the promotion of equity in access to education can have a positive impact on academic results.

The use of effective pedagogical strategies is essential to promote meaningful learning. Teaching methods and assigned workload can affect students' academic performance. (Terán and Schulmeyer, 2022). An unbalanced workload can lead to stress and lack of concentration, while an insufficient workload can cause lack of challenge and motivation. It is the responsibility of teachers to find an appropriate balance in teaching strategies and loads to promote optimal academic performance.

The size of student groups is an important factor that can influence their academic performance; smaller groups favor learning and improve students' academic performance by allowing individualized attention, close interaction between teachers and students, encouraging active participation and collaboration among students. (Pincay-Ponce, De Giusti, Reyes-Cárdenas, Franco-Pico, Macías-Espinales and Quiroz-Palma, 2022). It is important to consider group size when designing educational strategies, as it can have a significant impact on the learning process and academic outcomes of students.

Finally, regarding evaluation criteria, Méndez (2011) highlighted that the way students are evaluated can have an impact on their academic performance. Clarity in assessment criteria, constructive feedback and formative evaluation can promote more effective and motivating learning, which in turn is reflected in better academic results.

Studies by Méndez (2011) and Paredes & Paredes (2009) support the assertion that organizational management, educational policies, teaching strategies and loads, number of students per group and evaluation criteria are factors that will affect academic performance. These results underscore the importance of considering these aspects to improve student performance.

All these studies show that the study of academic achievement and the factors that determine it is a complex field, since there are numerous aspects that do not depend directly on the student, but that must be considered when establishing educational strategies to promote the progress of all students.

On the other hand, the influence of personal factors on academic performance has also been investigated. Some researchers claim that the learner is solely responsible for his or her learning process and that his or her success depends on him or her. In this regard, several personal factors, both cognitive and non-cognitive, have been identified as influencing academic performance. Non-cognitive factors include motivation, interests, expectations and self-regulation, while cognitive factors include specific knowledge, study habits and academic background. Studies have identified motivation, emotions, learning styles, study habits and the importance that the student attaches to academic tasks as determinants of academic performance.

Conclusions

According to the results obtained, it was not possible to establish a relationship between learning strategies and the academic performance of the students of the computer engineering course in the Engineering Department of the ISPB, both at the

general level and in its specific dimensions. This suggests that these variables are not linked and are independent of each other. However, a relevant relationship, although weak and inverse, was detected between the subdimension of "metacognitive skills" and academic performance, especially in the technical and methodical dimensions.

Learning strategies are widely used by students in general, predominantly at a medium level (51.1%) followed by a high level (29.9%). This indicates that learning strategies are a strength in the teaching process being delivered.

In terms of academic performance, in general, students show good academic performance, with more than 90% of the sample obtaining acceptable or good levels. However, it is necessary to reinforce the learning strategies that obtained a low level, so that students can use them effectively in the courses and in their daily activities. This could be achieved through experimental research.

It is important to carry out correlational research that relates the variables under study to other educational indicators. This would provide both theoretical and statistical material that would allow alternative solutions to be proposed in case problematic indicators are found.

The results suggest that there is no direct relationship between learning strategies and academic performance in the context studied. However, specific areas were identified in which learning strategies could have a significant impact on academic performance, so further research is recommended to improve students' learning and academic performance, taking into account a wide range of factors, both environmental and personal. Understanding and addressing these factors is critical to improving the quality of education and promoting student academic success.

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COLECTIVE MATHEMATICAL ERRORS OF ELEMENTARY STUDENTS IN THE BILINGUAL SYSTEM IN HONDURAS

ERRORES MATEMÁTICOS COLECTIVOS EN ESTUDIANTES DEL NIVEL PRIMARIO DEL SISTEMA BILINGÜE EN HONDURAS

Rhina Guadalupe Briceño Rodríguez
International Iberoamerican University, Mexico
(rhina.briceno@doctorado.unini.edu.mx) (https://orcid.org/0000-0002-8983-2609)
Wladimir La O Moreno
Instituto de Estudios Superiores del Sureste, Mexico
(wladimir.moreno@unini.edu.mx) (https://orcid.org/0000-0002-8708-3333)

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ABSTRACT

Learning Mathematics constitutes one of the most prevalent lines of research in recent times in the field of educational sciences. The importance of this knowledge for life is a secret to no one, justified by its use in multiple social, business, academic tasks, among others. This research arises due to the inadequate knowledge that bilingual students at the primary level have about the errors they can make and those they make while learning mathematics, which lead the purpose of this scientific text: to qualitatively analyze the collective mathematical errors that second grade students make while learning mathematics at an Elementary bilingual school will help improve their learning. A non-experimental study of qualitative and descriptive design is conducted. To collect data, interviews are conducted, questionnaires and academic tests are administered for an intentional sample of 100 second grade students and their corresponding processing to achieve the intended objective. The reflections of the 6 second grade teachers complement the analysis of the errors that students make during the teaching-learning process they facilitate. As a result, it stands out that at a collective level, students make errors in the thinking processes to solve problems that require Algebraic Thinking skills, which, according to the teachers, is largely due to the low level of understanding of English as a second language that constitutes an educational requirement of the school.

Palabras clave:
errores matemáticos, errores colectivos, aprendizaje, reflexión, calidad educativa.

RESUMEN

El aprender Matemática constituye una de las líneas de investigación de mayor prevalencia en los últimos tiempos en el campo de las ciencias educativas. Para nadie constituye un secreto la importancia de este saber para la vida, justificado por su uso en múltiples tareas de carácter social, empresarial, académicas, entre otras. Esta investigación surge, a razón del inapropiado conocimiento que poseen los estudiantes bilingües del nivel primario de los errores que pueden cometer y los que cometen mientras aprenden matemática; lo que trajo como propósito el

desarrollo de este texto científico: analizar cualitativamente los errores colectivos matemáticos que cometen mientras aprenden matemática los estudiantes de segundo grado del nivel básico de un centro educativo bilingüe para la mejora de su aprendizaje. Se realiza un estudio no experimental de diseño cualitativo y descriptivo. Para la recolección de datos se realizan entrevistas, se administran cuestionarios y pruebas académicas para una muestra intencional de 100 estudiantes de segundo grado y su procesamiento correspondiente para dar cumplimiento al objetivo previsto. Las reflexiones de los 6 docentes de segundo grado complementan al análisis de los errores que cometen los estudiantes durante el proceso de enseñanza aprendizaje que ellos gestionan. Como resultado, sobresale que a nivel colectivo los estudiantes cometen errores en los procesos de pensamiento para la resolución de problemas que requieren habilidad de Pensamiento Algebraico; lo cual, según los docentes, se debe en gran medida al nivel bajo de comprensión del inglés como segunda lengua que se instrumenta como exigencia educativa del centro educativo.

Introduction

Teaching and learning mathematics have been a line of research that has proliferated over time; there have been multiple attempts by teachers, managers and families to make the study of this science a problem that is already a problem in the diversity of contexts and nations. However, the teaching and consequently the learning related to this science is still far below international standards, which defines where academic efforts should be directed by all those involved in the education of children, adolescents and young people.

According to Rojas (2020), the educational system in Honduras has been no exception, as it has faced significant historical and structural obstacles, resulting in a deficit in the development of essential skills for the country's progress. The inadequate provision of efficient educational services presents a major obstacle for the Honduran public education system in terms of its main product for society: students who only possess outdated knowledge of the subjects tested.

The findings of the standardized tests in Mathematics and Spanish (reading) of students in the first, second and third cycles of basic education on a global scale highlight a remarkable situation within the Honduran educational system. This challenge refers to the main outcome that the system intends to provide to society, i.e., students who have inadequate learning levels and possess only a minimal understanding of the tested subjects. The current state of stagnation requires the implementation of several initiatives aimed at improving children's academic performance within the national primary education framework (Rojas, 2020).

In the process of searching for solutions we found that: "Research conducted in recent years has shown the importance of focusing attention not only on students' correct answers, but also on the errors they make" (Socas, 2007, p. 20). Additionally, there are consistent error patterns at two levels: at the individual level, where people exhibit a high degree of regularity in their approach to solving similar exercises and problems, and at the collective level, where individuals make similar errors in certain phases of their learning (Rico, 1995).

On the other hand, "We speak of error when the student performs a practice (action, argumentation, etc.) that is not valid from the point of view of the school mathematical institution" (Godino et al., 2003, p. 69). Consequently, identifying and analyzing the collective errors of bilingual students in order to correct these difficulties, which form the scaffolding of knowledge for learning mathematics, is a good starting point for improving the quality of education.

According to Socas (1997), students' errors due to the complexity of mathematics encompass the acquisition of concepts and application of mathematical procedures. The "knowing" and "doing" of mathematics go hand in hand in the process. The present difficulty becomes a major obstacle to learning and, if not identified early during the primary level, can become entrenched over time. In this regard, Hernández-Suárez et al. (2017) state that many students who have trouble learning basic concepts and managing them find it difficult to advance in their education.

Errors are inherent to the mathematical learning process of students. Errors are empirical information that we constantly encounter in the teaching and acquisition of mathematics; they form an enduring component of these processes. Since the main objective of mathematics teaching in the educational system is to ensure that all students acquire a thorough understanding of the subject, it is clear that any incorrect answers or solutions to the questions posed are considered an indicator of significant deficiencies and shortcomings in the achievement of this objective. For this reason, the analysis of

mathematical errors is an important topic in Mathematics Education, since its historical trajectory has been marked by diverse approaches and interests (Kilpatrick et al., 1998).

In addition, according to Kilpatrick et al. (1998), with the increase in popularity of mathematics classes in recent years, people in our country are once again interested in studying and investigating the mistakes children make in school. "However, since recent times, there has been considerable progress in mathematics education research, and there is a growing interest in achieving a clear scheme of interpretation and prediction of errors and misconceptions" (Kilpatrick et al., 1998, p. 83).

"Studying and analyzing errors made by students has recently emerged as a major line of study and research in Mathematics Education, with considerable implications for much of the fields of study in our area" (Kilpatrick et al., 1998, p. 85). For the author, there are recent studies and researches related to errors in mathematics learning that mention studies dedicated to the curricular treatment of errors including works dedicated to the didactic organization of mathematics teaching that include errors as a relevant data. Another line of study is related to teacher training and the observation, analysis, interpretation and management of student errors.

Socas (2011) cites his own work (Socas, 1997), to remind us of the different difficulties that students may face in learning mathematics the different difficulties that students may face during mathematics learning, which she mentions in five categories: a) Complexity of Mathematics; b) Thinking processes; c) Teaching processes; d) Students' cognitive development processes; e) Affective and emotional attitudes towards mathematics.

Difficulties due to the Complexity of Mathematics

According to Socas (1997), the complexity of mathematics encompasses the acquisition of concepts and application of mathematical procedures. The "knowing" and "doing" of mathematics go hand in hand in the process. The present difficulty becomes a major obstacle to learning and, if not identified early during the primary level, can become entrenched over time. In this regard, Hernández-Suárez et al. (2017) state that many students have trouble learning basic concepts and managing them. This makes it difficult for them to advance in their education.

A clear example is presented by Juarez and Lopez (2016) who concluded in their study that many students entering college carry bad foundation in Algebra, since they did some exercises and did not realize that they were fractions, so they did not follow the elementary school method of adding and subtracting fractions. Elementary school children beginning to learn fractions make the mistake of adding numerators and denominators. The same mistake was made by these college students.

On the other hand, Araya et al. (2018) state that abstraction and generalization in mathematics is a likely source of learning difficulties. This assertion is made in relation to students entering college and the challenges associated with mathematical content. By analyzing the mathematical material, it is possible to foresee the degree of potential difficulty it may present and to determine the factors that must be taken into account to facilitate its teaching. Sometimes the error is not due to a lack of information, but to the fact that the student uses knowledge that in some cases is valid, but in others is misapplied. This happens when the student uses knowledge that is legitimate in some circumstances, but not in others where it is misapplied.

Difficulties in Thought Processes

Difficulties in Thinking Processes refer when moving from one knowledge to another, either from one subject to another or one branch of Mathematics to another. In

this regard, Caballero and Juárez (2016) confirmed in their study analysis of algebraic errors among first-year students at a public institution in Puebla, Mexico that when students are presented with a variety of algebraic problems, they often rely on the arithmetic knowledge they have acquired in the past. This can make it difficult for them to adapt to the change from arithmetic to algebra, which in turn can cause them difficulties.

In practice, it has been observed that these difficulties are more evident when students move from one educational level to another. As a result of the teachers' reflections, they attribute it to the fact that, on occasion, in the previous course the students did not learn certain concepts that are necessary to move from one topic to another. These learning gaps create gaps that must be closed with mini-lessons and reviews of previous topics that serve as a basis for knowledge of new ones (Caballero & Juárez, 2016).

On the other hand, when content is taught superficially and with little opportunity to put learning into practice, it creates a problem for creating the connections necessary for learning. In this regard, Guizado et al. (2022) concludes that the development of mathematical thinking is crucial both for progress in the sciences and in everyday life; we frequently count, estimate, create, analyze, question, and guess; we always think about something or do it out of curiosity.

Mathematical thinking is a complex process; its development requires knowledge about the pillars that compose it: the first is related to numerical thinking of arithmetic processes. The second pillar is geometric thinking, which is characterized by processes related to the ability of movement, location and shape. The third pillar is metric thinking, which refers to scaled measurements to measuring instruments. The fourth pillar is random thinking, which includes the ability to manage data and probabilities, and the fifth pillar is variational thinking, which works with algebraic content related to the ability of equivalence, order and regularity (Guizado et al., 2022).

In a modern sense, we must recognize that mathematical thinking encompasses thinking about mathematical topics and advanced thought processes in a variety of contexts (abstraction, justification, visualization, estimation, and reasoning under hypothesis). This thinking, therefore, must operate on a complex network of advanced and basic concepts and procedures. These concepts are underpinned by practices(Cantoral et al., 2015).

Lozada and Fuentes (2018) in their study examining how problem-solving techniques can enhance the growth of mathematical reasoning and suggesting strategies for incorporating them into the classroom tells us that recently, there has been general agreement on the need to teach Mathematics to improve cognitive skills, beyond simply imparting mathematical concepts. The focus is shifting from developing problem-solving skills to improving critical thinking in problem solving. Many authors have suggested problem-solving methods, but there are limited concrete proposals to help teachers use these methods and heuristic resources to effectively implement problem-solving strategies that promote improved mathematical thinking.

Difficulties in the Processes of Teaching Mathematics

The cognitive development processes of students involved in learning are to know and analyze difficulties, obstacles and errors in learning Mathematics. And among the teaching aspects are to analyze and design ways and situations of teaching mathematical contents and to foresee their consequences. Finally, the evaluation of learning, which includes analyzing and designing situations to determine and assess the mastery of learning (Socas, 2011).

Following this idea, the didactic aspect equips teachers to design, elaborate, develop and evaluate the different curricular programs in order to be able to analyze, situate and sequence each of the content blocks. Teachers must also know and know how to use the resources available to them to adapt them to the learning needs of their students. In this sense, Barallobres (2016) highlights the importance of mathematical didactics and considers the contextual and institutional dimensions of mathematics learning as fundamental for the explanation of the learning phenomena of this discipline, thus giving meaning issues a central place; consequently, the identification of mathematical errors made by students will help the achievement of objectives associated with the mathematical education of students.

According to Pochulu (2009), after a careful examination and evaluation of the errors observed in students' work, he concludes that an important part of these errors stem from the teaching and learning processes of Mathematics, characterized by the following factors:

- Excessive reliance on algorithmic techniques or routines lacking theoretical foundations
- Use of insignificant rules as prerequisites for performing arithmetic calculations or solving equations
- Emphasis on algebraic concepts at the expense of practical problem-solving skills
- Presentation of disconnected and poorly integrated content, particularly in relation to other subjects
- Insufficient emphasis placed on cultivating skills related to critical interpretation of data and graph analysis
- Excessive reliance on visual representations that hinder the creation of conceptual understanding
- Excessive focus on numerical approaches to problem solving

Difficulties due to Students' Cognitive Developmental Processes

Cognitive processes are a factor that influences student competence in mastering mathematical concepts and skills. According to González-Nieves et al. (2016), studying Mathematics is a complicated way of learning that needs to be supported by timely neurobiological maturation. This neurobiological maturation should allow the student to reach a certain degree of cognitive development, which in turn facilitates mathematical learning. In that sense, it is imperative to take into account what is age-appropriate to teach. That said, learning expectations must go hand in hand with the intellectual capacity of students, especially in learning activities that require the use of critical thinking which at an early age is very limited.

According to Ariza et al. (2021), acquiring competence in mathematical problem solving is a fundamental and unbiased component of primary education. Problem solving has been considered part of students' higher cognitive ability, which has limited its use as a specialized subject for teaching and learning in research assessing how well mathematics is taught. The comprehension of arithmetic problems in primary education is influenced by the cognitive processes of primary school students, the textual characteristics of arithmetic problems and the specific levels of cognitive performance in text comprehension.

According to Ariza et al. (2021), the initial stage of development occurs between 6 and 7 years of age, specifically during the 1st and 2nd years of primary school. The first level of cognitive processing involves the ability to detect and understand local information such as places, characters and activities. It also includes the ability to replace

a term with a synonym, identify key words, search for supplied material expressly related to a topic, select data for a problem without superfluous data; understand the given and the claim(s) in given problems.

Second level (applicative): reformulating expressions; associating a problem with examples based on specific elements; paraphrasing the circumstances presented in the problem; choosing relevant facts in simple problems; forming transitive associations; condensing data using hyperonyms; determining the objective and repercussions of activities; inferring traits; evaluating attitudes.

The third phase of creativity involves abstracting the links between a topic and its illustration, creating graphical models for given problems, deriving meaning from inferences about parts and wholes, and coordinating equalities to solve difficulties. solving basic problems using graphs or counting; creating simple problems using equalities, illustrations, and visual diagrams.

Students' Affective Attitudes Toward Mathematics Learning

Affective and emotional attitudes toward mathematics are a common problem in students. The important thing to know is that the teacher has a great deal of influence on this issue. What is most interesting is that even students at older ages do not overcome this emotional challenge to mathematics. The good news is that students who can recognize their own mistakes can also demonstrate better academic performance (Juarez & Lopez, 2016).

It can be inferred that self-regulated learning is a strategy of great impact on students' academic performance. Self-regulated learning has been found to have a beneficial impact on student achievement at various educational levels, from elementary school through college. There is a positive correlation between a student's level of self-regulated learning and his or her academic performance. Conversely, there is a negative correlation between a student's low level of self-regulation of learning and his or her academic performance. Aside from academic performance, research has shown that self-regulated learning can improve students' motivation and self-confidence, leading to greater engagement in the learning process and better academic outcomes. The above findings are consistent with previous research on the impact of self-regulated learning tactics on school performance. Thus, to achieve superior academic performance, it is imperative to prioritize the implementation of self-regulatory learning strategies ((Fauzi & Widjajanti, 2018).

According to Pochulu (2009), teachers claim that students frequently read a sentence that is almost always incomplete and demands an immediate response. If they can't get the information in a few seconds, they immediately approach the teacher or a classmate who knows how to solve the problem. Gómez (1995) explains that this student's attitude is natural, since the teacher solves an exercise and presents the "clean" solution, without indicating the "draft" process by which the solution was reached. Consequently, the student believes that he must also find the solution "clearly" and is unaware that, in order to solve an exercise, he must have an adequate method or strategy, so he looks for shortcuts. These shortcuts divert you from the correct path and cause you to make mistakes.

On the other hand, Godino et al. (2003) states about the challenges in terms of student motivation, it is possible that, despite the fact that the class preparation procedure and the activities that have been offered are sufficient, the students may not be able to cope with them due to lack of motivation. This may be due to problems with each student's self-esteem or their own academic background. In relation to the affective response to mathematical errors, how teachers affectively project students' mathematical

errors influences how those students will feel when they make errors in the future (Barquero, 2023).

According to De la Osa (2016), students' attitudes and values are shaped by mathematics because they ensure solidity in its foundations, security in its procedures, and confidence in its results. All of this instills in children a conscious and favorable disposition to undertake actions that lead to the resolution of the daily challenges they face.

Therefore, for De Nicolás et al. (2016) in their study on the difficulties of students in teaching, recommend that it is important to carry out teaching, learning and evaluation processes that focus on the acquisition of skills and knowledge and try to improve affective and attitudinal factors. This is because the teacher's main job in the classroom is to help students improve their mathematical reasoning, their ability to form and solve problems, communicate their mathematical ideas, and see how the different parts of mathematics fit together.

Based on the results of one study, one can see the importance of the affective factor, which means that the student must be interested in mathematics, and all participants agreed that the role of the teacher is very important for this to happen (Barquero, 2023). To the above, it is important to add that students' lack of knowledge of primary mathematical information detracts from their self-confidence and is aggravated by their attitude towards arithmetic and their nervousness when solving problems (Nortes & Nortes, 2017).

Method

Study Design and Sample

The research design is non-experimental, qualitative and descriptive. The participants of this study comprised a non-probabilistic sample and a purposive sample of 100 students at the second-grade level at the elementary level with students between the ages of 8-9 years and 6 mathematics teachers. The institutional documents that evidenced the diagnosis of the educational center in the area of Mathematics and its relationship with regard to the management of students' collective errors were analyzed. Other instruments used were questionnaires that were previously reviewed by a group of experts for their required evaluation and approval. The questionnaires were used to interview teachers about their experience with the handling of mathematical errors for the analysis of these errors in the areas of numeration, statistics and algebraic thinking. The teachers' questionnaires are applied in Google forms format to collect qualitative information on the perceptions of students' collective mathematical errors and to analyze through the interviews, the handling of these errors by teachers and students. Student questionnaires are administered on paper for ease of completion. Statistical calculations and data analysis of the student and teacher surveys were carried out using the *Statistical Package for Social Sciences (SPSS)*, in the latest version 26. Finally, with the written academic tests, the students' collective errors were identified according to those that reflected the highest frequency. They were then analyzed according to the criteria of Socas (2011): Complexity of Mathematics, Thinking processes, Teaching processes, Cognitive development processes of students, Affective and emotional attitudes towards mathematics. Each academic test question validated by the iReady Math program (Curriculum Associates, 2020), corresponds to a standard from the Common Core U.S. Common Core standards in the following areas of mathematics: Numeration, Algebraic Operations and Statistics.

Research Objective and Hypothesis

The objective of the study was to qualitatively analyze the collective errors made by bilingual students during the learning of mathematics in a private bilingual school in Honduras, which guarantees, among its most innovative aspects, the improvement of educational quality. The following hypothesis was put forward as the hypothesis of the present study: Knowing the collective mathematical errors that students make during learning helps to improve their educational process during their stay at the private bilingual center in Honduras.

The independent variable was: The students' collective mathematical errors, which was analyzed in the collective mathematical errors identified in second grade students using the five categories proposed by Socas (2011) on the different difficulties that students may face during mathematics learning, which he mentions in five categories: a) Complexity of Mathematics; b) Thinking processes; c) Teaching processes; d) Cognitive development processes of students; e) Affective and emotional attitudes towards mathematics.

Study Participants

The sample for this study was simple purposive at the second grade primary level with the participation of 6 teachers and 100 students (6 teachers and 20 students from each of the 5 second grade sections of the Sampedrana International School).

The iReady Math program test was applied, which included a total of 12 problems and equations from the areas mentioned above. The sample was a group of 100 students in the second grade of primary education at the Sampedrana International School, of which 45 are girls and 55 are boys, and all of them were included in this study. The age range of second grade students is between 8 and 9 years old.

The second grade sections were chosen because the teachers have a highly qualified professional profile and have worked for the institution for more than 5 years. Also, they have actively participated in the changes in the improvement of Mathematics and work in an organized way and as a team they have expressed their desire to find real solutions to the current situation regarding the academic performance of their students.

Data Collection Instruments Used

Questionnaires, interviews and the academic test were used as research instruments for this research work. Questionnaires were drafted for teachers and students and included closed multiple-choice questions and some open-ended questions where they could express their reflections and were analyzed by the researcher. The questions were designed according to the 5 categories of Socas (2011) and were sent through a Google forms link that could be completed individually by each teacher participant. The questions were analyzed and approved by a group of experts and then administered and analyzed. The purpose of the questionnaires was to collect teachers' and students' perceptions of the errors they make in learning mathematics.

The researcher personally interviewed a purposive sample of at least 36 students who made errors on the academic test to obtain qualitative information about the collective errors students made on the Mathematics test. The 6 second grade mathematics teachers who teach the mathematics class were also interviewed. A purposive sample of students who made the collective errors on the academic test was selected to collect qualitative information to analyze the errors.

A second interview was conducted with the 6 teachers about their reflections on the students' mistakes in terms of the aspects that attracted their attention about the results of the academic test and, on the other hand, the questions that arose as a result of

the mistakes made by the students during the learning of Mathematics. Finally, what strategies do they use for handling students' mathematical errors by: Subject complexity, thought processes, cognitive development, teaching processes and affective attitudes of students (Socas, 2011).

The instrument called the i-Ready Math program diagnostic test validated by Curriculum Associates (2020) for second grade students was selected. The test consisted basically of a series of mathematical problems in English covering the first unit of the content block for Mathematics of the first bimester of second grade. The problems were organized by standard and the multiple-choice response required the student to reflect on the procedure he or she followed to arrive at the answer. The test was administered in English to 100 second graders at the primary level in groups of 20 students per teacher.

In the results of the diagnostic tests, the errors and successes per student were recorded for each question. Subsequently, according to the frequency of errors in each question, collective errors were identified and tabulated in bar graphs. Once the collective errors were identified, with the interviews of the students who made the errors, they were analyzed and classified according to the categories of Socas (2011).

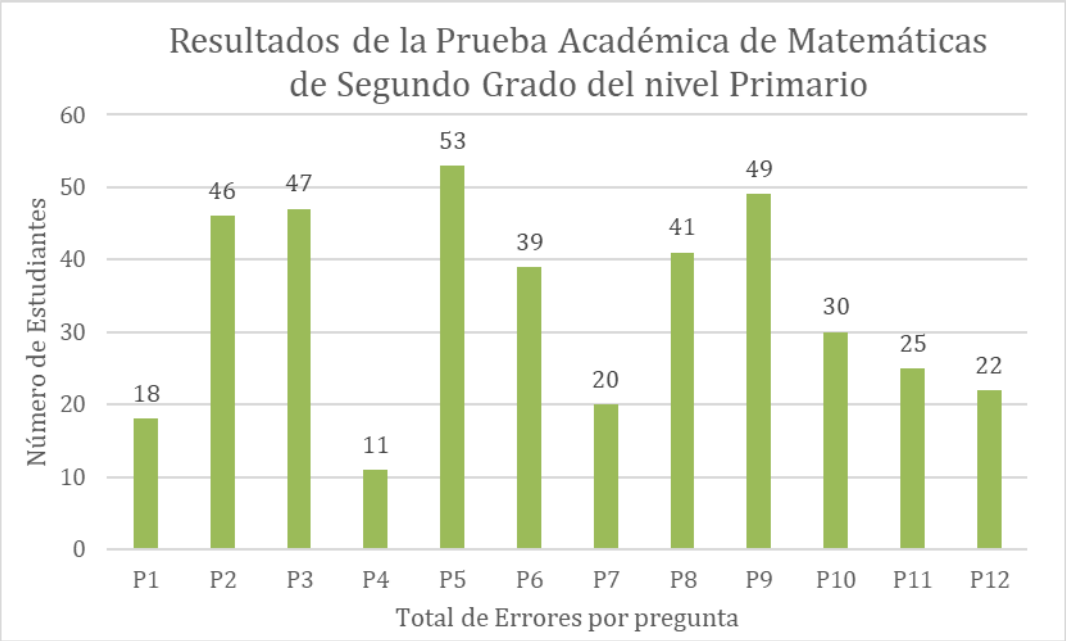
The data obtained after the application of the instruments were processed, organized, coded and statistically tabulated. The answers of the academic test were analyzed by question identified with the highest frequency of error, this was done through the elaboration of tables and graphs using the Excel sheets program and allowed us to answer the research questions. Statistical calculations and analysis of the teacher and student surveys were performed using the program using the *Statistical Package for Social Sciences (SPSS)*, in the latest version 26 at the time of the analysis of this research.

Results

The results of the academic tests showed that students presented mathematical errors in problems that required solving problems by interpreting bar graphs (P2), solving problems by applying the operation of addition or subtraction (P3), solving problems with mixed two-step operations (P5) and sums with double numbers (P9).

Figure 1

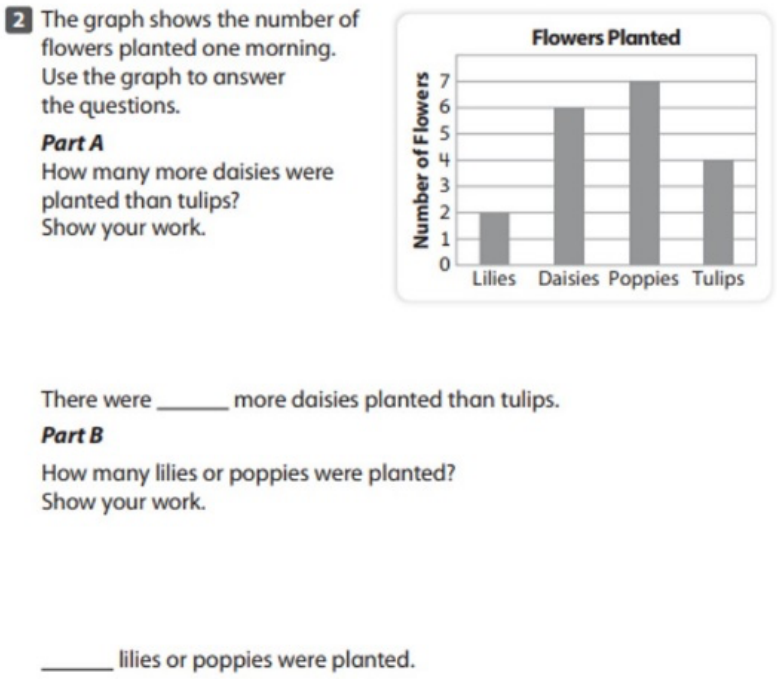
Mathematical Errors of second grade bilingual students according to academic test



In solving question number 2 (Q2) on problems with bar graphs and corresponding to the statistics standard (2.MD.D.10) of the Common Core standards, teachers read the problem aloud for students, then they read it independently to solve the problem related to the number of flowers planted in a garden. The problem includedó a bar graph representing the number and type of flowers that were planted in the garden. Among them were: Daisies and Tulips. To solve it correctly, students had to understand what the problem posed to them. After analyzing it, understanding what a bar graph meant, knowing how to read the bar graph and solving the problem using the information on the bar graph.

Figure 2

Question about Troubleshooting bar graphs (P2)



Note. Source: Curriculum Associates (2020)

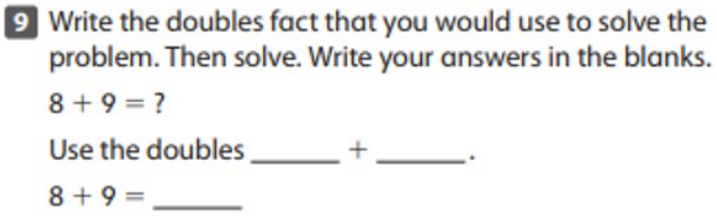
In summary, for the resolution of the statistics problem (2.MD.D.10) of the Common Core standards, the difficulties encountered by the students were the following: a) They could not read the bar graph to know how many flowers there were of each species b) Those who managed to read the graph were not sure what to do with the information c) They did not know if they should add or subtract d) The students used the wrong data to perform the operation. Faced with this difficulty, some left the problem incomplete and failed to get to the step of verifying their answer.

In solving problem 3 (P3) of the Operations and Algebraic Thinking standard (2.OA.B.2) of the Common Core standards, teachers read the problem aloud for students, then they read it independently to solve the problem related to an everyday life problem it stated: "Sean has 10 books. He has 6 more books than Kali. how many books does Kali have?" Teachers read aloud the problem, students listened attentively and understood it. Students read the problem again and independently to understand it. They then used the correct operation using the numbers they had to build the equation with to correctly subtract 10-6=4 and verify their answer. When interviewing the students who made mistakes in solving the problem, they acknowledged that: a) They could not understand the problem due to difficulties in reading and understanding English b) They stated that they were not sure of the operation to be used c) The others accepted that they had not checked their answers and made a mistake when performing the calculation.

On the other hand, collective errors were found in the resolution of question 5 (Q5) on 2-step mixed operations problems corresponding to the Operations and Algebraic Thinking standard (2.OA.A.1) of the Common Core standards that stated: "Jan places 14 markers on a table. 8 markers fall off the table. Riese puts 5 of those markers back on the table. how many markers are on the table now?". In this problem, students made the following mistakes: a) They wrote the equation, but incompletely, reflecting only one

operation instead of two. b) They wrote the complete equation, but applied the wrong operations. c) They also acknowledged not having checked their answers.

Figure 3
Question on double number addition strategy (Q9)



Note. Source: Curriculum Associates (2020)

Finally, in solving problem 9 (P9) of the Operations standard (2.OA.B.2) of the Common Core standards regarding sums with double numbers, students had to write double numbers as a strategy to easily add two large numbers to solve the problem. When interviewing the students who made the mistake, they stated that: a) They did not know the meaning of double numbers b) They did not understand the purpose of the problem with double numbers.

Table 1
Collective mathematical errors of second grade bilingual students

Problem	Errors found
Solving Problems with bar graphs and corresponding to the Statistics Standard (2.MD.D.10)	a) They could not read the bar graph to know how many flowers there were of each species b) Those who were able to read the graph were not sure what to do with the information c) They did not know whether to add or subtract d) The students used incorrect data to perform the operation.
Problem Solving for Operations and Algebraic Thinking standard (2.OA.B.2)	a) They could not understand the problem due to difficulties in reading and understanding English b) They stated that they were not sure of the operation to be used c) The others accepted that they had not checked their answers and made a mistake when performing the calculation.
Solving 2-step mixed operations problems corresponding to the Operations and Algebraic Thinking standard (2.OA.A.1)	a) They wrote the equation, but incompletely, reflecting only one operation instead of two. b) They wrote the complete equation, but applied the incorrect operations. c) They also acknowledged not having checked their answers.
Solving equations with double numbers corresponding to standard Operations (2.OA.B.2)	a) They did not know the meaning of double numbers b) They did not understand the purpose of the problem with double numbers.

As a result of the qualitative analysis of the students' collective errors according to the results of the academic test, the analysis of the types of collective

errors committed by the students follows. According to the above graph, it can be concluded that the four types of errors that were identified were: a) They used an incomplete equation b) They did not understand the concept of doubles or factor families c) They added or subtracted wrongly (precision error) and d) They applied the wrong operation to solve the problem (addition instead of subtraction or vice versa).

During the interviews with students in which errors due to incomplete equations were analyzed, they stated that: "The problem was very long, I thought we only had to solve with 2 numbers which is what we have always done in class" . On the other hand, others simply did not realize that there was a third number in the problem that had to be included in the equation and did not pay attention to the whole problem.

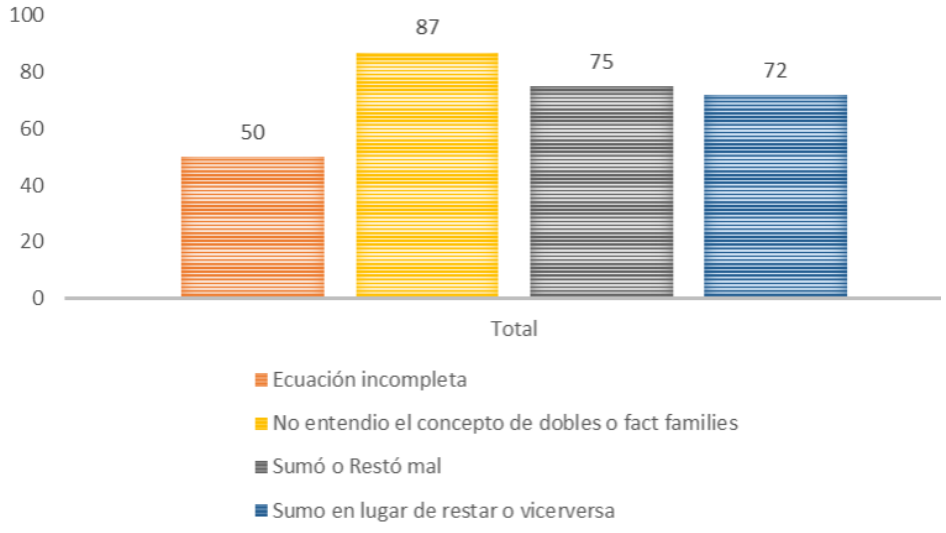
On the other hand, students who made mistakes on the question about factor families and double numbers admitted not remembering what the stated concepts meant, but admitted that the topic had been discussed in class. They expressed it as follows: "I don't quite remember what we learned because it was a long time ago, but I know we saw it in class."

Students who added or subtracted wrongly made calculation errors and admitted that: a) They did not check their answers b) They miscounted the drawings they used to solve the problem c) They solved mentally to finish the problem on time d) They were confident they could solve it mentally.

Finally, those who applied the wrong operation (added instead of subtracting or vice versa) acknowledged that: a) They did not understand the problem because of difficulty in understanding English b) Others confused the term "more" and thought they had to add. It should be explained that, in English, the word "more" means "more". However, the question: "How many more?" is used to ask "How many more?" and means that they should subtract.

Figure 4

Analysis of Collective Mathematical Errors according to the types of errors of second grade students of a Bilingual Educational Center



On the other hand, according to the teachers' perceptions, the four types of collective mathematical errors that students generally made were due to a difficulty in understanding the problem, which they attributed to a low level of understanding of English as a second language. The teachers' conclusion was derived from the fact that the problems were read in English and aloud by the teachers, and could be repeated for the students to better grasp the information. In conclusion, these errors were manifested as follows: 50% of the students left the equation incomplete, 87% did not understand the concept of doubles or factor families, 75% added or subtracted wrong (precision error) and 72% applied the wrong operation to solve the problem (addition instead of subtraction or vice versa). According to the analysis the teachers concluded that: "Transferring knowledge to new contexts is complicated for many students, especially when learning such a complex subject in a second language."

In this regard, Graus and Perez (2017) cited Radatz (1979) to refer to a classification of 5 categories of errors from information processing, among which he mentions errors due to language difficulties. This includes understanding concepts, symbols and vocabulary specific to mathematics that compares to learning a second language.

Finally, precision mathematical errors were the least frequent for second grade bilingual students at the school. They were able to solve the algorithms using visual strategies such as the number line, use of concrete or manipulatives and drawings.

Discussion and Conclusions

With the results found on the qualitative analysis of the students' collective errors we confirm our following hypothesis *H1= Knowing the collective mathematical errors that students make during learning helps to improve their educational process, during their stay in the private bilingual center in Honduras.*

We conclude that collective errors affect the learning of Mathematics of second grade bilingual students of an international educational center in different ways; being the most influential factor, according to the academic tests and with the complement of the teachers' opinions, the students' thinking processes due to the difficulty of transferring learning to new contexts.

In this regard, in the interviews with teachers, no major emphasis was identified on the variety of strategies to reinforce students' thinking processes. With the above, it is intended to achieve a teaching focused on lasting learning that is transferable and that empowers the student to identify and correct his or her mistakes independently.

We also concluded that knowing the collective mathematical errors that students make during learning helps to improve their educational process in a private bilingual school in Honduras, because the thought processes are a factor that influences the student's competence in mastering mathematical concepts and skills that are needed to learn the next grade or the next level.

According to the students surveyed, most students recognize that their teachers always know their mistakes, help them overcome them, explain well when they do not understand and teach them about the mistakes they can make. In this regard, it is indisputable that the teaching-learning process of Mathematics should promote student autonomy in learning, offering techniques to connect previous knowledge with new

concepts, facilitating the acquisition of new knowledge through personal experience and encouraging the development of mathematical reasoning (Lozada & Fuentes, 2018).

On the other hand, the resolution of mathematical problems reveals collective errors that require the ability of Algebraic Thinking. On this topic, Montero and Mahecha (2020) cite Blanco and Caballero (2015) who present a more contemporary viewpoint by introducing an integrated model of problem solving that encompasses affective and cognitive components. This model is organized in five distinct phases. Each stage of the process has a distinct purpose: cultivating understanding and control over one's cognitive reactions; identifying potential approaches that result in a resolution; implementing previously chosen strategies; evaluating responses; and ultimately, contemplating the task accomplished. It is important to note that this progression remains focused on the overall goal of enabling students to develop their own problem-solving methodology.

In relation to the students' handling of their mistakes and according to the surveys on students' perceptions, more than 50% of them perceive that they always know how to correct their mistakes. However, of these, only 19% admit that they never have trouble correcting them. The above confirms the problem of how second grade students handle mathematical errors, since although more than half of the students perceive that they always know how to correct their errors, very few admit that it is never difficult for them to correct them. That said, we need to create action plans in terms of teaching strategies that equip students with the knowledge and skills for identifying and dealing with error more independently to eradicate the limitation in the difficulty they perceive in correcting their errors.

As a result of the qualitative analysis of the students' collective errors with the academic test administered, the analysis of the types of errors made identified in the students as a result of the processes they followed for the resolution of these errors. In conclusion, the four types of errors that were identified both in the academic tests and their subsequent analysis with from the interviews conducted with the students who made the errors are:

- The incomplete equation
- They did not understand the concept of doubles or families of factors
- They applied the wrong operation to solve the problem (sum in instead of subtraction or vice versa)
- Wrong addition or subtraction (accuracy error)

Additionally and taking as a reference the criteria of Socas (2011) on the categories of mathematical errors of students and according to the perceptions of second grade bilingual students recognized the difficulty in understanding the new topic and remembering what they know to learn a new topic. These exercises require the transfer of learning from knowledge to practice for new contexts. Likewise, for teachers and according to their perceptions, they also identified it as a collective mathematical error of second grade bilingual students.

On the other hand, when content is taught superficially and with little opportunity to put learning into practice, it creates a problem for creating the connections necessary for learning. According to Rico (2008), when engaging in student-oriented learning tasks, it is crucial to establish the necessary conditions for analyzing the task requirements. This involves taking guiding actions, such as assessing existing knowledge, identifying gaps in knowledge, determining available data, understanding the task requirements, and designing a solution strategy. Reflection, as a component of cognitive processes, allows the student to develop an understanding of the methods used in an activity, as well as the strategies and results obtained.

For Pochulu (2009), we must also recognize that many of the mistakes that students make in mathematics are not due specifically to the topic being developed, but to a lack of prior knowledge that is transferred to the new content being addressed. In this regard, second grade teachers agreed that they were unaware of the level of depth with which second grade students were taught and reinforced in those topics when they were in first grade.

In relation to thinking processes, according to the results of the students' surveys, 67% of them perceived that sometimes they find it difficult to understand new words and 55% find it difficult to understand figures and symbols in Mathematics. To assist students in the use of academic language, language routines that promote understanding of the problem are suggested. Among those routines, repetitive reading is very effective in getting students to understand the problem by reading it 3 times, being intentional each time they read it. For example: The first reading your approach is to answer the question: What is the problem about, the second reading your approach is to answer the question: What are we trying to find? And the third question: what are the important quantities and ratios? (Curriculum Associates, 2020).

Curriculum Associates (2020) recommends differentiated instructional strategies called tiered language for students learning mathematics in English. The strategies are described as follows: Read aloud and in chorus the problem being posed, use drawings to represent the concepts being taught, work with a partner to solve the problem, show the steps they followed to solve it, and explain to share aloud how they solved it.

Another collective mathematical error that bilingual students make while learning mathematics was found in the thought processes for solving mathematical problems.

Multiple scholars have recognized the crucial role of problem solving in the educational process. The potential of the learning situation is underutilized, with a strong focus on learners acquiring patterns to improve their problem-solving skills, neglecting its importance for the development of thinking, particularly mathematical cognition (Lozada & Fuentes, 2018).

For purposes of continuity of the research process, it is recommended that the same study be carried out in the lower and higher grades to obtain a stepwise idea of the evolutionary behavior of the error by level. This is due to the fact that the students of the school learn English as a second language and their level of English improves every year in terms of comprehension and oral and written communication of the foreign language.

On the other hand, it is recommended to study the types of errors per student according to their classification according to the Response to Intervention Model (RTI). With the description of each student's profile and the type of mathematical errors that are identified, the way is opened for a more personalized pedagogical attention and the grouping of students by abilities to facilitate differentiation.

Some limitations of the present study were the lack of recent studies on the subject of mathematical errors in elementary school students, and in particular, in students who learn mathematics in a second language. On the other hand, the use of mathematical language during the interviews, data analysis and discussion of the results with the participants. As a result of the conversations and in order to understand the ideas of others, it was necessary to clarify the concepts that were being used in order to match them with the ideas of others. For the purpose of similar studies, it is recommended to prepare a list of mathematical vocabulary to be used by the analysis and discussion group. In this way, we ensure that everyone speaks the same language and that ideas flow easily.

Another limitation on the qualitative analysis of the students' errors consisted in the fact that it was difficult for the students who made the errors to explain the procedure they followed and how they handled the error. This is due to the fact that, according to

their developmental maturity, some have better communication skills than others. Therefore, in order to collect the necessary information, more students had to be interviewed than were planned for the qualitative analysis of the collective errors of second grade students. In specific cases, teachers supported students through dialogue.

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DEVELOPMENT OF ORAL LANGUAGE AND ITS INFLUENCE IN THE ACQUISITION OF HIGH MOUNTAIN CHILDREN READING IN TUMBAYA, JUJUY, ARGENTINA, ON APRIL 2023

DESARROLLO DEL LENGUAJE ORAL Y SU INFLUENCIA EN LA ADQUISICIÓN DE LA LECTURA EN NIÑOS DE UNA ESCUELA DE ALTA MONTAÑA EN TUMBAYA, JUJUY, ARGENTINA DURANTE ABRIL DE 2023

Carlos Eduardo Savedra[1]
Secondary School Nº 9 "Juana Azurduy", Argentina
(carloseduardo2702@msn.com) (https://orcid.org/0009-0001-3589-6412)

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ABSTRACT

The propose for the present work is to inquire oral language development and its relationship with the acquisition of students reading in a high mountain school in the Departament of Tumbaya, Jujuy, Argentina. Through a non-experimental mixed research model along with semi-structured interviews, it aims to explain how the linguistic stimulus of the nearby environment relate with the particular characteristics of morphosyntactic structuring. The influence of personal experience and the standard transmitted by the social environment in acquisition of semantics. Also, we are interested in the social environment input in acquisition of pragmatics. All of it from the theoretical perspective of Bronfenbenner ecological model that conceives the environment as a set of serial structures disposed in different levels, in which their interconnections are vital in the process of human development. Finally, it concludes that the reading-learning skill of the child depends on the way it is taught and on nature and existence of ties that unite school and home, in a context with its own characteristics of the social, cultural and geographical environment.

Palabras clave:
desarrollo del lenguaje, lenguaje oral, adquisición de la lengua, lenguaje, morfosintaxis, semántica, pragmática

RESUMEN

El presente trabajo se propone indagar sobre el desarrollo del lenguaje oral y su relación con la adquisición de la lectura en alumnos de una escuela de alta montaña en el departamento de Tumbaya, Jujuy, República Argentina. Mediante un modelo de investigación mixta no experimental con entrevistas semiestructuradas pretende explicar cómo se relacionan los estímulos lingüísticos del entorno cercano con las características particulares que toma la estructuración morfosintáctica; el modo en que operan las experiencias personales y los modelos transmitidos por el ambiente social en la adquisición de la semántica; se interesa además por el aporte que hace el ambiente social a la adquisición de la pragmática.
Todo ello desde la perspectiva teórica del modelo ecológico de Bronfenbrenner que concibe al medio ambiente como un conjunto

[1] Corresponding author.

	de estructuras seriadas y dispuestas en diferentes niveles cuyas interconexiones son decisivas en el proceso de desarrollo humano. Finalmente concluye que el aprendizaje de la lectura por parte de un niño depende tanto del modo en que se le enseña como de la naturaleza y existencia de los lazos que unen a la escuela y el hogar en un contexto atravesado por las características propias del entorno social, cultural y geográfico.

Introduction

During their development, children have different trajectories, among which the following stand out: physical, cognitive, socioemotional and finally language development, which will be the focus of the present study (Gómez, 2015). Language is the most complex and complete resource that human beings possess, whose development begins at birth and extends throughout life. This capacity is divided into morphosyntactic levels, which accounts for grammatical structures; semantic, which refers to the meanings of words or phrases; pragmatic, which accounts for the contextualized use of language; and phonological, which refers to the sounds that make up speech (Rodríguez y otros, 2017). All of them allow understanding and expressing communicative statements; occupying a fundamental place as an exclusive means of communication between people (Sandoval Zúñiga y otros, 2020). This complex process takes place in close relation with the different areas of development among which we can name the neurological development that controls the perceptual-motor activity, the development of the auditory apparatus, the formation of the psyche of the subject both in its conscious and cognitive sphere (development of thought) and in the unconscious; all of them summarized in the experimentation of the own body and the closest environment; the control of oneself and the coordination of body movements (Rodríguez y otros, 2017)thus making it possible to affirm that from the earliest years, the child relates intensely with the environment and that therefore there is simultaneity between the understanding of words, acting and interacting with the environment, in the sensory-motor demands of the brain (Ruiz-Pérez y otros, 2016) .

Language thus occupies a central place in the movement of appropriation of the reality called the world as human beings advance in the understanding of their environment (Pérez-Echeverría & Martí, 2010). It also provides unique ways of understanding and interpreting the world in intimate relation with the space-time coordinates, establishing a sort of circularity in the feedback, since in this way the cultural elements and the rules of language are incorporated in each time and place, which serve as categories according to which the human being can and will be able to interpret the world, giving a dynamism to the systems of representation that have varied from their beginnings and have diversified from rudimentary to highly complex systems (Pérez-Echeverría & Martí, 2010).

Oral language is fundamental in the first stage of human development as it constitutes a means of access to the world of culture and knowledge (Uribe-Hincapié y otros, 2019). Its acquisition consists of the development of the ability to communicate verbally and linguistically through conversation in a given situation and with respect to a given spatio-temporal, linguistic and extralinguistic context of the speakers; in such a way that communicative competence refers to the knowledge that a person has of a language and the ability to use it with the intention of communicating effectively with other users, with whom he shares the same language and patterns of use of the language (Moreira-Aguayo y otros, 2021).

In a recent study, Emilce Toledo asks whether morphosyntactic markersin the Spanish language influence the recognition of different grammatical categories, countable and uncountable nouns and verbs. Pseudowords are used in this study, because if words known to the children were offered, it could not be determined whether the recognition of the grammatical category being examined is due to the influence of morphosyntactic markers or to the semantic recognition of the lexicon (Toledo, 2021). The author presents

Roger Brown's studies on the identification of countable nouns, uncountable nouns and verbs by the 3- to 5-year-old child on the basis of morphosyntactic markings in the adult sentence in order to explain how the type of grammatical practice affects cognition (Toledo, 2021). The methodology consisted of taking a sample of 12 3-year-old children separated into 3 groups to expose them to linguistic stimuli and evaluate their ability to recognize verbs, countable and uncountable nouns. In general terms, the study concluded that, although the children did not have access to the integral comprehension of the proposition, the answers showed the identification of the action in the verbal category of the pseudoword; inferring that it could be due to the morphological behavior of the gerund verb. Finally, he infers that the morphological marker not only makes it possible to categorize a pseudoword but also, together with the context, allows a first approximation to its meaning (Toledo, 2021).

Canales Jara wonders if there are linguistic differences in the phonological awareness skills of rhyme and initial phoneme identification, syllable segmentation and sound integration in kindergarten children of the province of Mendoza from different socioeconomic backgrounds; he also wonders if these differences originate in the socio-environment of the educational level or in the socioeconomic background of the household (Canales Jara, 2021). This study recognizes the value of context and culture as conditioning factors in the development of language in interaction with individual personality traits (Carneros, 2015). The study further suggests that there is a directly proportional relationship between the environment in which children grow up and the level of language skills such that, during the initial learning process of reading, children from low socio-economic backgrounds tend to experience difficulties at a higher rate than children from other social sectors (Canales Jara, 2021).

The study concludes that there is a marked difference in socioeconomic level and educational level between the parents of children attending urban kindergartens and the parents of children attending urban-marginal kindergartens; that the socioeconomic and educational level of the families of children attending urban kindergartens is higher than that of the families of children attending urban-marginal kindergartens; and that there is a marked difference in educational climate between the two groups (Canales Jara, 2021).

José María Gil explains from the relational approach that language development is not based on an innate grammar, but on a two-level system in which meanings are directly connected to the means of expression, such as sounds and gestures. Innate structures, linguistic stimuli and the communicative needs of the subject concur in the development of language (Gil, 2019). In this article he concludes that the speaking subject has an active role in the process of language acquisition and development in which the learning of words and grammatical structures depends on the meanings that speakers need to convey or understand (Gil, 2019). He further points out that language development is a complex process of four fundamental strategies: recruitment of nodes; selection of nodes that previously did not fulfill a specific function (were latent); establishment of connections between nodes; and finally consolidation and strengthening of connections. Therefore, learning language and learning to communicate are two linked and continuous processes (Gil, 2019).

This paper aims to investigate the development of oral language and its relationship with the acquisition of reading in students of a high mountain school in the town of Tumbaya, Jujuy, Argentina, emphasizing that as social beings they are immersed in an environment with a particular culture and context, which operates as a conditioning factor without ignoring the interaction between the variability of individual personality traits (Carneros, 2015).

In this context, we ask: What was the relationship between oral language development and reading acquisition in students of a high mountain school in the department of Tumbaya, Jujuy, during the year 2023? what is the relationship between linguistic stimuli from the immediate environment and the particular characteristics that morphosyntactic structuring takes on in high mountain children? How do the personal experiences of the high-mountain child and the models transmitted by the social environment operate in the acquisition of semantics? What contribution does the social environment make to the acquisition of pragmatics in high-mountain children?

Method

The present research used a non-experimental mixed research model with semi-structured interviews that made it possible to describe qualitatively and quantitatively the way in which the relationship between the phenomena "oral language development in high mountain children" and "its relationship with the acquisition of reading" occurs without conducting experiments. For this purpose, a cross-sectional study was carried out during the months of March and April of the year 2023.

The universe is made up of a total of 13 children from kindergarten to seventh grade, which translates into 52% of the student population, which is why it is possible to affirm that the results are highly representative of the school reality. In addition, of the total number of participating students, 54% are boys, while the remaining 46% are girls; this difference of less than 10 points between boys and girls allows us to infer that the study provides a fairly accurate picture of the use of language and communication skills of the student population, the performance obtained by boys and girls in the standardized tests, and the possible relationships that exist between language development and learning to read.

The educational institution where the research was carried out has an enrollment of 25 students between kindergarten and seventh grade. We worked with thirteen children whose parents agreed to sign the corresponding informed consent forms. The study included the participation of the 9 teachers of the educational institution who provided qualitative information on the linguistic competencies of each participating child through a questionnaire that is part of the CELF V battery and the contribution of some of them in semi-structured interviews.

The particular characteristics of the institution that arise from its geographic location in an area of difficult access make the student population remarkably low in comparison with educational institutions in urban centers of the same province, thus requiring a multigrade organization according to the needs of the context (Table 1).

Table 1
Distribution of the student population

		Students	
Cycle / Level	**GRADE**	**CA**	**% A**
Initial Level	Room of 5	2	8%
Iº Cycle	grade 1	5	20%
	grade 2	3	12%
IIº Cycle	grade 3	3	12%
	grade 4	6	24%
IIIº Cycle	grade 5	3	12%
	grade 6	1	4%
	grade 7	2	8%
Total		**25**	**100%**

Note. CA= Number of students; %A= Percentage of Students

As for data collection techniques, a semi-structured interview was used for teachers and designed for this study. The CELF-5 battery was also applied, which measures the language skills of children and adolescents (from 5 to 15 years and 11 months) and identifies and diagnoses possible language and communication disorders. This test was used to perform a complete exploration of the different language fundamentals that were considered relevant to the research. The tests that make up this battery made it possible to evaluate morphosyntax, semantics and pragmatics, providing complementary information on communication and language skills both in educational environments and in real conversation situations.

The scalar scores provided information about the subject's linguistic performance in relation to the content measured by each test. The application manual also indicates that the scalar scores allow comparison of each child's performance with others of the same age in the typing sample. Its measure is 10, and the standard deviation (Std) is 3, so that if a scalar score of 10 reflects the average performance of a given group or age, scalar scores 7 and 13 indicate a standard deviation below and above the mean respectively, constituting the limits of the average range (Wiig, 2018).

As clarified in the CELF V Manual, some of the tests cover all ages, i.e., from 5 to 15 years old, while others, depending on the relationship between language and development, cover certain age ranges, as is the case of morphosyntax, which applies to children from 5 to 8 years old. In all cases, the average scalar score obtained by the population is first presented and then discriminated according to the corresponding percentages. It is clarified that there is the presence of an atypical subject depending on the results of the test, which is why in some cases the average scalar score will be presented integrating the atypical case and excluding it in order to plot the impact it has on the average scalar score of the group

Results

Morphosyntactic Structuring

Morphology deals with the internal relationship of words, studying the forms or structural units with meaning: words and morphemes. He is interested in two central elements: one is *the structure,* i.e., how words are made; the other element is *the function,* which refers to the role they play when integrated into statements, phrases and sentences (Granada Azcárraga, 2009). It also covers both inflection and derivation; by means of rules that operate on the same basic units: the morphemes. This is even better understood from the example proposed by Lyons: just as the inflectional form cantar is composed of

the most basic units (morphemes) cant and ar, so the derivational form cantante is composed of the two most basic units cant and ante; applying in both cases the same process of affixation, adding an affix to a base form (Lyons, 1984).

Syntax defines the type of word combinations that can be considered acceptable or grammatically correct. Here, concordance, i.e. the harmony between the different parts, the regime, which refers to the relationships of dependence between the elements and the construction, and finally the order in which the words are placed, play an important role. Syntax is ultimately the study of the formal relations of signs to each other (Chilton & Schaffner, 2000).

In the investigation of the relationship between the linguistic stimuli of the immediate environment and the particular characteristics of morphosyntactic structuring in the children of a high mountain school, the contribution of a teacher who can provide elements that can serve as a frame of reference for possible interpretations of the quantitative results obtained by the CELF V battery in morphosyntax is interesting. According to the teacher, an adult neighbor of the institution stated that her grandparents were nomadic, as they had no land they moved around the puna area, they belong to the Kolla people and their native language is Kunza. "they come from the Kolla people and the language they spoke was Cunsakunza." The Kolla language is not the case of the present study, so it will suffice to say that it was spoken in the Puna area both in the Atacama region in Chile and in the provinces of Jujuy, Salta and Tucumán until the first decades of the twentieth century (Pueblos Originarios). It is characterized by the lack of verbal and nominal inflections, the scarcity of verb tenses; in fact, verbs express concepts that are less stable in time, in the sense that they usually refer to states or events (Vidal Leyton, 2021).

On the other hand, among the characteristics observed in the oral language of the participating children is that they generally do not finish words or join terms that in the grammatical structure of our language should be separated, for example: "noicomiuou" /noi komiu/ meaning I have not eaten; "lescuela" /'leskuela/ for referring *to* school. As for the speakers in the environment, it is noted that communication based on orality has similar characteristics, since the teachers state that they have experienced the need to contact an adult caregiver due to apparent difficulties in understanding what the children wanted to communicate through oral expression; however, when the adult was present, they noticed that it was even more difficult to understand what the adult wanted to express, so it is understood that many communicative behaviors are learned from adults: "I decided to interview the grandfather and it was more difficult to understand the grandfather."

Some results of the tests that make up the CELF 5 Battery for the evaluation of morphosyntax.

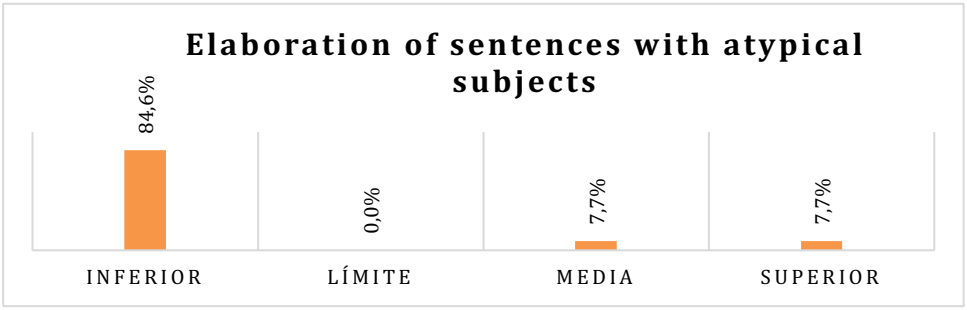
Elaboration of Sentences

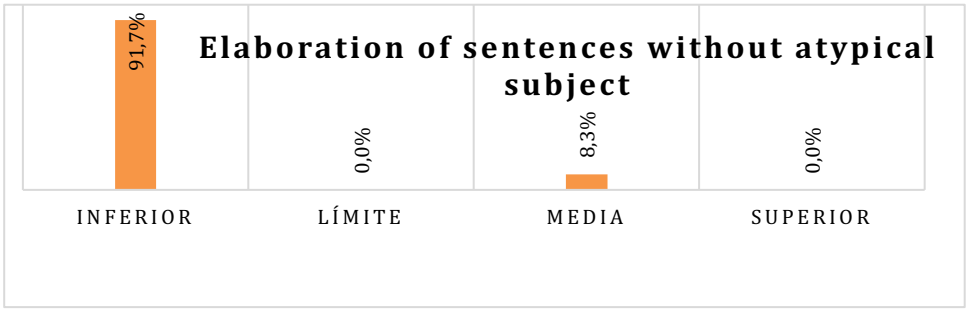
This test evaluates the ability to orally elaborate complete, semantically and grammatically correct sentences of increasing length and complexity from given words, for example: car, yes, because, within a context established by illustrations. It reflects the ability to integrate semantic, syntactic and pragmatic rules or constraints, as well as to use working memory. The skills assessed are related to the curricular objectives of infant, primary and lower secondary education concerning the internalization of linguistic rules (semantic, syntactic and pragmatic) and their integration to produce oral and written discourse (Wiig, 2018).

In the analysis of the values obtained by the test, 7.7% of the population obtained a scalar score above the mean, that is, equal to or higher than 13 points; 7.7% was within

the mean; no individual was located at the limit; finally, 84.6% obtained scalar scores below the mean. However, if we proceed to discard the outlier, the distribution of values changes significantly, increasing the percentage of values below the mean to 91.7%, which suggests that the number of children with syntactic, semantic and pragmatic restrictions is even higher (Figure 1).

Figure 1
Elaboration of sentences.



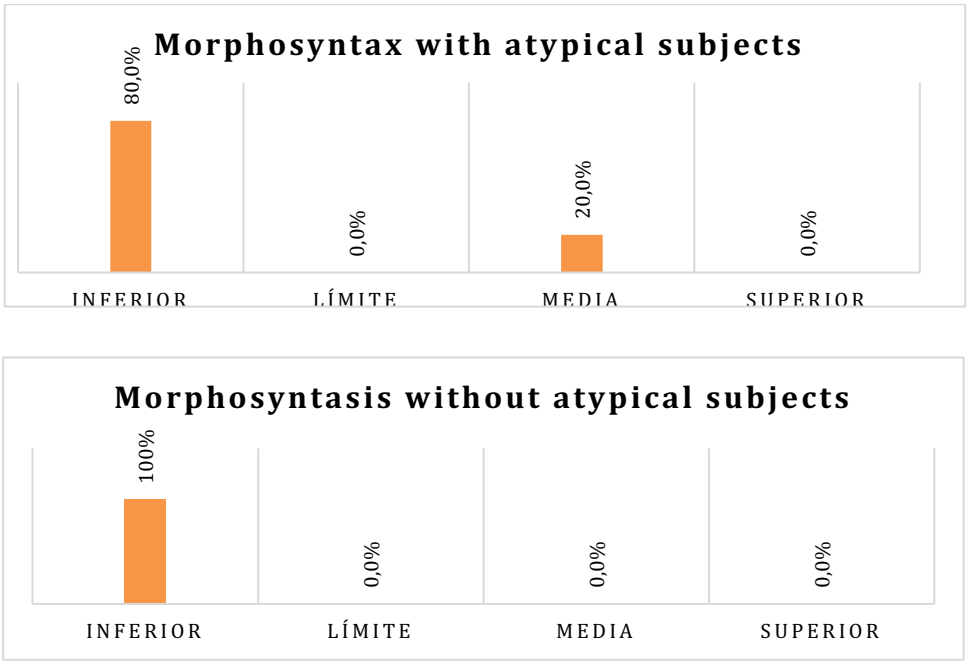


Morphosyntax

This test evaluates the child's ability to apply the morphosyntactic rules of gender and number inflection, verb conjugation, agreement, nominal and adjective derivation, comparative and superlative degrees, contraction; select and use determiners and possessive pronouns, personal pronouns, reflexive pronouns, prepositions and conjunctions. It has scales for children between 5 and 8 years of age, which is why 38% of the participating population was evaluated.

The detailed analysis shows that 80% of the population obtained a lower scalar score, 20% obtained a score within the mean; finally, no individual obtained a higher score or a borderline score. If we proceed to discard the outlier, the distribution of values changes notably, placing all the children evaluated in the lower range, which suggests that the number of children with morphosyntactic restrictions is total (Figure 2).

Figure 2
Morphosyntax.



Semantic Structuring

This level represents the knowledge that people have of objects, of the relationships between objects and between events in the real world; therefore, it studies the meanings and changes of meanings that words undergo (Granada Azcárraga, 2009). For Lyon there is an interdependence of the orational meaning with respect to the meaning of the lexemes that compose each sentence. Furthermore, it establishes that lexical, grammatical and orational meanings belong to the domain of linguistic semantics. Finally, he will say that while descriptive meaning may be exclusive to language, expressive and social meanings are not; they are also found in other natural semiotic systems, both human and non-human (Lyons, 1984).

In the research on the relationship that exists between the personal experiences of the high mountain child and the models transmitted by the social environment in the acquisition of semantics, it is observed that there is a strong cultural component, according to some interviewees this component is transmitted by the close social environment, i.e. it is perceived that children imitate their parents in such a way that expressions such as "aquisito" /akisito/, "aquí nomás" /akí nomas/ which can usually be interpreted as close, next, beside, etc. are used to indicate places and/or things whose proximity is measured in relation to another element, for example: community A is approximately 10 kilometers away, but in relation to community B it is very close.

One of the teachers interviewed also points out that in the construction of the meaning of words, the gesticulation that accompanies them plays a role, "before they pronounce the words, you realize that they want to talk to you". This observation of the teacher is correlated with one of the characteristics of the Kunza language in which, according to Vidal Leyton, due to the lack of inflections and scarcity of verbal tenses, the use or support of gesticulation and/or hands is necessary for communication (Vidal Leyton, 2021).

Some results of the CELF V battery that investigate semantic structuring.

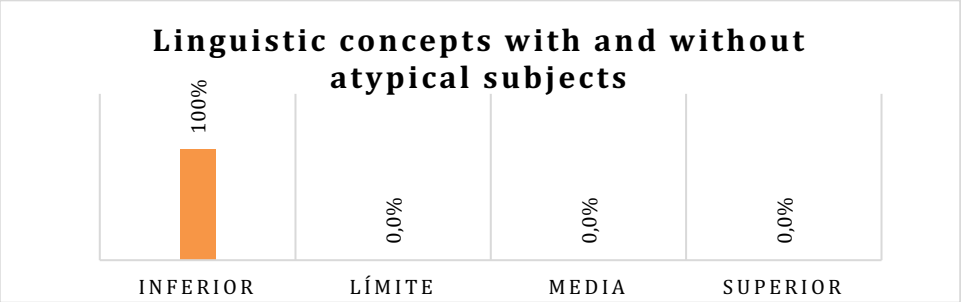
Linguistic Concepts

The test evaluates the subject's aptitude to interpret indications that contain basic concepts and require logical operations, such as inclusion, exclusion, location and time; and also evaluates tasks related to the execution of indications that contain basic concepts necessary for the classroom task. Understanding the basic concepts, such as and, before or after, is essential for following directions during hands-on activities, classes, projects and other assignments (Wiig, 2018). It has scales for children between 5 and 8 years of age, which is why 38% of the participating population was evaluated.

It is observed that 100% of the children evaluated obtained a scalar score below the mean, which suggests that the entire population of participants between 5 and 8 years of age has a deficit in the ability to interpret indications that contain basic concepts, for example: medium, different, many; as well as in the comprehension of logical operations and conjunctions, such as and, all, except those referring to conjunction, disjunction, conditional, etc. Figure 3.

Figure 3

Linguistic concepts

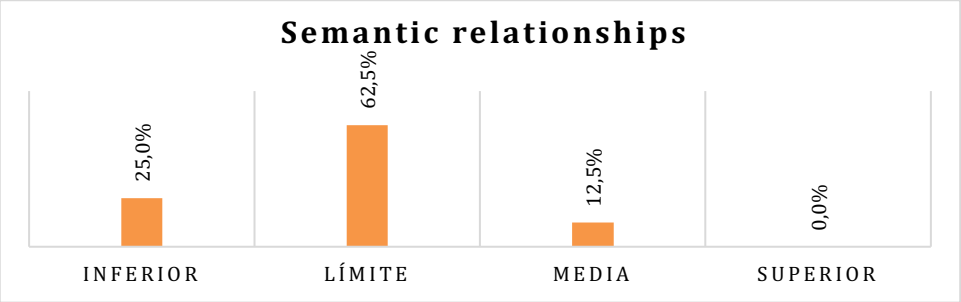


Semantic Relationships

The test evaluates the ability to understand sentences that contain a comparison; include spatial content; specify a temporal relationship; and express sequential content or are formulated in the passive, necessary for following oral or written directions, performing tasks, understanding established series, e.g.: days, years; and the order of actions (Wiig, 2018). It has scales for children between 9 and 15 years of age, which is why 62.5% of the participating population was evaluated. The average scalar score obtained by all the children evaluated is 6 points and places the group below the average, which allows inferring that at group level there are difficulties in the abilities to understand and/or execute indications; difficulties in logical sequential ordering that negatively impact on the ability to order around the space-time categories.

The scalar scores obtained by those evaluated were distributed as follows: 62.5 % were at the borderline, 25 % below and 12.5 % obtained a medium score. According to these measurements it is possible to affirm that 87.5% of the children evaluated could present difficulties in understanding sentences containing a comparison, which are presented to them orally or in writing (Figure 4).

Figure 4
Semantic relationships



Pragmatic Structuring

At this level, the context takes center stage as a network of relationships interwoven to shape the structure of meaning. Pragmatics is the study of the relationships between language and the contexts in which it is used. Granada Azcárraga refers to three types of contexts of linguistic function: linguistic, paralinguistic and extralinguistic contexts, which operate in an integrated manner in the communicative dynamics (Granada Azcárraga, 2009). According to Blum-Kulka it can be stated that, in a broader sense, pragmatics is the study of linguistic communication in context, however, knowledge of the words and grammar of a language alone does not guarantee success in communication. Several factors are involved in the interpretation of words, such as familiarity with the context, intonation marks and cultural assumptions (Blum-Kulka, 1997).

In the inquiries about the contribution that the social environment makes to the acquisition of pragmatics, in relation to oral expression, one of the teachers interviewed describes the way adults and children speak as striking, because generally there is no voice modulation, the words are said in a low tone of voice, in addition the teacher states that he has always worked in the high mountains but that in this community his way of speaking so closed is noticeable. This suggests that in the paralinguistic context of the pragmatic dimension it becomes difficult to access what the speakers really want to communicate. In addition, the lexical selection made by speakers for conversations that take place both in the classroom and outside it, is impregnated with characteristics of the immediate social environment with modifications at the phonological level; these characteristics make it difficult to correctly identify graphemes in the grammatical structure, for example: "corniada" /korniada/ instead of cornada which refers to the blow of an animal with horns, "maistro" /maistro/ instead of maestro "está llaveado" /'ta yaviao/ to mean that the door has a key, these modifications are transferred to writing, since according to the teacher the children write as they speak, which causes interference in the interpretation and/or execution of instructions in the school environment.

Some results of the CELF V battery in the assessment of pragmatic skills.

Execution of Indications

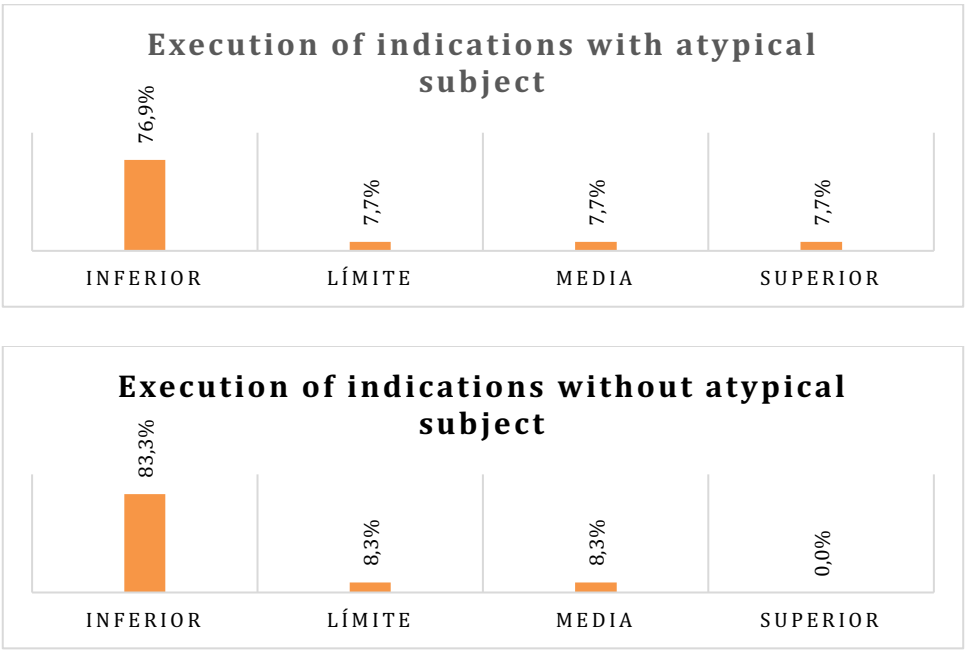
The test evaluates the subject's ability to interpret indications that contain basic concepts and require logical operations, such as inclusion, exclusion, location and time; it also evaluates abilities to identify the mentioned drawings from among several drawings (Wiig, 2018). In the classroom context, these skills are related to the execution of instructions that contain basic concepts and that must be followed during the school day in order to appropriate knowledge. It has a range of 5 to 15 years, which is why all

participating children were evaluated. The average scalar score obtained by all the participating children is 5, which places the group below the average, which allows inferring that at group level there are difficulties in interpreting and/or following directions. Moreover, if the atypical subject is excluded, as has occurred in other tests, the average scalar score drops one point, showing that the bulk of the population has even greater difficulties.

The percentage analysis shows that 76.9% of the participants obtained a lower scalar score, 7.7% obtained a borderline score, 7.7% obtained a medium score and 7.7% obtained a higher score. These scores allow inferring that most children experience difficulties in interpreting, remembering and/or following oral directions of increasing length in a learning context, which negatively impacts access to knowledge. Furthermore, when excluding the atypical subject, the percentage of children who obtained lower scalar scores is 83.3%, 8.3% obtained borderline scores and the remaining 8.3% were within the mean, so it is understood that the percentage of the population with difficulties is even higher, Figure 5.

Figure 5

Execution of indications.



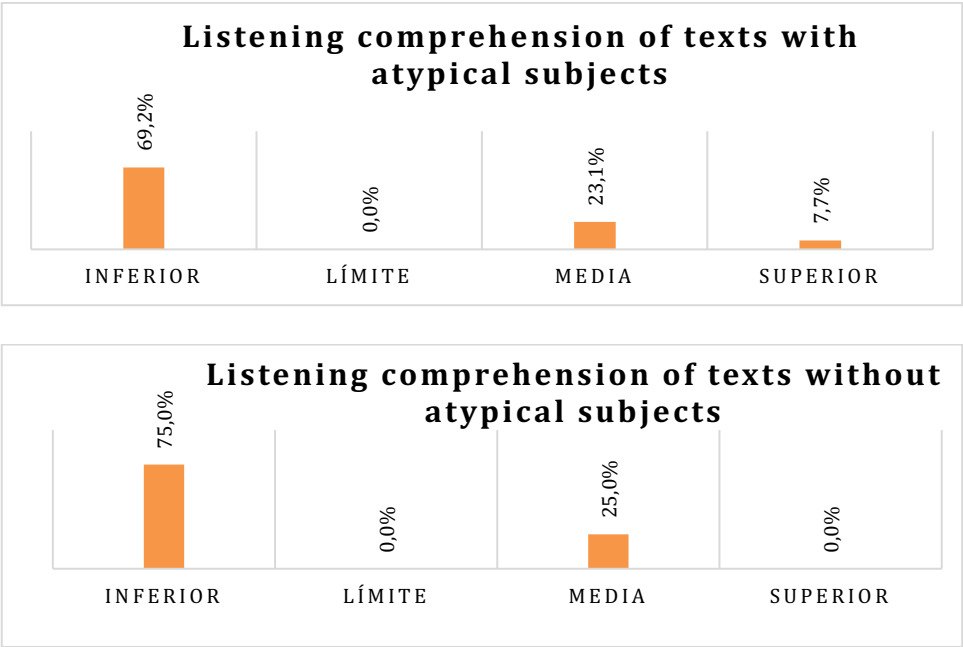
Oral Comprehension of Texts

The test assesses the subject's ability to maintain attention and concentration while listening to oral texts; create meaning from the texts; answer questions about the content of the text; and use fundamental thinking strategies to carry out interpretations beyond the information contained in the text. Measures comprehension of the main idea, recall of facts and details, recall of the sequence of events, as well as making inferences and predictions (Wiig, 2018). It has variables for children from 5 to 15 years of age, which is why the entire participating population was evaluated.

The percentage distribution shows that 69.2% of the children scored below average, 23.1% scored average and 7.7% scored above average. This allows inferring that most of the children present restrictions in listening to educational content; the use of the information presented; and the application of fundamental thinking skills to go beyond

the information given, learn and create new knowledge. Furthermore, if the outlier is excluded, the percentage of children below the mean rises to 75 % while the percentage at the mean also rises to 25 %. This allows us to infer that the percentages that best represent the group in its aptitudes is the one that excludes the atypical subject, Figure 6.

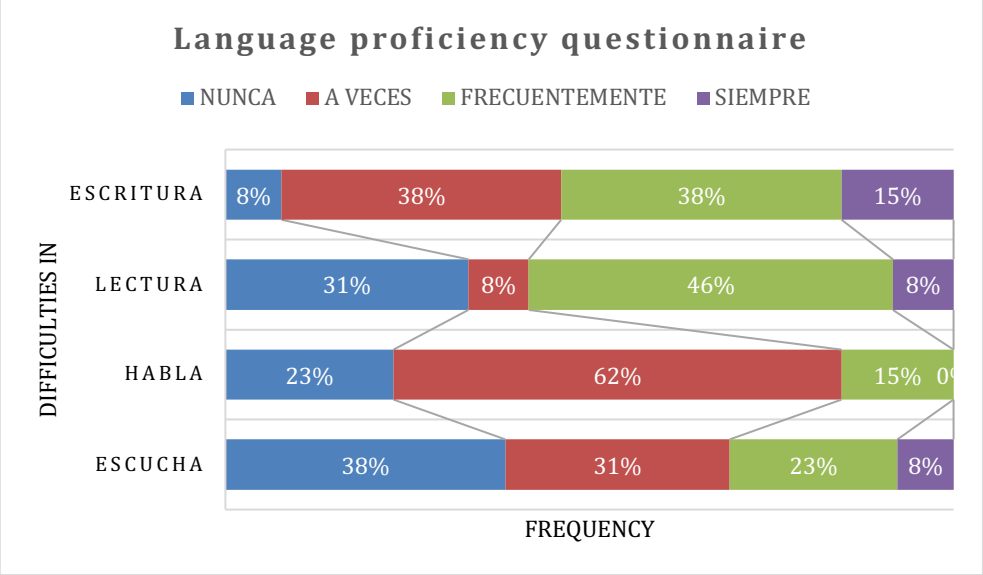
Figure 6
Oral comprehension of texts.



Language Proficiency Questionnaire

The linguistic competence questionnaire allows to enter the classroom from the particular point of view of each teacher and in group form from the perception that the teaching staff has about the group of students participating in the classroom context in which linguistic communication takes place, the linguistic uses that the student performs in order to read and write, socialization, organization and self-regulation (Wiig, 2018). Comparatively, it is observed that the adults who teach in this institution generally perceive that the majority of students (38%) never present difficulties in listening, another majority group (62%) of students sometimes present difficulties in speaking, another majority group (46%) of children frequently present difficulties in reading, and finally 76% of children sometimes and frequently present restrictions in writing. This comparison allows us to infer a relationship of inverse proportionality between listening, reading and writing, Figure 7.

Figure 7
Comparison between listening, speaking, reading and writing



Discussion and Conclusions

Discussion

The first objective was to investigate the relationship between the linguistic stimuli of the immediate environment and the particular characteristics of morphosyntactic structuring in high mountain children, taking as a reference Bronfenbrenner's ecological model that conceives the environment as a set of serial structures arranged in levels, understanding that development is a complex process, which responds to the influence of a multiplicity of factors closely linked to the environment or ecological environment (Ortega Chávez & Pozo Ortega, 2021).

Elements of the ecological environment were found that operate as structuring elements of the morphosyntax, among which we can mention in the first place the direct and close ancestry in time of the members of the community with the Kolla people and their native language Kunza, characterized by the lack of verbal and nominal inflections, and the scarcity of verb tenses with their own rules of combination and meaning. It is also observed that the speakers participating in the study generally do not finish words or join terms that in the grammatical structure of our language should be separated, for example: "noicomiuou" /noi komiu/ to say I have not eaten; "lescuela" /'leskuela/ to refer to school; this modification in the combination modality of spoken words translates into difficulties in making legal combinations when writing, or difficulties in accessing the correct decoding of the message in a written text.

These obstacles are correlated with the quantitative data provided by the CELF V battery in the morphosyntax section. When the children were asked to elaborate grammatically correct sentences of increasing length and complexity from a given word with the intention of inquiring about contents related to the internalization of linguistic rules (semantic, syntactic and pragmatic) and their integration to produce oral and written discourse, the group tendency showed difficulties in the integration of these rules with syntactic, semantic and pragmatic restrictions. Similarly, the group evidenced

difficulties in applying the morphosyntactic rules of gender and number inflection, verb conjugation, agreement, nominal and adjective derivation, comparative and superlative degrees, contraction; selecting and using determiners and possessive pronouns, personal pronouns, reflexive pronouns, prepositions and conjunctions. These restrictions in the access and application of the morphosyntactic rules of our language that are inherited by the ecological environment find their correlate in Pérez Pedraza, for whom the acquisition of morphosyntax by the child is linked to an order of evolution and is carried out by processes of gradual and progressive imitation of the rules that the adult transmits from the oral interaction with the child (Pérez-Echeverría & Martí, 2010). In this context, it is worth mentioning the contributions of recent studies that suggest a close relationship between cognition, language development, corporeality and movement capacity; the social environment becomes important again, which is presented as an environment full of language and action, which allows us to affirm that in every human group the incorporation of language into the communication system occurs naturally, which, with gestures and the mastery of motor skills, allows the child to acquire and show competence according to his environment (Ruiz-Pérez y otros, 2016).

The second objective of this study was to investigate how the personal experiences of the high mountain child and the models transmitted by the social environment operate in the acquisition of semantics, positioned from Bonfenbremer's ecological theory. A strong cultural component is observed in the speech modalities of the participating children, i.e. children imitate their parents in such a way that expressions such as "aquisito" /akisito/, "aquí nomás" /aki nomas/ which can usually be interpreted as proximity, geographic proximity, indicate in context places and/or things whose proximity is measured in relation to another element.

The results allow us to corroborate restrictions in this field. In the evaluation of basic linguistic concepts: and, before or after*;* which are fundamental to follow directions during practical activities, classes, projects and other tasks (Wiig, 2018)the population evaluated obtained scalar values that evidence the existence of difficulties in the abilities to understand and/or execute indications; difficulties in logical sequential ordering that negatively impact the ability to order around the space-time categories. Furthermore, in the inquiries on semantic relations, the scalar mean allows us to affirm that the group mostly experiences restrictions in the skills necessary for following oral or written directions, performing tasks, understanding established series, e.g., days, years; and the order of actions. The scalar values obtained in the item related words allow inferring that the group also experiences restrictions in understanding the relationships in the semantic field and therefore in using or specifying words in both oral and written discourse. These restrictions imply difficulties in accessing semantic meanings when writing a text as well as when trying to access the meanings of written texts through reading. All these elements find a correlation in a study by José María Gil who affirms that there is a marked difference in socioeconomic and educational level between the families of children attending kindergartens in urban centers with respect to families of children attending educational institutions located in marginal urban environments; he also explains from the relational approach that language development is not based on an innate grammar, but on a two-level system in the development of language in which innate structures, linguistic stimuli and the communicative needs of the subject concur (Gil, 2019). In this article he concludes that the speaking subject has an active role in the process of language acquisition and development in which the learning of words and grammatical structures depends on the meanings that speakers need to convey or understand (Gil, 2019). The context becomes important as a constitutive element of a subjective model of the speakers involved in each interaction that takes place, from a psychosocial basis that allows to adapt the linguistic

performance according to a socio-cognitive interface that mediates between the individual dispositions of the language users and the interpretation of the social situation in which they are inserted (Ghio, 2013).

The third objective of this study was to investigate the contribution of the social environment to the acquisition of pragmatics. As Ortega Chávez points out in Bronfenbrenner's ecological theory, the person must be understood as a developing and dynamic entity, which is progressively involved in the environment and therefore also influences and even restructures the environment in which it lives (Ortega Chávez & Pozo Ortega, 2021). Pragmatics, as the study of the relationships between language and the contexts in which it is used, refers to three types of contexts of the linguistic function: the linguistic, the paralinguistic and the extralinguistic context, which operate in an integrated manner in the communicative dynamic (Granada Azcárraga, 2009).

In the paralinguistic context of the pragmatic dimension, it is difficult to access what the speakers really want to communicate; in addition, the lexical selection they make for conversations that take place both in the classroom environment and outside it, is impregnated with characteristics of the immediate social environment with modifications at the phonological level, these characteristics make it difficult to correctly identify the graphemes in the grammatical structure, for example: *"*corniada*"* */korniada/* instead of cornada which refers to the blow of an animal with horns, "está llaveado" /'ta yaviao/ to mean that the door has a key; these modifications are transferred to writing, i.e. speakers write as they speak, and speech is learned from other adult speakers, which causes interference in the interpretation and/or execution of instructions in the school environment.

In the items of the CELF V battery that inquire about pragmatic skills, it is observed that the values obtained by the group in the item execution of indications indicate restrictions in the aptitude of the subjects to interpret indications that contain basic concepts and require logical operations, such as inclusion, exclusion, location and time; which have a negative impact on the organization of the school day in order to appropriate knowledge. The mean scalar score obtained in the item pragmatic skills profile allows us to observe that the group experiences restrictions in the knowledge of social situations and the understanding of both explicitly established and implicit norms that are fundamental in curricular and non-curricular activities.

Finally, the item "oral comprehension of texts" assessed the ability to maintain attention and concentration while listening to oral texts and to create meaning from the texts. Comprehension of the main idea, recall of facts and details, recall of the sequence of facts, as well as making inferences and predictions were measured. The average scalar score yielded values that indicate that the group experiences difficulties in listening to educational content; using the information presented; and applying fundamental thinking skills to go beyond the information given, learn and create new knowledge.

Conclusions

In relation to the first objective, it is possible to affirm that there is a concurrence of cultural elements typical of the region: the Kunza language spoken by the grandparents of the community, the transmission of ways of speaking by the surrounding adults, and that all this has a structuring character in the development of morphosyntax in the children evaluated, which causes interference in the internalization of linguistic rules (semantic, syntactic and pragmatic) and their integration to produce oral and written discourse, triggering syntactic, semantic and pragmatic restrictions.

In relation to the second objective, taking into account the ecological model and highlighting that as social beings, individuals are immersed in an environment with a

specific culture and context, which operates as a conditioning factor without ignoring the interaction between the variability of individual personality traits (Carneros, 2015)the study also shows that the evaluated population experiences restrictions in understanding the relationships in the semantic field and therefore in using or specifying words in both oral and written discourse.

In relation to the third objective, the data obtained allow us to conclude that in the paralinguistic context of the pragmatic dimension it is difficult to access what the speakers really want to communicate; furthermore, the lexical selection they make for conversations that take place both in the classroom and outside it is impregnated with characteristics of the immediate social environment and therefore they experience restrictions in their ability to interpret indications that contain basic concepts and require logical operations, such as inclusion, exclusion, location and time.

Finally, in the item oral comprehension of texts, which allowed the evaluation of aptitudes for maintaining attention and concentration while listening to oral texts; creating meaning from the texts; comprehension of the main idea, memory of facts and details, recall of the sequence of facts, as well as making inferences and predictions were measured. The data obtained allow us to conclude that the evaluated group experiences serious restrictions in listening to educational content; the use of the information presented; and the application of fundamental thinking skills to go beyond the information given, learn and create new knowledge.

Based on the previous conclusions, it is possible to affirm that there is a close relationship between morphosyntactic, semantic, pragmatic, oral comprehension of texts and reading acquisition in children from a high mountain school that can find possible explanations based on Bronfenbrenner's ecological theory.

Limitations

First of all, the restrictions of the instrument used for data collection, whose scales are Spanish, must be taken into account. Another limitation of the present study is that it could not include the entire population due to refusal of the parents of those who did not participate in the study. Finally, a limitation of this research is the lack of time and resources to extend the study to the secondary school that operates in the same locality, since, if it had been carried out, it would have covered all the children and adolescents in the community.

Recommendations

It is suggested for future research to deepen the relationship between the development of language in children in a high mountain school and its relationship with the learning of reading in a comparative study with an institution in an urban center of the same province to establish possible convergences and/or divergences.

It would also be convenient to carry out a study to adapt the CELF V battery scales for their application in different regions of the Argentine Republic, discriminating between urban and rural environments, in order to provide a tool according to the characteristics of the region, as is the case with M Casullo's norms for Bender in children.

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WRITTEN PEDAGOGICAL SPEECH IN TEACHERS OF INCLUSION IN PRIMARY EDUCATION

DISCURSO PEDAGÓGICO ESCRITO EN LOS DOCENTES DE INCLUSIÓN EN EDUCACIÓN PRIMARIA

Marcia Yelitza Bonilla Gonzalez[1]
International Iberoamerican University, Colombia
(marcia.bonilla@doctorado.unini.edu.mx) (https://orcid.org/0000-0001-8402-5317)
Javier Diz Casal
International Iberoamerican University, Mexico
(javier.diz@unini.edu.mx) (https://orcid.org/0000-0003-1332-8905)

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ABSTRACT

In the context of this dissertation, the objective is to analyze the written pedagogical discourse of inclusion teachers in primary education at the Juan Rangel de Cuellar educational institution, in Cúcuta, Norte de Santander, Colombia. From the theoretical point of view, it is sustained in the conceptions of the context, Halliday (1994) and Halliday and Hasan (1989), who build their theory in a close relationship with the social context where the context of culture and the context of situation stand out. The methodology is of the qualitative research type, whose design is based on an ethnographic study, where the aim is to provide a faithful image of what teachers say and the way in which they act. For the development of this research, teacher informants were approached, in a period of two months, from the month of January to the month of March of the year 2023. The present investigation assumes as an instrument an in-depth interview script. By triangulating the results obtained in the investigation, three significant categories for the interpretation and final analysis were selected as a result of a constant review of the work material: written pedagogical discourse and communication, written discourse and pedagogical procedures, written pedagogy and educational quality. It is concluded that the written pedagogical discourse is a generative act of teaching where the student must establish a relationship with the procedures and contents proposed by the teacher, to seek a contextualized social practice. In addition, the practice of written pedagogical discourse must be implemented in a contextual framework of pedagogical activities.

RESUMEN

[1] Corresponding author.

Palabras clave:
discurso pedagógico escrito, inclusión, calidad educativa, comunicación.

En el contexto de esta disertación se plantea el objetivo donde se pretende analizar el discurso pedagógico escrito en los docentes de inclusión en educación primaria la institución educativa Juan Rangel de Cuellar, de Cúcuta, Norte de Santander, Colombia. Desde el punto de vista teórico se sostiene en las concepciones del contexto, Halliday (1994) y Halliday y Hasan (1989), quienes construyen su teoría en una estrecha relación con el contexto social donde se destacan el contexto de cultura y el contexto de situación. La metodología es del tipo de investigación cualitativa, cuyo diseño se sustenta en un estudio de carácter etnográfico, donde se trata de proporcionar una imagen fiel de lo que los profesores dicen y del modo en que actúan. Para el desarrollo de esta investigación se abordó informantes docentes, en un periodo de tiempo de dos meses, iniciando en enero y finalizando en marzo del año 2023. La presente investigación asume como instrumento un guion de entrevista en profundidad. Al triangular los resultados conseguidos en la indagatoria, se seleccionaron, producto de una constante revisión al material de trabajo, tres categorías significativas para la interpretación y análisis final: el discurso pedagógico escrito y la comunicación, el discurso escrito y los procedimientos pedagógicos, el discurso pedagógico escrito y la calidad educativa. Se concluye que el discurso pedagógico escrito es un acto generativo de enseñanza donde el estudiante de inclusión, debe establecer relación con los procedimientos y contenidos propuestos por el docente, para buscar una práctica social contextualizada. Además, la práctica del discurso pedagógico escrito debe implementarse en un marco contextual de las actividades pedagógicas.

Introduction

When it comes to learning the written language, it is always thought to be a difficult path. This is due, among other things, to the fact that the structure of the writing process must be understood. It is also believed that the acquisition of writing does not develop in a simple way, but through a process that is determined by a series of variables associated with the learner, such as attitude and motivation, among other aspects.

For the learning of writing, teaching is fundamental, because through it, learning can be facilitated, giving the student the opportunity to learn, through strategies previously chosen by the educator. The understanding of how the student learns also determines the way used to teach, the teaching style and the didactic teaching strategies implemented in class. The adequate development of didactic strategies for the teaching of writing also depends on the teacher's mastery of these strategies, and this unquestionably involves his or her academic training to incorporate motivating didactic strategies into the teaching process, particularly when dealing with inclusion students.

Currently in education, the term inclusion has become a controversial and significant topic among forums and educational institutions in the country, as well as a debatable reference among teachers since, being promulgated as a right, it raises concerns, questions and even perceptions and attitudes that somehow predispose pedagogical practices in the classroom. In addition to becoming one of the most important and significant educational reforms by countries around the world (Savolainen et al., 2020). Inclusion necessarily has to do with a break with traditional paradigms (Diz-Casal, Aliaga, and Apolo, 2020).

Especially in elementary school where more attention is required in the cognitive, social and behavioral aspects of the student. For this reason, there is a need to interpret inclusive education from the written pedagogical discourse in order to address aspects of the exclusion of those students who have different needs but who can be adaptable in an educational society.

In this research, we seek to analyze the written pedagogical discourse of teachers in elementary school inclusion students, seeking to ensure equality and quality to students with different abilities, with cognitive, cognitive and/or physical difficulties in the classroom, so that they can start a formal learning process. To speak of inclusion in a society of inequality and disinterest in others is to speak of exclusion, since they are considered as people with different abilities incapable of adapting to reality.

For Van Dijk (2000), written pedagogical discourse is a specialized mode of communication through which the transmission of knowledge and learning is affected by the load of emotions that underlie the event itself; in this sense, pedagogical discourse is a means of reformulating a primary discourse. It is the recontextualization through two basic discursive orders: exposition and description (Sánchez, 1992). The pedagogical discourse conveys the feelings and emotions of the didactic task from the detailed exposition of facts with some descriptive elements. The understanding of the pedagogical reality is not simply one more mode among the forms of behavior of the educational subject, but the peculiar way of being, of existing, of the pedagogical discourse, and a particular and distinct way of textual production by its actors. For this reason, it is essential that there is a connection between external signs and learning, thus creating evidence of the teacher's pedagogical discourse (Jewitt, 2005).

Given the importance of the context, that is, the framework from which the written pedagogical discourse emerges, particularly in classrooms with inclusive students, we follow the views of Lyons (1981), who proposes the text as a whole, where the ideas of

the students must be brought out, taking into account the related but distinct properties of cohesion and coherence from a given context. Likewise, Álvarez (1999) states that the text forms a semantic unit referred on the one hand to itself, and on the other hand, to the situational context in which it occurs, so much so that the semantic elements of the text, as well as its form, can be announced from the situational context. Regarding the ideas of Lyons and Alvarez on the necessary relationship of the text with the situation where it is produced, Firth (1957) mentions that depending on the context where a communicative act is produced, the function and expectations of said act will vary. Hence, if one wishes to analyze the discourse of a language, it is necessary to propose ideas on how, in the context, the participants contribute to the process of interpreting the message (Levinson, 1989). This idea is shared by Zhou Ling (2020) when he emphasizes that text and context are complementary and mutually dependent, since, as the author states, without the language of the specific environment, it is impossible to access the real meaning of the text. Regarding context, Halliday (1994) and Halliday and Hasan (1989) build their theory in a close relationship with the social context, highlighting the context of culture and the context of situation, which are fundamental aspects when dealing with students of inclusion.

In this same area of context, Ortega (1991) argues that a text depends to a great extent on the context in which it has been issued, and, consequently, the study of the text will depend on the knowledge we have of the context. However, context should not be understood as the set of all extralinguistic elements, but only those that have an effective influence on the properties of a text, such as the context arising from the inclusion learners. Then, based on the preceding statements, it can be indicated that the pedagogical context of teaching inclusion students, where the written text is sustained in the classroom, which serves as a corpus for the present study, has an impact on the type of text.

Although, as expected, not all elements of the context have a direct influence on the linguistic characteristics of the discourse, particularly in written pedagogical discourse, since new contextual elements could always be added in the discourse, which makes the symbiosis between text and context possible. Van Dijk's (2001) conception of context reflects a constant concern: the relevance of the context in the production of the text. The most complete systematization of the definition of context is manifested in the structured set of all properties of a social situation (knowledge, beliefs, intentions, actions) that are possibly relevant to the production, structures, interpretation and functions of text and conversation (Van Dijk, 1988).

The context is a set of circumstances in which the message is produced: place and time, culture of the sender and receiver, among others, and which allow its correct understanding. In this sense, Lyons (1981) refers to context as the determinant element of the meaning of the utterance at three different levels of textual analysis. First, you may allude to which sentence has been stated, if it has indeed been stated. Second, it will usually say what proposition has been expressed, if a proposition has been formulated. Third, it can serve to explain that the proposition in question has been expressed with one type of illocutionary force rather than another. In all three cases, the context is relevant in determining what is said.

On the other hand, each discursive community has its own culture that distinguishes it, characterized, among other aspects, by different schemes that control the production and dissemination of knowledge. The school community, as discursive, produces a type of discourse with very particular characteristics, specifically pedagogical, which shows a certain type of organization. The discursive activity itself and the language

that accompanies it construct contexts that allow the participants in the interaction (teacher-students of inclusion) to represent in a more or less coordinated way what they are dealing with. In fact, didactic interaction seeks to provoke in the student mental representations and skills elaborated in a more or less scaffolded way by the teacher, or developed through the didactic actions elicited in class (Vygotsky, 1979).

In this sense, the texts produced in the classroom are written to be interpreted in a particular sociocultural context, and therefore reflect the knowledge, norms and conventions shared by the members of the community (Van Dijk, 2001). In this environment, the type of text that emerges from the classroom constitutes an interesting communicative medium for teachers working in basic schooling, since, on the one hand, it allows them to make their pedagogical experiences known and, on the other hand, to have a space where they can obtain elements for their daily activities. In the context of the aforementioned aspects, the objective of this dissertation is to analyze the written pedagogical discourse of inclusion teachers in primary education at the Juan Rangel de Cuellar educational institution in Cúcuta, Norte de Santander, Colombia.

Method

In this research we propose to analyze the written pedagogical discourse of teachers of inclusion in primary education at the Juan Rangel de Cuellar educational institution in Cúcuta, Norte de Santander, Colombia. The concern, in this part of the work, is to investigate in natural contexts, that is, to analyze data taken as they are found in reality. This means that those texts extracted from the interviews in a specific context, such as the basic education classroom of the Juan Rangel de Cuellar school, were selected for the analysis.

Since the purpose as researchers, following Martínez (2000), is to observe the phenomenon, but not to transform it but to make interpretations, it is necessary to point out that the study is based on real data, so the type of research is qualitative. The design is supported by a study of ethnographic character, in which the researcher, according to Jirón and Imilan (2016), Diz-Casal (2017), Ingold (2017) and Frasco (2016), who agree with Goetz and Lecompte (1988), tries to provide an accurate picture of what teachers say and how they act. The use and justification of ethnography, in this research, is supported by the analytical description of the subject on the written pedagogical discourse.

For the development of this research, teachers from the Juan Rangel de Cuellar educational institution were approached. As this research requires the selection of participants, the Case Study is taken into consideration as an approach for the selection of key informants; therefore, the group of teachers is ascribed to the so-called purposive sample, according to Hernández et al. (2014). Finally, it is mentioned that the research process in the context was carried out over a period of two months, from January to March 2023.

Among the most frequent techniques for qualitative research are observation and interview, which according to Barrios (2006) and Hernández et al (2014), are specified through instruments. Thus, in the present research, the interview technique and an in-depth interview script were used as an instrument. Since the focus of interest in this ethnographic study is the discursive parts, following Martínez (2013) and Hernández et al. (2014) categorization and, subsequently, triangulation, constitute the basic analysis activities in the analysis of the data. Therefore, the information obtained during the

research was analyzed and interpreted based on the transcriptions of the interviews conducted with the selected teachers.

Results

Introductory Aspects

The research now requires the realization of the interpretative activity of the diagnostic findings on educational inclusion and written pedagogical discourse in the Juan Rangel de Cuellar educational institution. Information obtained from interviews. Thus, this chapter shows the implementation of the guidelines explained in the methodological design, i.e., one of the interviews is analyzed and categorized. In this regard, following Corbin and Strauss (2002), the first step consisted of "the simplification or selection of information to make it more manageable and manageable" (p.23).

For the aforementioned authors, data reduction tasks constitute rational procedures that usually consist of categorization; identifying and differentiating analytical units of meaning. Then, in each analytical unit of study, following Corbin and Strauss (2002), "textual accounts are obtained that give way to what the authors call axial coding, which is a process of relating categories to their subcategories" (p.134). These analytical units are constituted by the interview with the teachers, from which one was selected that functions, in this study, as an analytical unit from which deductive categories are obtained, which arise from the analysis through the permanent revisions to the work material.

What Teachers Say in Interviews

For this study, it is very important what teachers who work with inclusion students think about the teaching of written pedagogical discourse. In this regard, teachers mention that they do not feel qualified to assist a student with special educational needs in the writing process, since they generally always work with regular students. Therefore, it is necessary for teachers to be trained for diversity attention, but it is a process that must happen spontaneously.

Inclusion in Colombia, in recent times, is taken as letting them enter the classroom to study, but there are no tools, no material, no support to make the necessary adaptations. For example, how to care for a student in a wheelchair or with some other physical or cognitive disability, and also teach them how to write. Therefore, teacher training should allow for an analysis of the student's history, his or her condition and the recommendation made by the professional who detected the need, in order to provide professional and human assistance. Significant sentences and deductive subcategories that emerged from the teacher interviews are presented below.

Table 1
Meaningful sentences and subcategories

Meaningful sentences	Deductive subcategories
When we talk about inclusion students at the moment, one feels as a teacher that one does not have the competencies to be able to guide them.	Inclusion student orientation competencies.

But in theory we think we are not ready, but as we advance, we say that we are ready for it	
Inclusion is not properly implemented in the classroom because there are barriers: Let's say we have a student with a motor disability or a student with reduced mobility who has to be in a wheelchair and the school has not designed ramps for him/her, for example	Inclusion is not properly implemented in the classroom because there are barriers.
There is a need for instruments that enable this quality.	There is a need for instruments that enable quality in inclusive education.
It also requires the commitment of the parents so that the child can overcome these barriers, as well as the commitment of some students.	It also takes parental commitment for the child to overcome these barriers.
Classroom teachers should be trained for diversity. It is difficult to guarantee the process of adaptation and acceptance not only of the student with the disability, but also the process of adaptation with the student outside the family or outside the child.	Classroom teachers should be trained for diversity. It is difficult to guarantee the process of adaptation and acceptance not only of the student with the disability, but also the process of adaptation with the student outside the family or outside the child.
In teaching, learning styles and rhythms must be taken into account because this allows us to make these curricular adaptations and if we know the type of student, planning can be made a little easier.	Learning styles and rhythms must be taken into account in teaching.
The beliefs or preconceptions held by the teacher or the lack of knowledge about the disability greatly affects learning and the entire educational process.	The beliefs or preconceptions held by the teacher affect learning.
When teachers talk about written pedagogical discourse, they think it is very important because it is like the way to concretize ideas, it is like the way to know how to communicate.	The written pedagogical discourse is the way to concretize ideas and the way to know how to communicate.
The written discourse allows to identify the procedures to be carried out.	
With what is written, it is recognized which are the evaluative processes.	The written speech allows to identify the procedures to be carried out.
We have to look at the type of disability... because if we have students who... who have difficulties in interpreting or recognizing what is written, we have to do it with verbal language.	The evaluative processes are recognized in writing.
	It is necessary to look at the type of disability, because if the student cannot interpret or recognize what is written, it is necessary to do it with verbal language
you have to give very specific characteristics, like a few steps... what are we going to do first? we are going to read the text, second step we are going to understand what the text says, third step underline what is most important fourth step, ask what you don't understand... fifth step how to do it, yes? let's say we are going to do a specific topic... the narrative genres... then, we can	The teaching of writing goes first by reading the text, second step we will understand what the text says, third step underline what is most important, fourth step, ask what you do not understand ...

put an activity: elaborate a mind map, then explain step by step how to build a mind map, that we place a central idea, that we draw branches, then, the next step is to place an image, then look at what the main ideas are, then break down the themes of those main ideas... in other words, the written pedagogical discourse has a great influence... to achieve the goals of education as such..	We can draw up a mind map, then look at what the main ideas are, then break down the themes of those main ideas. Written pedagogical discourse is important to achieve the goals of education.
We improve our pedagogical practice and it is strengthened through experience...because we make an analysis of our daily life...today I did not do so well...these groups are not working...What am I going to do with this student? How do I improve? And to the extent that I ask myself what and how I improve, I am resignifying my pedagogical practice...	We improve our pedagogical practice and it is strengthened through the experience..
In the teaching of writing we must start from learning styles... learning styles and rhythms... why? Because first it allows me to identify the number of students who are...kinesthetic, visual and auditory...why? because knowing that result...when I plan my classes or when I am guiding a specific topic...I raise my voice for the students who are auditory, I move around the room or use resources in my hand...ehhh...so that I capture the...the attention of those who are visual and kinesthetic at the same time when I move around...yes? and when they are visual, I bring a poster or a slide, something that allows me to keep all the students focused...it allows me, for example, to plan classes with videos and not in the traditional way...but a minute and a half long video and the strategy would be to sit down with him, talk to him suddenly in an hour of rest, know what he wants, what he likes, have his affinities because even the chirping may represent that...what is the boy good for...	In the teaching of writing we must start from learning styles... learning styles and rhythms. Conversation with the student is necessary.
Starting from learning styles and rhythms...sometimes I may be bold but I refer the parents...I refer the students to orientation...so that they can give me a concept from the psychological profile... but if we can identify that the student has a learning difficulty, that he/she has a dyslexia problem, a dyscalculia problem, a dysgraphia problem...then I start to inquire with the parents and even with the students themselves... ehhh...and sometimes I am daring...when the disability is not so visible...for example, a student who has many motor difficulties...yes, to write, to have strokes...well...I tell him...bring me a double line notebook and I'll make him a planas...or if he wants we can make the planas together...let's make little figures together...so that you can improve your fine motor skills or so...but in any case, we always try to guarantee quality education whether you are diagnosed or not...ehhh...as I said at the beginning of this question...I refer you...take him.	Starting from learning styles and rhythms. Analyze whether students have dyslexia, dyscalculia, or dysgraphia and then inquire with parents and even with the students themselves. When a student has a lot of motor difficulties...a double line notebook is used to make flats.

Note. By the author (2023)

Table 2

Selection of subcategories and deductive categories resulting from the diagnostic interviews

Deductive subcategories	Deductive categories
Teacher competencies to guide the inclusion student.	Pedagogical competencies
In the classroom at inclusion is not properly enforced in the classroom because there are barriers.	Barriers to educational inclusion.
There is a need for didactic instruments that allow for quality in inclusive education.	Inclusive teaching strategies
It also takes parental commitment for the child to overcome these barriers.	Parental commitment
Classroom teachers should be trained for diversity.	Teacher training for educational inclusion.
It is difficult to guarantee the process of adaptation and acceptance not only of the student with the disability, but also the process of adaptation with the student outside the family or outside the child.	Adaptation of the student with some diversity.
	Acceptance of the student with a disability.
The beliefs or preconceptions held by the teacher affect learning. Learning styles and rhythms must be taken into account in teaching.	Pedagogical conceptions of the teacher.
The written pedagogical discourse is the way to concretize ideas and the way to know how to communicate.	Written pedagogical discourse and communication.
The written discourse allows to identify the procedures to be carried out.	Written discourse and pedagogical procedures.
The evaluative processes are recognized in writing.	
It is necessary to look at the type of disability, because if the student cannot interpret or recognize what is written, it is necessary to do it with verbal language	Writing and evaluation
	Relationship between writing and orality.
The teaching of writing goes first by reading the text, second step we will understand what the text says, third step underline what is most important, fourth step, ask what you do not understand ...	Writing process.
We can draw up a mind map, then look at what the main ideas are, then break down the themes of those main ideas.	The mind map and the writing process.
Written pedagogical discourse is important to achieve the goals of education.	

	Written pedagogical discourse and educational quality.
We improve our pedagogical practice and it is strengthened through the experience..	Pedagogical practices
In the teaching of writing we must start from learning styles... learning styles and rhythms.	Learning styles and the teaching of writing.
Conversation with the student is necessary.	Conversation and writing.

Reviewing what teachers say in the interviews reflects the subcategories and deductive categories. Then, the categories resulting from the interviews with teachers of the Juan Rangel de Cuellar educational institution appear: pedagogical competencies, barriers to educational inclusion, inclusive didactic strategies, parental commitment, teacher training for educational inclusion, adaptation of the student with some diversity, acceptance of the student with some disability, pedagogical conceptions of the teacher, written pedagogical discourse and communication, written discourse and pedagogical procedures, writing and evaluation, relationship between writing and orality, writing process, mind mapping and the writing process, written pedagogical discourse and educational quality, pedagogical practices, learning styles and the teaching of writing, conversation and writing.

From this variety of categories, the decision was made to select those that were directly related to the object of study, so the following were selected for the triangulation process: written pedagogical discourse and communication, written discourse and pedagogical procedures, writing and evaluation, relationship between writing and orality, writing process, mind mapping and the writing process, written pedagogical discourse and educational quality, pedagogical practices, learning styles and the teaching of writing.

A final section will present the conclusions of the article, followed by the main conclusions. Where appropriate, limitations and proposals for continuity will be included. The research now requires the realization of the interpretative activity of the diagnostic findings on educational inclusion and written pedagogical discourse in the Juan Rangel de Cuellar educational institution. Information obtained from interviews. Thus, this chapter shows the implementation of the guidelines explained in the methodological design, i.e., one of the interviews is analyzed and categorized. In this regard, following Corbin and Strauss (2002), the first step consisted of "the simplification or selection of information to make it more manageable and manageable" (p.23).

For the aforementioned authors, data reduction tasks constitute rational procedures that usually consist of categorization; identifying and differentiating analytical units of meaning. Then, in each analytical unit of study, following Corbin and Strauss (2002), "textual accounts are obtained that give way to what the authors call axial coding, which is a process of relating categories to their subcategories" (p.134). These analytical units are constituted by the interview with the teachers, from which one was selected that functions, in this study, as an analytical unit from which deductive categories are obtained, which arise from the analysis through the permanent revisions to the work material.

Triangulation Interviews

After having generated the deductive research categories, we proceed to triangulation. For this purpose, the comparison of empirical sources and theoretical sources is used. In this case, we compare what was said by the teachers in the interviews, as key informants and what was observed by the researcher, to explain the selective categories from the convergence with the theoretical aspects to analyze the analysis of the written pedagogical discourse in the teachers of inclusion in primary education at the Juan Rangel de Cuellar educational institution, in Cúcuta, Norte de Santander, Colombia.

In this regard, Goetz and Lecompte (1988) argue that "triangulation consists of a cross-check between different sources of data, whether they are people, instruments, documents or a combination of all of them" (p.78). Next, the graphic systematization of the triangulation is presented, to give way to the interpretative processes of the selective categories.

Figure 1

Triangulation process

Note. The figure shows the final selection of deductive categories that emerged from the teacher interviews.

Therefore, by triangulating the results obtained in the inquiry, three significant categories were selected for the final interpretation and analysis, as a result of a constant review of the work material. In this sense, the categories written pedagogical discourse and communication, written discourse and pedagogical procedures, written pedagogical discourse and educational quality were used. That is to say that, from a variety of categories that emerged from the permanent review of the interviews, the decision was made to select those mentioned; and for their analysis, the subcategories significant to each category were extracted.

Then, with respect to the category written pedagogical discourse and communication, it starts from the subcategory associated with written pedagogical discourse as the way to concretize ideas in order to communicate. For the researcher of the present study, the written discourse that emerges from classroom activities is a tool that involves the participation of the protagonists of the educational environment, even

among classmates and teachers, since everyone performs the action of writing. Therefore, it is important, in the writing process to communicate what happens in the classroom, that the teacher takes into account the student's knowledge regarding the use of techniques and resources to produce a text. Within the classroom, written work should encourage participation and exploration of both teaching and learning processes, since the products that emerge allow observing the individual contribution of a student, even increasing the motivation for classroom work, generating the collaborative need for each other to produce well elaborated texts, which can strengthen the development of skills and spontaneous learning to communicate in writing the didactic activities.

In this order of ideas, following Leal (2009), the written pedagogical discourse that emerges from the classroom is built through a dialogic process, expressed by the transmission of knowledge of something that is to be communicated. It seeks to provoke the learning of writing with a social function, since, in addition to the procedures for imparting knowledge, it also requires making pedagogical practices known. In this regard, Van Dijk (2002), states the importance of communicating classroom actions in order to generate useful knowledge for life in the student. To this end, it is important that teachers assume a conception of teaching that implies comprehensiveness in the construction of knowledge in the production and communication of written discourse.

For this reason, the researcher alludes that, inside the classroom, teachers discover every day different ways of conceiving writing on the part of the students, among them the scarce motivation for what is written, so it is important to be clear about the difficulties presented by the students. For this reason, the classroom climate is fundamental, which must be oriented to the learning of writing, accompanied by listening and observation of these particular needs. Thus, the teacher must create spaces within the classroom to motivate and encourage writing by developing potentially meaningful contexts that rely on a highly interactive methodology with a social function.

Regarding the category of written discourse and pedagogical procedures, the researcher states that these depend on the actions of the teacher, who is basically oriented to understanding the educational reality in which he/she works, in order to organize the teaching of written discourse according to his/her conception. Didactic strategies are a way of planning the teaching process for the learning of writing, all of which revolves around a general theme that becomes the integrating axis of the process, providing consistency and significance to the theoretical contents that the student must acquire, but, in some cases, far from the training in writing. Likewise, the researcher thinks that this way of organizing knowledge and experiences should consider the diversity of elements that contextualize the process: student level, sociocultural and family environment, to regulate the practice of the contents, select the basic purposes to be achieved, the didactic guidelines with which the written text is worked and the necessary teaching experiences to improve the process.

Following the ideas of Leal (2009) and Parodi (2000), the teacher, in his processes of teaching written text, shares with the student didactic and cultural forms that are the basis for acquiring knowledge, specifically about written discourse. Van Dijk (1983) mentions that if students and teachers, when sharing pedagogical discourse, have the same knowledge base, the classroom experience could be written down in a concerted manner. The complex way of producing knowledge through pedagogical practice implies a hierarchy and position of the teacher. For example, once the teacher begins his class, students must be ready to listen and thus the pedagogical discourse is lost in the teacher's text.

That is to say, according to Mota (2001), teachers do not share with students the cultural knowledge that is the basis for acquiring social and specifically pedagogical knowledge; therefore, there are very few publications on the pedagogical practices that take place inside the classroom. For, as Núñez (1993) says, if the members who share the pedagogical discourse, teachers and students, exchange and construct knowledge, a written discourse could be produced as a product of classroom discussions and not as a copy of the class.

Regarding the category of written pedagogical discourse and educational quality, the researcher states that it is essential for teachers to take into account the basic learning rights - DBA. Because in this proposal is printed the aspirations of Colombian education for the so longed-for quality. The DBAs state that students should develop skills to assume the written production processes as constructive processes resulting from actively constructing meanings, applying cognitive strategies and reflecting on their own writing process. Thus, for the researcher of this inquiry, the Basic Learning Rights associated with writing are necessary for competencies in all areas of the curriculum. In this sense, the student requires the necessary reasoning to have the ability to write in the different subjects. In relation to the above, Tobón (2009) and Hoyos and Gallego (2017), refer that didactic strategies to form a good writer from the classroom, must take into account thinking skills.

According to Silva (2012), the search for quality in the teaching and learning processes requires teachers to train students to be competent in textual production. In this regard, López (2000) and Macías (2006) state that educational quality also requires a search for meaning in the processes that involve the concerns and possibilities of those who work in academic environments. The issue of the didactics of writing plays an important and urgent role, due to its transversality in academic learning and its role in the quality of education.

Consequently, for Fuenmayor et al. (2008) and León and Cordero (2021), it is essential that teachers reflect on what corresponds to the teaching of writing and learning in the management of linguistic resources as a tool for the production and communication of knowledge. Because, according to Silva (2012), by unveiling the factors that influence the process of teaching writing, it will be easier, then, to search for strategies appropriate to the demands imposed by the pedagogical environments to their students, to make their practices known and contribute to the quality of education.

According to Silva (2012) and León and Cordero (2021), the aforementioned aspects imply transcending teaching techniques to give way to the students' knowledge, which allows the debate on the quality of education, from the perspective of written literacy, inasmuch as the qualification in writing is necessary for all learning, in the different academic areas.

Discussion and Conclusions

The written pedagogical discourse is the consequence of the interaction between the teacher and the student inserted in a culture, where each member shares categorizations, differentiations and negations with the members of the community. Therefore, the teaching practice, the action and the interaction between the teacher and the teacher presuppose discursive strategies that regulate the basis of the didactic activities to make them an encounter between the student and the writing processes.

The written pedagogical discourse is a generative act of teaching where the student must establish a relationship with the procedures and contents proposed by the teacher, in order to seek a contextualized social practice. In this sense, the practice of written pedagogical discourse must be implemented in a contextual framework of pedagogical activities and, in turn, framed in the students' knowledge, in order to activate the students' thinking with a view to forming them as text producers, without forgetting, of course, the context where this is developed. As stated by Arvelo (2021), the adaptation of pedagogical strategies according to the context makes it possible to respond to educational barriers in terms of inclusion. This finding was found in the results since the participants mentioned the need for orientation and training in terms of inclusion and its management in the classroom, taking into account that the educational institution is not fully adapted for this type of students even though it theoretically meets the minimum conditions, so that training the learner as a text producer becomes complex.

Now, based on the results, an interesting conclusion is the preconception that educators have in relation to inclusive students since they mention that having a student with this type of conditions makes their pedagogical practice more complex, adding the management of emotions that the student may have and their influence on the school environment such as motivation in the development of activities, assertive communication and participation. Opinions that are supported by Van Dijk (1988), when he mentions that the definition of context is manifested in the structured set of all the properties of a social situation (knowledge, beliefs, intentions, actions).

Finally, from the teachers' opinion, it is concluded that teacher training for the correct orientation of inclusion students is important in order to generate an inclusive and quality education, either during the pedagogical practices or during teacher training (university studies). In the same way, the participants affirmed the need to adapt the educational facilities for students with physical disabilities, since they do not have these adaptations, which makes it difficult for them to move around the school. Likewise, it is important to mention that, although the research obtained results with broad clarification, the research will continue with a larger sample of participants in which the results will be compared in order to provide a conclusive and significant result.

In relation to the researcher's opinion, it is concluded that teachers act from their experience despite the lack of knowledge and tools (physical, human) that they may have regarding inclusion, both cognitive and social, with the optimism of generating: a) a concept of quality inclusive education in their reality; b) a practice of written pedagogical discourse based on a contextual framework of pedagogical activities; c) the flexibility of their curriculum according to the needs of students; and d) the adaptation of the environment in order to provide an optimal school environment for all learners in general.

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ACTIVE METHODOLOGIES IN ECUADOR: APPROACH TO THE LITERATURE REVIEW OF PROJECT-BASED LEARNING, PROBLEM-BASED LEARNING AND FLIPPED CLASSROOM

METODOLOGÍAS ACTIVAS EN ECUADOR: APROXIMACIÓN A LA REVISIÓN DE LITERATURA DE APRENDIZAJE BASADO EN PROYECTOS, APRENDIZAJE BASADO EN PROBLEMAS Y AULA INVERTIDA

Antonio Abarca Zaquinaula[1]
International Iberoamerican University, Ecuador
(antonioabarcaz1@hotmail.com) (https://orcid.org/0009-0008-5479-2150)

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active learning, pedagogical practices, active methodologies.

ABSTRACT

Educational processes are changing in Latin America, adjustments have been made to curricular models, attempts are being made to incorporate technological innovations, attempts are being made to better understand current students, and in that order, in Ecuador it is also a matter of innovating teaching-learning methodologies. The purpose of this study, developed during 2022 as part of the Master's Thesis (TFM), is to identify recurrent conceptual and methodological aspects on the implementation of active methodologies in Ecuador. This is a bibliographic review of journal articles and master's theses, a total of 10 empirical investigations. In Ecuador, the process of methodological change and renewal, from the traditional teaching scheme, would take at least ten years, during which time attempts have been made to implement new methodological strategies, such as: Project-Based Learning (PBL-projects), Problem-Based Learning (PBL-problems), and Flipped Classroom-based learning. There is a certain similarity in terms of concepts and procedural guidelines of application, as well as the resistance to change in a large part of teachers. Based on the results, the widespread application of active methodologies in the Ecuadorian school environment is justified; and, based on unforeseen findings, the convenience of conducting empirical studies to evaluate the presence of aspects of several active methodologies in teaching practice in a combined or simultaneous way is proposed. Keywords: active learning, pedagogical practices, active methodologies.

[1] Corresponding author.

Palabras clave:
aprendizaje activo, prácticas pedagógicas, metodologías activas.

RESUMEN

Los procesos educativos están cambiando en América Latina, se han realizado ajustes a los modelos curriculares, se está tratando de incorporar innovaciones tecnológicas, se intentan comprender de mejor manera a los estudiantes actuales, y en ese orden, en el Ecuador se trata de innovar también las metodologías de enseñanzas - aprendizaje. El presente estudio, desarrollado durante el año 2022 como parte del Trabajo de Fin de Master (TFM), tiene como propósito identificar aspectos conceptuales y metodológicos recurrentes sobre implementación de metodologías activas en el Ecuador. Se trata de una revisión bibliográfica de artículos de revista y tesis de maestría, en total 10 investigaciones empíricas. En el Ecuador el proceso de cambio y renovación metodológica, desde el esquema tradicional de enseñanza llevaría al menos diez años, durante los cuales, se ha intentado implementar nuevas estrategias metodológicas, como: Aprendizaje Basado en Proyectos (ABP-proyectos), Aprendizaje Basado en Problemas (ABP-problemas), y Aprendizaje Basado en "aula invertida" (flipped classroom). Se percibe cierta similitud en cuanto a conceptos y pautas procedimentales de aplicación, como también, la resistencia al cambio en gran parte de docentes. En función de los resultados se justifica la masificación de la aplicación de metodologías activas en el ámbito escolar ecuatoriano; y, en función de hallazgos no previstos, se plantea la conveniencia de realizar estudios empíricos para evaluar la presencia de aspectos de varias metodologías activas en la práctica docente de forma combinada o simultánea.

Introduction

This article addresses one of the determining factors in the learning process. As important as the conditions of the educational center, the educational policies or the role of the teacher are, so are the appropriate learning methodologies.

Teaching and learning models, strategies and methodologies are progressively advancing, adapting to the new conditions and circumstances of social change. According to Bauman (1999), the last decades, unlike previous moments of social change in history, are shaping a new characterization of the subject, and therefore of the subject of learning[2]. Therefore, teachers are required to innovate teaching methodologies based on their knowledge of these new circumstances and contextual conditions that are affecting the learning processes.

The traditional teaching-learning methodologies, based mainly on behaviorist and cognitivist theories focused mainly on the role of the teacher, do not correspond to the current contextual conditions of globalization in access to information, digitalization in technological tools, and the new profiles and needs of current students, so it is necessary to move towards student-centered learning methodologies, which promote their participation in the learning process; it is therefore necessary to consider active methodologies, whose theoretical bases arise from constructivist perspectives.

Active methodologies are better adapted to the profile of the new student, susceptible to be motivated mainly through the manipulation and use of images, this new student that García et al. (2007) describe it in the following terms:

> They were born in the digital age and are consummately skilled, permanent users of technologies. Its main characteristic is undoubtedly its technophilia. They are attracted to everything related to new technologies. With ICTs they satisfy their needs for entertainment, fun, communication, information and, perhaps, also education (p.2).

For their part, Restrepo and Waks (2018) refer to active learning as:

> Active learning is framed within constructivist learning methodologies and consists of using instructional techniques that involve students in the process of their own learning through activities such as writing, reading, speaking, discussing, researching, manipulating materials, making observations, collecting and analyzing data, synthesizing or evaluating elements related to the content covered in the classroom, among other aspects (p.4).

In this sense, active methodologies are by definition drivers of active learning, to the extent that they are the result of didactic strategies that promote participation, cooperative and collaborative work, which, in general, is also achieved through group activities. In this order, Valcárcel et al. (2015) note: "In the interaction fostered by active methods, individual knowledge is socialized, enriching and enhancing it in collective knowledge, which appears as a product of group activity" (p.52).

Moncayo-Bermúdez and Prieto-López (2022) emphasize the application of constructivist techniques in the teaching-learning processes as a strategy to develop 'visible thinking', stating: "Visible thinking, according to studies carried out by Sepúlveda et al. (2018) is any kind of observable representation that helps to document, support, and develop thinking, (...)" (p.48). Therefore, active methodologies, of course, contribute

2 We are facing a new learning subject profile, which has been emerging since only three decades ago, a transmutation catalyzed by this "new normality", which greatly accelerates the transition from analog to virtual-digital.

to the formation of the ability to reason critically, in order to confront meaningful learning with concrete reality.

Muñoz and Pérez (2017) in their work around "invisible learning", point out the importance of using didactic resources in a creative way, for the development of higher levels of reflective capacity in students to relate concepts to concrete problems of everyday life. In other words, the application of active methodologies will have a better chance of contributing to the consolidation of this type of learning, which, moreover, according to the authors, is present in practice in all people.

Restrepo and Waks (2018) address basic concepts about the principles and foundations of active learning, refer to the advantages over traditional techniques, and support them with comparative case research. They also point out the absence of tools to guide active learning when planning: "There are few resources available to teachers and schools that explain in a synthetic, practical and agile way what this active and participatory methodology consists of" (p.3). On the other hand, Restrepo and Waks, regarding the basic characteristic of active learning, point out that not only the student is motivated to greater participation and critical reflection, but also, implicitly, the teacher.

Some authors agree that some general principles of active methodologies are: cooperation, collaboration, metacognition, self-regulation, and the use of ICT. Cooperation refers to the fact that each person shows commitment to his or her task; collaboration, when, in addition to cooperating, people work together with the same objective; metacognition, as the ability to reflect on thought processes and the way in which one learns; self-regulation, the ability to self-manage and self-generate reflections, feelings and actions; and the use of communication technologies, which are gradually and progressively incorporated into the field of teaching-learning processes, until becoming the tool with the greatest incidence at present.

Bernal and Martínez (2009), on the fundamentals of active methodologies, point out:

1. The student is an active protagonist of his or her learning.

2. Learning is social. Students learn much more from the interaction that arises between them than from exposure alone.

3. Learning must be meaningful. Learning needs to be realistic, feasible and complex so that the learner finds relevance in the transfer of such content (p.102).

By incorporating the term meaningful learning we are alluding to a pedagogical current that emerged from constructivism; this perspective considers that new learning is constructed from previous knowledge that the student possesses as preconceptions, forming at the same time a network of knowledge (Ausubel, Novak and Hanesian, 1983).

Theoretically, there are several active methodologies: participatory master class, thinking-based learning, inverted classroom, project-based learning, problem-based learning, design thinking-based learning, gamification-based learning, solidarity service learning and team-based learning; but, for this review, based on direct daily observations and approximate surveys in information search platforms on the web, this study focused on three of them, which may be the most recurrent in the Ecuadorian school environment: Project-based learning (PBL-projects), problem-based learning (PBL-problems), and flipped classroom learning (flipped classroom).

Project-based learning is essentially "learning by doing". Castellano (2021), refer to its definition as:

> (...) Project Based Learning, in its acronym PBL, can be defined as a teaching modality that focuses on different tasks through a shared process of negotiation between the different participants, student-teacher and student-student, its main

> objective being the achievement of a final product or project that provides a solution to a challenge, problem or key question posed. (p.178).

The problem-based learning as well as project-based learning is made viable through collaborative work, self-regulation and the use of ICT, the characteristic result of this methodology is the creation of critical-reflective capacity in the student; in this sense, Morales (2018) points out: "(...) PBL is the means by which it becomes possible to establish the conditions conducive to active, contextualized, integrated and comprehension-oriented learning, providing opportunities to reflect on the educational experience and apply what has been learned" (p. 93).

Méndez and Méndez (2021), in one of the first conceptual considerations, emphasize that one should not confuse or consider in an equivalent way the task of solving problems with the learning methodology, thus, quoting several of their sources, they point out "However, problem solving is an extension of PBL and may or may not be included in this learning method" (p.12). These authors, on the other hand, analyze the learning-by-problems methodology from the cultural-historical approach, pointing out the following, based on Vygotsky's foundations:

> In this process, the central axis is the articulation of the psychological processes, which allow us to become aware of ourselves and the environment in which we develop, as well as the sociocultural ones where social relations intervene in the environments established by the subject. (...) (p. 80).

Therefore, the difference between PBL-projects and PBL-problems lies in the fact that while in projects, the final product of learning must necessarily be a tangible product, in problems, the final product is the solution of a case, generally at a theoretical-abstract level.

In turn, "inverted classroom" is the methodology that, whether operating as an exclusive methodology or complementing another methodology such as PBL problems or PBL projects, is the one that best adapts to the new characteristics that educational processes are acquiring. In its procedural sequence, two stages are differentiated: individual autonomous and group directed and facilitated by the teacher in the classroom, together, the student progressively advances in the different phases of knowledge construction. In this sense, Berenger (s/f) points out:

> The flipped learning model manages to cover all the phases or levels of the well-known Bloom's Taxonomy, since, when the student faces the previous work outside the classroom, he/she exercises the first three, that is, knowledge, comprehension and application (skills or cognitive processes considered of lower order) and in the classroom he/she works on the cognitive processes of greater complexity (knowledge, comprehension and application) (p. 5).

On Tools for Implementation in the Ecuadorian Context

Noguera and Mejía (2017) propose a didactic guide on active techniques of the direct method in the development of communicative competencies, emphasize the need to use active strategies in the teaching-learning processes of the English foreign language. In this regard, it can be said that guides such as the one proposed in this work can be applied in a conditioned manner to the learning of other contents.

The Ministry of Education of Ecuador has made available to teachers the document called "Instructive for the elaboration of interdisciplinary projects" (Ministry of Education of Ecuador -MINEDUC, 2021), as a guide for the implementation of the so-called "interdisciplinary projects" during the last two school years. The following are some relevant ideas from these instructions.

An interdisciplinary project is a means to develop competencies anchored to the current curriculum, it is based on the ABP (Project Based Learning) methodology, which is approached from different subjects and/or curricular disciplines, it aims to:

- Integrate areas of knowledge.
- Strengthen competencies according to the sub-level of General Basic Education and High School level.
- Apply knowledge. (p. 6).

Méndez and Méndez (2021) about the procedure of Learning by problems refer to four sequential phases: "knowledge activation and analysis; research and study; problem solving; and, presentation to the class and evaluation" (p.23).

Studies in Favor of a Methodological Change in Middle School Education in Ecuador

Villacrés (2016) establishes the need to consolidate the application of active methodologies, in a given educational unit, noting first that teachers, despite having some institutional guidelines and directives on active methodologies, tend to use the traditional methodology, which results in low performance in student learning. In this research a description of the problem is made, such as the poor training and lack of training of middle level teachers in active methodologies, added to this the lack of available tools, a situation that according to the author is having a negative impact on the learning level of students. In one of the conclusions it states:

> The learning by skills with performance criteria that students have achieved are the following: estimating, identifying, listening, recognizing, among others, those that have not yet been achieved are understanding, constructing, solving, contrasting, due to the fact that teachers are not adequately developing the learning by skills with performance criteria. (p.97).

Granja (2019) mentions that teachers continue to adopt traditional roles in their actions within the classroom, typical of traditional methods and school, which continue to apply the master lecture as the basic methodology, with which, effectively, it is agreed that it "kills the creativity and autonomy of students", deriving in low academic performance. The author refers to studies such as the "PISA assessment standards" (pp. 15-17); and ends by emphasizing the advantages of active methodologies over the traditional teaching method.

For his part, Morales (2011), referring to the nature of active methodologies in contrast to traditional methods, points out: "The active and participatory methodology demands that the subjects engage with and strengthen the group" (p.45). In her research with a qualitative approach of descriptive scope, Morales starts with a diagnosis of the application of active strategies in teachers of an educational unit in the south of the city of Quito, and ends by recommending the "study circles" strategy.

Alvarado-Miles et al. (2017), diagnose the training needs of teachers in a certain school in the city of Quito, emphasize the importance and need to incorporate the tools that information technology currently provides to teaching strategies.

The following objectives were established for this literature review: 1) Characterize the bibliographic production on implementation processes of: Project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning in Ecuador; and, 2) To identify the conceptual and procedural particularities in the experiences of project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning in Ecuador.

Method

The bibliographic production on experiences of active methodologies in the Ecuadorian space is relatively scarce in databases; on the other hand, no doctoral theses from Ecuadorian universities were found that have directly addressed the subject; therefore, methodologically, this is a bibliographic review of narrative order in the terms expressed by Reyes (2020): "They are a selection of data collected from the literature, presented to readers as a synthesis to which the review authors add their own comments, conclusions and recommendations (...)" (p. 5).

The following search equations were used in the Google Scholar and SciELO databases: thesis, active methodologies, active learning, project-based learning, problem-based learning, inverted classroom. In addition, the Boolean operator AND was used in the case of the SciELO database; to make search combinations among the selected descriptors, 'methodologies AND active', 'methodologies AND active learning', 'methodology AND projects', 'learning AND problems', 'learning AND flipped classroom' and the descriptor thesis AND most of the other descriptors mentioned above were combined.

The inclusion criteria were theses and articles should have been published within the last five years. In particular, the articles should be empirical research, and the theses should correspond to master's degree levels and be included in repositories of Ecuadorian universities.

Of these, 3 are articles where empirical methods were used, published in Ecuadorian journals and 7 master's theses (Master's thesis) obtained from repositories of the following Ecuadorian universities: Universidad Central del Ecuador, Pontificia Universidad Católica del Ecuador-PUCE, Universidad Técnica del Norte, Universidad Nacional del Loja and Universidad Regional Autónoma de los Andes - UNIANDES. This is shown in Table 1.

Table 1

Studies on the implementation of active methodologies in Ecuador analyzed

Study	Type of publication	Magazine/Repository	Database
Eras (2022)	Thesis	Repositorio Universidad Nacional de Loja	Google Scholar
Fonseca-Factos and Simbaña-Gallardo (2022)	Empirical article	"Novasinergia" magazine.	SciELO, LATINDEX
Macias-Peñafiel and Arteaga-Pita (2022)	Empirical article	"Polo del Conocimiento" Magazine	Google Scholar
Mancheno (2013)	Thesis	UNIANDES University Repository	Google Scholar
Lopez (2017)	Thesis	Central University of Ecuador -UCE Repository	Google Scholar
Ortega (2015)	Thesis	National University of Loja-UNL Repository	Google Scholar
Red (2021)	Thesis	Repository of the Pontifical Catholic University of Ecuador - PUCE	Google Scholar
Rumipulla (2020)	Empirical article	Repository of the Pontifical Catholic University of Ecuador - PUCE	Google Scholar

Sanchez (2022)	Thesis	National University of Loja-UNL Repository	Google Scholar
Yépez (2022)	Thesis	Universidad Técnica del Norte Repository	Google Scholar

Results

In the initial steps, we proceeded to characterize the studies analyzed, 4 refer to PBL-projects, 3 to PBL-problems, and 3 to Inverted Classroom; in most studies the survey is used as data collection technique, only in one case observation is used; as for instruments, the questionnaire prepared for the study (ad hoc questionnaire) predominates, one study is quasi-experimental with application of pre-test and post-test; as for the level of education, where the study populations and samples are located, 2 correspond to the primary or basic general education level in Ecuador, 6 to the middle or high school level, particularly at the baccalaureate sub-level, and 2 to the higher level; as for the year of the research, the oldest identified is 2012-2013; as for the subjects participating in the samples, they are teachers and students of the educational levels referred to, which, in terms of number, range between 1 and 11 teachers, and between 21 and 256 students, as shown in Table 2.

Table 2
Characterization of the studies analyzed

Study	**Thematic**	**Technique and instruments**	**Level of education and school year of study**	**Research subjects**
Eras (2022)	PBA - Projects	Survey Ad hoc questionnaire	Primary level	6 teachers 30 general basic education students
Fonseca-Factos and Simbaña-Gallardo (2022)	PBA - Projects	Survey Likert Scale	Medium level	11 teachers 256 students of the Rural Educational Unit
Macias-Peñafiel and Arteaga-Pita (2022)	PBA - Projects	Survey Ad hoc questionnaire	Medium level	4 teachers 31 high school students
Mancheno (2013)	PBA-Problems	Survey Ad hoc questionnaire	Higher level	12 teachers 87 students from Instituto Técnico Superior
Lopez (2017)	Inverted Classroom	Survey Ad hoc questionnaire Pre test and post test Quasi-experiment	Higher level 2016-2017	University students 30 students for the experimental group 30 students for control group
Ortega (2015)	PBA-Problems	Survey	Medium level 2012-2013	3 teachers

		Ad-hoc questionnaire Pre test and post test		21 first year high school students
Red (2021)	PBA - Projects	Survey Ad hoc questionnaire	Medium level 2020-2021	10 teachers 80 students in the third year of high school
Rumipulla (2020)	PBA-Problems	Survey Ad hoc questionnaire	Medium level 2019	31 teachers of the Educational Unit
Sanchez (2022)	Inverted Classroom	Observation, interview and survey Ad hoc questionnaire	Primary level 2021 - 2022	1 teachers 30 students in the first year of high school, seventh grade, general basic education
Yépez (2022)	Inverted Classroom	Survey Ad-hoc questionnaire	Medium level 2021 - 2022	90 high school students

In the bibliographic review, an attempt was made to identify the basic concepts of active methodologies, such as active learning; from there, to the procedural guidelines, difficulties, achievements, and more particularities related to the application of the three selected active methodologies: Project-based learning (PBL-projects), problem-based learning (PBL-problems) and flipped classroom learning.

On the other hand, the Ecuadorian bibliographic production of research on the implementation of active methodologies is directly related to the institutional structure of teacher training in Ecuador. In approximate terms, in the Ecuadorian university system, at least 15 universities, most of them state universities, train teachers at the bachelor's or third level, from faculties that are generally called "Education Sciences", of which no more than 10 faculties have master's degrees in education, while there are no universities with completed doctoral programs in education.

Project-Based Learning (PBL-projects)

Macías-Peñafiel and Arteaga-Pita (2022), referring to the relevance of the student's role in the learning process in the Project-Based Learning methodology, point out: "The role of the learner in PBL is central, since a project must incorporate the component of learner autonomy in their choices, as well as unsupervised work time (p. 1589).

The authors start from the importance of the diagnosis for the application of strategies for teaching mathematics to high school students of a certain educational unit in the city of Guayaquil; in the results of the research, they refer to the following: "Most teachers know about active methodologies such as project-based learning, but they are unaware of the importance of these methodologies and how they can contribute to the teaching and learning process with students" (p.1590).

Fonseca-Factos and Simbaña-Gallardo (2022) conducted an evaluation of the results of the project-based learning methodology, under the particularity of "Science, Technology, Engineering, and Mathematics (STEM)" implemented in the subject of physics at the high school level, in a specific educational unit in rural Ecuador, reaching the following results, among others:

> 81.8% of teachers say that the use of new technologies for teaching the subject of Physics will always improve the understanding and motivation of students.
>
> 72.7% of teachers believe that establishing interdisciplinary projects will always allow the integration of content and learning experiences in the classroom. (p. 99).

Eras (2022) in his research with a quantitative approach, refers to project-based learning in terms of the role that teachers should play:

> (...) leads teachers to work collaboratively, prevailing order, respect and generation of new ideas that are permanently promoted by the teacher, all this is done to achieve the central objective of learning by doing (p. 6).

In one of his conclusions, the author states: "Project-based learning works mainly under a collaborative learning where it seeks the creation of heterogeneous groups in which students can help others in some aspects of the learning process" (Eras, 2022, p.56). On the other hand, the author refers to the collaborative and participatory nature of the dynamics of this active methodology, which is particularly expressed in the group work in class, which, in addition and in general, is widely accepted to be developed through the workshop strategy.

On the other hand, Rojas Moposita (2021) defines PBA-projects as:

> (...) it is an active methodology, which allows students to develop collaborative integration skills for the search of solutions to real problems through motivation, planning, construction and evaluation, which promote the development of competencies to be applied in the working world (p.22).

In terms of findings, Rojas Moposita, referring to the need for innovation in learning methodologies in the educational unit under study, points out: "teachers use old-fashioned learning strategies, do not allow for the development of creativity, nor for cooperative participation, thus preventing the student from being the main author of his or her learning" (p.101).

Problem-Based Learning (ABP-problems)

Mancheno (2013), in his research with quantitative approach, verifies that university students of the higher education institution of Ecuador of his study consider as a valid alternative option the definitive implementation of problem-based learning instead of the traditional methodology. In relation to the innovative nature of this learning methodology, citing Martínez & Cravioto, (2002), he points out:

> (...) While traditionally the information is first presented and then its application is sought in the resolution of a problem, in the case of PBL the problem is first presented, the learning needs are identified, the necessary information is sought, and finally the problem is returned to (p. 27).

Mancheno (2013), in one of his survey questions notes: "Do you consider that the application of problem-based learning (PBL) at ITSB will lead to improved student understanding?" (p.79). The affirmative answer to this question by the majority of the respondents gives the basis to consider that the application of PBL can have a significant impact on the teaching-learning process of the marketing subject, improving the academic performance of the students of the Higher Cycle of the ITSB of the city of Ambato. In this order, in one of its conclusions it states that:

> The change from the traditional methodology, focused on memory, where the student assumes a passive role, receiver of information, to the active methodology of PBL, where the student takes responsibility for his learning process and undertakes actions that lead him to develop strategies to search for information, select it, organize it and finally employ it for the resolution of the problem posed,

> caused, at the beginning of its implementation, bewilderment and anxiety in most of the students in the test group (Mancheno, 2013, p.126).

Regarding the simultaneous nature of the processes of teaching and learning, which in practice affects both the one who teaches and the learner, Mancheno (2013) points out: "(...) the type of relationship existing between teaching and learning is one of ontological dependence between the two concepts. Teaching cannot exist without learning because if learning did not occur there would never be any sense in talking about teaching" (p.38).

Ortega (2015) refers to the potential and advantages of the problem-based learning methodology, which should be implemented permanently as a teaching-learning strategy in the subject of mathematics in the educational unit of his study, in the province of Loja. It refers to PBA-problems such as:

> (...) is based on the principle of posing problems as a starting point for the acquisition and integration of new knowledge, working in small groups of students and through the tutor's facilitation, selected or specially designed problems are analyzed and solved to achieve certain learning objectives (p.49).

The aforementioned author starts by establishing, by means of quantitative techniques, the situation of the didactic strategies that mathematics teachers usually apply. In his conceptual framework, the author refers to the definition of the problem as as: "To have a problem means to consciously seek an appropriate action to achieve a clearly conceived, but not immediately achievable goal" (Ortega, 2015, p.10). It concludes that "PBL improved the teaching-learning process of linear and quadratic functions in the first year of high school at the Colegio Nacional Mixto Manuel Benjamín Carrión in the parish of Yangana, in the canton and province of Loja" (p.141).

On the other hand, Rumipulla (2020), in his research with a qualitative approach, in defining and describing the specific characteristics of PBL-Problems points out: "(...) it is a didactic method, which falls in the domain of active pedagogies and more particularly in that of the teaching strategy called learning by discovery and construction, which is opposed to the expository or magisterial strategy" (p. 9). On the other hand, it is referred to as: "an active method of learning based on the principle of using problems for the integration of new knowledge" (p.11).

Rumipulla (2020) states in one of the specific objectives "To diagnose the knowledge that teachers of the "María de Nazaret" Fiscomisional Educational Unit have about Problem-Based Learning" (p.7); and in results, he points out:

> (...) it was possible to verify that the teachers of the "María de Nazaret" Fiscomisional Educational Unit do not agree with the theme of teacher training by the Ministry of Education, since they consider that it does not meet their professional needs (p.35).

Learning Based on "Inverted Classroom"

Yépez (2022), research with a qualitative approach and explanatory scope, in the theoretical framework, regarding the concept of "inverted classroom", citing Vidal (2016), points out:

> A pedagogical orientation in which direct education moves from a collective learning space to a space particular to the school, and the resulting collective knowledge space becomes a dynamic and participatory knowledge environment, where the teacher guides the group as it uses the concepts and participates creatively in the subject. (p.12).

Yépez (2022) defines his research problem through the following question: "Is it possible to change traditional teaching with the use of active methodologies to achieve meaningful learning for high school students?" (p. 6); the general objective: "To strengthen the learning process of the high school students of Victoria Bilingual Christian Academy based on the Inverted Classroom methodology, which will allow the implementation of more effective teaching strategies in the 2021 - 2022 school year." (p. 8); in one of its conclusions, it states:

> The active methodology of the inverted classroom is a modality for learning that combines the virtual environment with the face-to-face, where the teacher is a guide that contributes to complete the cycle of knowledge based on this methodology that includes: knowledge, comprehension, application, analysis, synthesis and evaluation, these strategies used to fulfill the cycle of knowledge are effective and keep them motivated, also encourages them to be part of the teaching-learning process of their school life (p.154).

López (2017), in his research with mixed approach and correlational explanatory level, tries to explain the incidence of the inverted classroom methodology in the academic performance of the learning of specific topics of the English subject in the students of the period September 2016-February 2017 of the university of his study. Regarding the specific characterization of inverted classroom, he points out:

> (...) focuses on the student's autonomous work to be reinforced collaboratively in class. In addition, this technique accepts any type of materials such as videos designed by the teacher or videos previously made by other teachers related to the topics, books, workbooks, multimedia broadcasting or countless other materials that introduce key concepts about any topic that can help the student to better understand the subject he/she wants to learn. (p. 11).

Lopez (2017) poses the problem in the following terms: "How does the inverted classroom model impact the learning of independent morphemes of the English language in students of initial levels at La Universidad de las Américas during the period September 2016-February 2017?" (p.4); and, in one of its conclusions, it states: "(...) it was possible to increase the learning of the independent morphemes of English in students of initial levels of the University of the Americas" (p. 45).

To conclude this review, Sanchez (2022) evaluates through mostly quantitative procedures the teaching techniques of a teacher in the educational unit of his study, in the city of Loja. Based on the results of the problem, a proposal for improvement is presented in the form of a didactic guide on the implementation of the inverted classroom methodology. Regarding the definition of the inverted classroom, Sanchez points out: "The inverted classroom methodology allows the student to be the subject of knowledge formation, the main axis in the learning process". (p.7). As a general objective, it states: "Incorporate the inverted classroom in the teaching-learning process of seventh grade students at Zoila Alvarado de Jaramillo School to generate collaborative learning environments" (p.5). As for the application procedure, based on the "Aulaplaneta" portal, it proposes three phases with differentiated roles for the teacher and student: phase 1, before the class, phase 2, during the class, and phase 3, after the class; and, in one of its conclusions, it points out:

> (...) the teacher used traditional tools such as books, blackboard, notebook and puzzles in the development of the different subjects; this is a negative factor in the development of constructivist learning, since the application of videos, multimedia and other interactive activities are fundamental for the improvement of the teacher's actions and should be constantly updated (p.35).

Discussion and Conclusions

This study provides characteristic elements of the bibliographic production on the implementation processes of Project-Based Learning (PBL-projects), Problem-Based Learning (PBL-problems) and Flipped Classroom Learning in Ecuador, as well as identifying procedural particularities of their application.

The experiences of the 3 selected methodologies analyzed in this study have been identified as the most recurrent. No reviews were identified that included more than one active methodology. On the other hand, most of the studies analyzed emphasize the following as the foundations and general principles valid for all active methodologies: active learning, collaboration, cooperation and student-centered teaching.

The way in which the Ecuadorian authors define the three methodologies that are the subject of this review are similar to each other and to other studies in the Latin American context; thus, in the case of PBA-projects, with the systematic review of Ruiz and Ortega-Sanchez (2022): "According to the most recent international scientific literature, PBL continues to be perceived as a teaching method capable of enhancing the characteristics expected in successful learning processes" (p.10). In PBL-problems, with the review of Bermudez Mendieta (2021), who, regarding the absence of connection between the constructivist perspective and PBL-problems in the studies of his research, points out: "The theory underpinning this research with respect to problem-based learning is constructivism, although it is not explicitly stated in some research" (p.82). And, in the case of Aula invertida, with the review of (Pino-Apablaza and Taipe-Mayhuire, 2022), in the Latin American context, of the last 10 years; as well as, with the review of (Cantuña Avila, and Cañar Tapia, 2020), for the Ecuadorian context; and, with the empirical study of (Laura and Almanza, 2020), developed in the Peruvian school system.

The studies analyzed do not allow us to perceive whether the levels of success in the implementation of active methodologies are related to any particular school level; likewise, no comparative analyses were identified between private and public school systems; nor were ex-ante and ex-post studies of the application of active methodologies.

From which, it can be concluded that active methodologies are the alternative in the teaching-learning processes that best correspond to the profile of today's students at different levels, which due to the particular social change of recent decades tend to be motivated mainly by visual stimuli and deconstruct their preconceptions quickly.

Most active methodologies are based on general methodological principles, such as cooperation, collaboration, participation, metacognition, self-regulation and the frequent use of ICT, which together implicitly induce and promote active learning. In this sense, it could be said, according to the main theorists of constructivist pedagogy, both the classics such as Lev Vygotsky, Jerome Bruner, Jean Piaget and John Dewey, as well as contemporary ones such as Maria Montessori and Paulo Freire, and also sociologists of education such as Pierre Bourdieu and Edgar Morin, that it is the type of teaching-learning that best suits the nature of socialization processes in the early formative stages.

As one of the unanticipated results, it can be pointed out that there are indications that teachers, particularly at the intermediate level, are applying in their daily pedagogical practice, generally without knowing or conceptually differentiating, some procedural aspects that could correspond to various active methodologies, which is in line with the starting idea of this review that supported the choice of the 3 active methodologies analyzed: assumptions based on daily observations during teaching and exploratory surveys on web-based information search platforms.

As educational innovation processes continue in parallel with changing conditions, circumstances and educational policies, it is expected that new and more extensive reviews will emerge, accounting for progress in the implementation of active methodologies in Ecuador.

Perhaps the main limitation of the present study is its unrepresentative sample, given that it analyzes three active methodologies, which leads to the need for reviews focused on a single one, to determine trends in the impact of its application results in different geographic areas, educational levels and more variables of analysis of the teaching-learning processes in Ecuador.

This review could serve as a basis for quantitative and qualitative empirical studies to determine whether active methodologies are being applied simultaneously or in a complementary manner in Ecuadorian schools.

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VALIDITY, RELIABILITY, AND THREATS TO VALIDITY IN VIRTUAL ENGLISH I CLASS ASSESSMENTS IN THE FOREIGN LANGUAGES DEPARTMENT OF THE NATIONAL AUTONOMOUS UNIVERSITY OF HONDURAS

VALIDEZ, CONFIABILIDAD Y AMENAZAS A LA VALIDEZ EN LAS EVALUACIONES DE LA CLASE DE INGLÉS I VIRTUAL DEL DEPARTAMENTO DE LENGUAS EXTRANJERAS DE LA UNIVERSIDAD NACIONAL AUTÓNOMA DE HONDURAS

Bessy Valeska Mendoza Navas[1]
Universidad Nacional Autónoma de Honduras, Honduras
(d.lenguasextranjeras@unah.edu.hn) (https://orcid.org/0000-0003-1898-256x)
Leonel Armando Madrid Argenal
Universidad Nacional Autónoma de Honduras, Honduras
(d.lenguasextranjeras@unah.edu.hn) (https://orcid.org/0000-0002-8354-7858)

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ABSTRACT

This article corresponds to a study carried out within the framework of the Master's Thesis called: "Students' representations on threats to validity, and reliability of assessments of the Virtual English I class of the Department of Foreign Languages of the National Autonomous University of Honduras" with the purpose to have references that serve to eliminate threats and correct security gaps to assessments of the virtual English I class and at the same time give out the background to develop a valid and as secure as possible evaluation system in virtual language classes of the UNAH. The study adopts a mixed methodology, the instrument used to collect data were two questionnaires applied to students of virtual English I of the III PAC 2022. The instruments were filled out online in a survey form using Microsoft Forms. The quantitative analysis was performed with IBM Spss software the quantitative analysis with Atlas/Ti. The results of this research have allowed validation of the Null Hypothesis about the evaluations of the virtual English I class do not have the validity or security that reflects the acquisition of language skills achieved by students according to the CEFR corresponding to 56 hours. Although the validity manages to comply with 4 of 5 validity shreds of evidence suggested by (Downing, 2003; Messick, 1989), some inferences put the safety of the evaluations at risk due to the open possibility of cheating and plagiarism in the evaluations.

[1] Corresponding author.

Palabras clave:
representaciones, validez, fiabilidad, amenazas a la validez, Inglés Virtual

RESUMEN

El presente artículo corresponde a un estudio realizado en el marco de la tesis de maestría denominada: "Representaciones de estudiantes sobre las amenazas a la validez, y seguridad de las evaluaciones de la clase de Inglés I Virtual del Departamento de Lenguas Extranjeras (DLE) de la Universidad Nacional Autónoma de Honduras (UNAH)."con la finalidad de tener referencias que sirvan para eliminar amenazas y corregir brechas de seguridad a las evaluaciones de la clase de Inglés I virtual, y que al mismo tiempo sirva de antecedentes para desarrollar un sistema válido y lo más seguro posible de evaluación en clases virtuales de lengua del DLE de la UNAH. El estudio adopta una metodología mixta: los datos analizados fueron tomados de 2 instrumentos que se aplicaron a estudiantes de inglés I virtual del III periodo académico (PAC) 2022. Los instrumentos se llenaron en línea en forma de encuesta usando Microsoft Forms. El análisis cuantitativo se realizó con el software de IBM SPSS, y el análisis cuantitativo con Atlas/Ti. Los resultados de esta investigación han permitido validar la Hipótesis Nula: las evaluaciones de la clase de inglés I virtual no cuentan con la validez ni la seguridad que reflejen la adquisición de competencias lingüísticas alcanzadas por los estudiantes según el MCER correspondientes a 56 horas. Si bien la validez logra cumplir con 4 de 5 evidencias de validez sugeridas por Downing, 2003 y Messick, 1989; hay inferencias que ponen en riesgo la seguridad de las evaluaciones debido a la posibilidad abierta de trampas y plagio en las evaluaciones.

Introduction

This research has its genesis in the doubts that language teachers, specifically teachers who teach the virtual English I class at UNAH, have about the validity and security of online assessments. Doubts about not knowing if it is indeed the students who make the evaluations or other people, if students copy or plagiarize, or if they modify previous work. This would be a false indicator of the validity of the results in the acquisition of language skills virtually. Other questions arise as to whether oral production and interaction can be developed and assessed online.

The teaching, acquisition, and evaluation of language skills in virtual environments can be affected by various factors such as aspects, previous technological and linguistic training, availability of technological resources, study habits and disciplines, time available, academic load and pressures, formation of values such as honesty, relevance of programs and content, appropriate methodology and practice of virtual teaching, design and application of assessments, feedback, among others. These circumstances make it complex to visualize the effects on learning and its results in the development of expected skills and competency achievements. It is therefore necessary to define, on the basis of precise diagnoses and specific research, the criteria, methodologies and instruments required for a solid and pertinent evaluation of the different components of a virtual environment. The present research work is justified by the need to seek solutions to the validity and security of the evaluations in the virtual English I class of the Foreign Languages Department of the National Autonomous University of Honduras (UNAH) with the objective of reducing the threats to the online evaluation processes.

Evaluation generates multiple reactions in students, not all of them pleasant. We usually say that organizational activities must be evaluated, that in order to improve we must evaluate, that without evaluation it is impossible to know exactly where we are, among other statements, but when it comes to personal evaluation the situation changes, especially when it is summative with high impact, and the news that we will be evaluated often generates a feeling of discomfort, anguish or even fear, and if we can defer or exempt it on occasions, we do so. (Sanchez, 2021).

Evaluating requires a reflective and mature attitude, resources to carry it out, personnel with training and experience in its methodological and technical nuances, time to plan, carry it out and analyze it, as well as infrastructure, all to document the different stages of the process. Effective evaluation processes require participatory organizational structures, not so vertical or hierarchical, that are willing to accept the results with enthusiasm and transparency, to act accordingly and to improve the structure, processes and results of the system. Systemic thinking and long-term vision are required for the evaluation process to be properly integrated into the system, as well as the active participation of the people who make up the different elements of the system. In summary, evaluation is not an easy or simple task; it requires individual and collective effort, as well as support from the various levels of the organizational structure. (Sanchez, 2021).

Literature Review

The previous introduction leads to a bibliographic review of the central aspects addressed in this work, with the aim of providing reference arguments that can support the results of the study presented.

There are many definitions of the term "assessment" in education, Miller defines it as: "an umbrella term that includes a range of procedures for acquiring information about student learning and the formation of value judgments..." (Miller, 2012). This implies a systematic process of gathering information through the application of various instruments, such as written or oral examinations, to be analyzed with methodological rigor and thus provide the basis for decision making. The most recent edition of the AERA-APA-NCME Standards for Educational and Psychological Testing defines "assessment" as: "systematic method of obtaining information, used to formulate inferences about the characteristics of people, objects, or programs; systematic process for measuring or evaluating the characteristics or performance of individuals, programs, or other entities for the purpose of making inferences; sometimes used as a synonym for testing" (AERA, APA, and NCME, 2014).

Regardless of the technical definitions we use of assessment and its proximate concepts, teachers who have interactions with students should internalize assessment from a deeper view, as suggested in 1977 by Rowntree, when he says that a person consciously obtains and interprets information about another person's knowledge and understanding, skills and attitudes when that person interacts with another person directly or indirectly.

In recent years, the concept of "assessment of-for-as learning" ("assessment of-for-as learning" in English) has gained momentum, which aims to modify the emphasis that has existed on summative assessment, tests and grades, towards a broader and more integrated picture that leads us to anchor the entire assessment process with learning, the fundamental goal of the educational process (Ashford-Rowe et al, 2014; Bennett, 2015; Harapnuik, 2021; Maki, 2010; NFETLHE, 2017a). Teaching, learning and assessment are inextricably linked concepts and activities, and the alignment of these elements with curriculum planning, design and implementation is indispensable and becomes a key element for educational success.

- Learning assessment. According to several authors this type of evaluation is equivalent to summative evaluation, to document that learning occurred and the level of learning. Its nature is to evaluate activities that have already occurred, after or at the end of a learning period, and it emphasizes quantitative and numerical aspects, being associated with grades. When this assessment has significant consequences on the student, it is referred to as a "high impact assessment". In this type of assessment the main actor is the teacher or the organization that applies the assessment, who are the main decision makers, and the student is a passive participant who receives or to whom the exam or test is applied, in contrast to assessment for learning.
- Assessment FOR learning. As previously commented, the main goal of assessment should be to improve learning, not only to measure it, so when we talk about assessment for learning we refer to assessment traditionally called formative, linked to feedback (Maki, 2010; Man Sze Lau, 2016; Martínez Rizo, 2009; Wiliam, 2011). This assessment occurs throughout the teaching and learning process, is more longitudinal and represents a dialogue that occurs between teachers and students throughout their multiple interactions. It is

focused on helping the student, identifying their areas of opportunity and achievements, to guide them to progress in a better way in the educational process, without generating stress or wear, treating them as a person. It aims to move from an action that is done *to the* student, to a process that is done *with* the student. This assessment is inseparable from teaching and strongly supports learning, if carried out with professionalism and responsibility.

- Evaluation AS learning. In this type of evaluation the student is empowered, has greater responsibility in the learning process and can be the key decision maker. Students need to acquire skills for the use of basic evaluation concepts in their personal development. Self-directed lifelong learning, autonomous learning, critical thinking, among others, require evaluating data and information on work and life situations, analyzing them, establishing value judgments, and making decisions on personal and professional issues. All this requires self-evaluation and the ability to make decisions based on the evaluation of complex contexts and realities. Although the teacher generally holds the hierarchical power in the formal educational process, assessment as learning moves this *locus* of external control to a more intrinsic control by the student body. However, the student requires support from teachers and peers to fully exercise the aforementioned skills. Assessment as learning helps students learn how to learn, fosters metacognition and self-regulated learning.

It is very important to review what is being taught and what students are expected to learn; the alignment of teaching, learning and assessment are essential in any field of education, because in this way the teacher ensures that what is being taught and learned is indeed what is being assessed. (Basabe et al. 2020).

It would be a wasted effort what is done in the evaluation if we do not have these objectives. Formal education is guided by processes clearly organized by a curriculum, syllabus, and subject matter programs. These plans and programs are the guide at the time of our evaluations and to make sure that indeed, what we teach and expect our students to have learned, is what we are actually going to evaluate.

It is therefore essential to have a thorough knowledge of these two documents in order to carefully review each of their elements and the function or raison d'être of each one. In the case of the study plan, it locates the subject and the connections it has with the rest of the subjects that integrate it. This can guide the evaluation of the objectives, not only of the subject, but also of the curriculum as a whole, thus contributing to the training of students. The curriculum is a system in which several gears are derived, and it is necessary that all of them work properly to achieve the established purposes. This is precisely what we mean when we talk about alignment of teaching, learning and assessment.

Validity, Reliability and Threats to Validity

Throughout our lives as teachers we conduct many assessments to try to learn about the level of knowledge or performance of our students. This process involves the elaboration, application and interpretation of different types of tests: diagnostic, formative and summative. Regardless of its purpose, the goal of any assessment includes the identification of the level of some construct, such as written communication competence, oral communication competence or interaction in the case of foreign languages.

Assessment results should ideally reflect in an accurate and reproducible manner what is intended to be assessed, in order to be able to rationally interpret the assessment

results and to be able to make inferences and decisions on a sound basis. When assessing students on a particular topic, you want to identify the process and learning outcomes that allow you to infer the level of performance on the constructs of interest. After applying the evaluations, we obtain results in the form of scores that help us to make decisions, which lead to the following questions: are we evaluating exactly what we want to evaluate, what do the results imply with respect to the student's academic progress, if it is a summative evaluation, what is the minimum grade to pass the course, how reproducible is the measurement, among many others. Evaluation in education is an increasingly sophisticated and research-based discipline that requires incorporating fundamental academic concepts to be carried out with professionalism and methodological soundness (Instituto Nacional para la Evaluación de la Educación, 2017).

The most important conceptual pillar of evaluation in education is validity. Today, the concept of validity has evolved from the traditional "measuring what it is intended to measure," to a broader and deeper model, in which it "refers to the degree to which evidence and theory support interpretations of a test's scores for proposed uses of the tests" (AERA, APA, & NCME, 2018). It is a set of actions that are placed throughout the evaluation process, to support the interpretation of the results and thus generate inferences. Validity analysis, or validation, is the process by which we evaluate the evidence presented to determine what the degree of validity is (Cook and Hatala, 2016). It can be performed for different types of examinations, diagnostic, formative and summative, although it is particularly relevant for high impact summative evaluations.

Traditionally, validity in education was classified as "the 3 Cs": content, criterion and construct validity (Cronbach and Meehl, 1955). In the current definition this distinction has disappeared, since the current model proposes different sources of evidence that shed light on different aspects of validity, not that they reflect different types of validity. Validity is a unitary concept, so all validity is considered to be construct validity.

Subsequently, in the late 20th century, a new validity framework was proposed and accepted by the major educational assessment and psychological testing organizations (American Educational Research Association et al., 2018), incorporating the holistic concept of construct validity. This model establishes that, in order to determine the degree of validity of the uses and interpretations of the results of an evaluation, several elements must be provided to demonstrate it (Downing, 2003). This scheme proposes the following elements as five sources of validity evidence (Downing, 2003; Messick, 1989):

- Evidence based on the content of the test.
- Evidence based on response processes.
- Evidence based on internal structure. The internal structure presents three basic characteristics: dimensionality, differential functioning and reliability (Rios and Wells, 2014). When designing the test, it must be determined which dimensions are to be assessed on the construct of interest, and this information is described in the test specification table.
- Evidence based on relationships with other variables.
- Evidence based on the consequences of the test. Test results.

Validation

Validation is a process that should be planned at the same time as the test is designed, to ensure that the necessary sources of evidence are available to obtain the highest

possible degree of validity in the interpretation of the test results. The following is a suggested way to carry out this process.

1. Specify the uses and interpretations of the scores

1a. Formulate the uses and interpretations. The uses and interpretations of the scores obtained in a test are different concepts and both should be clarified from the beginning of the test design.

1b. Establish the hypotheses. Hypotheses are questions we can ask ourselves about the evaluation being developed. They must be proven by means of the aforementioned sources of evidence.

2. Evaluate sources of evidence

2a. Create a plan to test the hypotheses. Based on the hypotheses selected, sources of evidence are sought and the corresponding information is gathered.

2b. Evaluate the evidence and formulate a judgment. In this last step, all the evidence is evaluated in order and the degree of validity of the interpretation of the test scores evaluated is established. This grade will depend on the quality of the evidence presented and also on the most important evidence, depending on the test.

Threats to Validity

In addition to analyzing the sources of evidence of validity, it is suggested to identify elements that may affect the degree of validity of the evaluation results. This step is important because it gives strength to the decisions made based on the test results. Items that reduce the degree of validity are called threats to validity; they are so called because they interfere with the correct interpretation of the scores (Carrillo-Ávalos et al., 2020; Downing and Haladyna, 2004). These threats may be present in any type of assessment. In general, two types of threats to validity are recognized: construct underrepresentation (CS) and variance irrelevant to the construct (VIC) (Downing, 2003; Messick, 1989).

The first is the threat to validity due to underrepresentation of the construct. This refers to the fact that there is an inappropriate representation of the domains explored in the assessment of the content to be assessed by the tests. For example, when a test has too few items or too few questions that do not properly explore the area of knowledge to be reviewed. Another example is the distribution of reagents that do not faithfully follow the specification table. So some areas end up being over-explored and others under-explored. There are even times when there are areas that are not even explored in an exam. This obviously affects the validity of the use of the test. Another example is many items, many questions, that explore low-level cognitive processes, such as memory or factual data recognition, while the teaching objectives are ideally higher-level, such as application or problem solving. Another threat to validity, which has become increasingly important, is the phenomenon of teaching to the test. This means that the teacher overemphasizes in class what is to be included in the exam, thus distorting the curriculum, the educational goals and in general, the whole process; this has come to occur to such an extent that some teachers use test items in class to artificially increase their students' grades and thus improve the evaluations of their group or even their institution in this world of educational accountability.

The second major type of threat to validity is what we call construct-irrelevant variance. This refers to variables that systematically interfere with the ability to interpret the evaluation results in a meaningful way, and that cause, shall we say, noise in the measurement data. Examples of this type of threat to validity are reagents that have been developed with deficiencies and are flawed. Writing good test question questions is both

an art and a science, and requires training and experience. It is not as easy as we often think. Another example is the problems that occur with test security and with information leakage or cheating on the test, cheating, using what we call accordions, so that the test result does not accurately reflect what the person really knows.

This obviously invalidates the test results, with complex ethical and resource implications, such as retesting, re-testing, or taking repressive measures with students. Most of the departments that offer online classes at UNAH have item banks that are not very large or do not have an item bank at all, so overexposing test questions becomes a major operational problem. On the other hand, creating a punitive or punitive culture around evaluations is not the message that teachers should ideally give to students, so these aspects should be taken into account when considering how to respond when these types of irregularities occur. There is also something called test-taking cunning; this occurs when students prepare with test-taking strategies and may get scores that do not necessarily reflect what they know, especially on tests that are not well done.

Method

The research that we have carried out is inscribed within the methods of research in language learning as a non-experimental *ex post facto* field study, at a descriptive MIXED level, but with a correlational characteristic.

Participants

On a self-selected sample of 163 subjects in single cross-section, the study has been conducted with students from 5 classes (Sections: 0702, 0800, 1005, 1401, 1802) who were taking General English I in the III academic period (PAC) 2022 in the Department of Foreign Languages of the National Autonomous University of Honduras.

Research Instrument

A mixed self-administered questionnaire with both closed and semi-closed items was applied. The frequency of response for each item is presented in tabular and graphical form. Finally, open coding and selective coding have been implemented for textual citations.

Data Analysis

For the analysis and interpretation of the data , different categories were chosen according to the main issues raised in the research: evaluation (E), security in evaluations (SE), use of technological tools (UHT), improvements (M) and level of satisfaction of the class (NS). In each category, a series of subcategories were identified in response to indicators provided by the various informants and directly linked to the main themes selected in advance, which made it possible to manage the accumulation of information gathered during the research and to present the results in accordance with the proposed objectives. Regarding the presentation of the results and interpretation of the open-ended questions used in the questionnaire that provide textual information, opinions, explanations, justifications, the analysis was implemented from the perspective of the different categories, entering into the respective subcategories defined.

Results

With the findings found throughout this research we were able to validate our null hypothesis ***Ho:*** The evaluations of the virtual English I class of the Department of Foreign Languages of the UNAH do not have the validity nor the security to reflect the acquisition of linguistic competencies achieved by the students according to the CEFR corresponding to 56 hours.

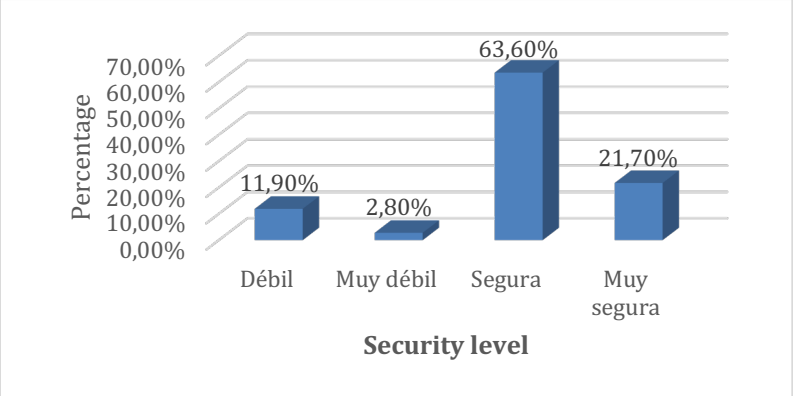
The findings revealed that:

- The overall course evaluations are in the range of .854 of Alpha Cronbach's.
- Threats to the validity and security of English I class assessments are around 78.2%, which demands urgent updating of the class.
- While the assessments show a safe percentage in the development, at the time of response, there are several threats that need to be addressed urgently.

The analyses of inferences made to the validity of the evaluations, in relation to their security variable, gave the following results that show latent threats to the validity of the evaluations:

- 14.7% of the respondents stated that the level of security for evaluations and tasks was weak or very weak.

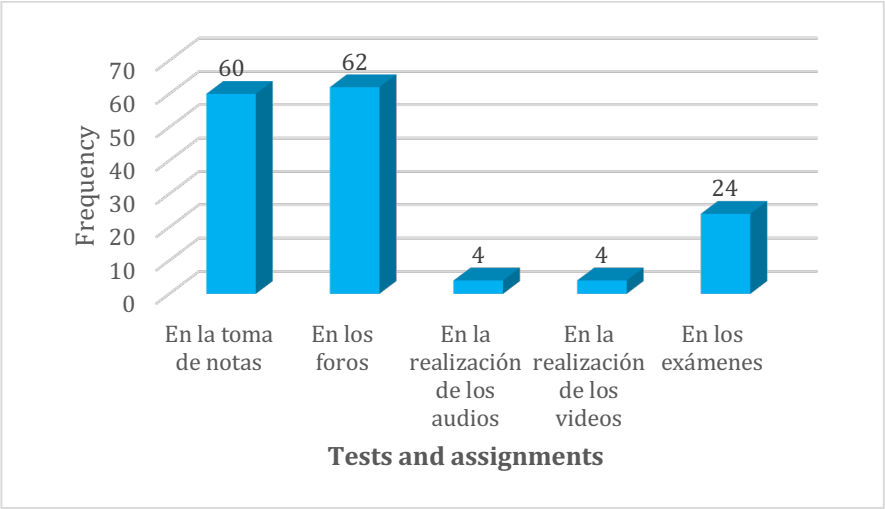
Figure 1
Item C1. P12 security level



The activities in which it is easiest to cheat or copy according to respondents, and which present threats to validity are:

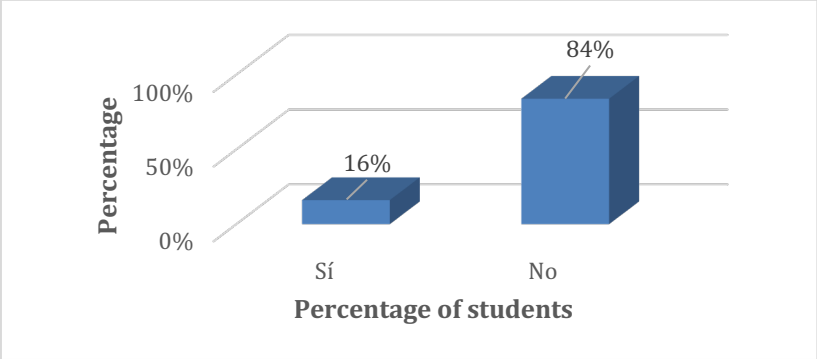
- Forums (40%)
- Note taking (39%)
- Exams (16%)
- Audio production (3%)
- Video production (3%)

Figure 2
Item C1. P16 easiest test or task to cheat on



Respondents reported hearing in 16% that their peers had copied or cheated on assessments (C1.p18).

Figure 3
Item C1. P18 English I students copy or cheat



The answers to question C1.p18 show the ways in which students cheat in which they highlight:

- Using an assignment already presented in previous classes c1.p18-c,
- Asking someone else to do homework for him/her, a family member, or paying someone bilingual c1.p18-a,
- Having the internet, books, or notes open when taking the exam, committing plagiarism over the internet c1.p18-b,

Table 1

Item C1. P19 how do they cheat in the virtual English I class?

Ways to cheat on virtual English I assessments, according to respondents.			
Code	**Form**	**Frequency**	**%**
c1.p18-a	Asking someone else to do homework for you, a family member, or paying someone bilingual.	45	25%
c1.p18-b	Having open internet, books, or notes when taking the exam, Committing plagiarism over the internet	34	18.90 %
c1.p18-c	Using a task already presented in previous classes	55	30.60 %
c1.p18-d	Working with another on an individual task	16	8.90%
c1.p18-e	Using digital tools to modify texts, changing the name of the lessons	9	5%
c1.p18-f	Using digital tools to modify audios	2	1.10%
c1.p18-g	Using digital tools to modify videos	2	1.10%
c1.p18-g	Using audio tools to fake the voice	1	0.60%
c1.p18-i	Others (suggested by students)		
c1.p18-i-1	Sharing screenshots of exams, having someone else do the exam for you or doing it with someone else, sharing reviews with others, using phones when taking exams	11	6.10%
c1.p18-i-2	Using translator or looking for someone to translate for you	2	1.10%
c1.p18-i-3	Presenting previous class assignments when repeating the class	2	1.10%
c1.p18-i-4	Copying answers from forums	1	0.60%
	Total, frequency and percentages	**180**	**100%**

Therefore, the Null Hypothesis is tested, although the validity manages to comply with 4 out of 5 evidences of validity, there are inferences that put the security of the evaluations at risk due to the open possibility of cheating and plagiarism in the evaluations.

On the other hand, the results revealed that despite threats to validity in the assessments, the virtual English I class helped students to:

- Written production, the class contains 12 video lessons of about 1 hour each (12hrs in total). Students should watch the lessons, and take notes from a note-taking guide for each lesson. In addition, students were required to complete written assignments in forums.
- Improve oral and written comprehension by watching videos. The video lessons, in addition to helping improve writing, also helped improve listening and reading comprehension.
- Perform oral productions through audio and video. Oral production or *speaking* was developed and evaluated through the production of audios through a simple tool (Vocaroo.com), and through the production of videos to ensure that the person in the video is the student who performs the oral production.
- Desire to learn more of the language. The data is relevant because a desire to learn more of the language was sown through the class.

Other contributions made by the class were to improve reading, engage in simple conversation, gain confidence in speaking, achieve autonomy in learning, develop technological skills and be more organized in study time. Less than 1% (0.5%) said that the class had not helped them at all, and 0.5% said that it had helped them in other aspects, but did not mention what those aspects were. Despite the threats to validity and security in the evaluations, the class contributed to the students' linguistic formation, and to the development of values and motivation to learn more of the language.

Discussion and Conclusions

This research had as its main objective to analyze the representations of English I - III PAC 2022 students of the Department of Foreign Languages of the UNAH about the threats to the validity and security of the online assessments of the virtual English I class. The research was conducted in order to have data to eliminate threats and correct security gaps in the evaluations of the virtual English I class, and at the same time serve as a reference to develop a valid and as secure as possible evaluation system in virtual language classes of the DLE of the UNAH. The researcher started by testing the following 2 hypotheses:

1. Null Hypothesis ***Ho***: The evaluations of the virtual English I class of the DLE of the UNAH have neither the validity nor the security to reflect the acquisition of language skills acquired by students according to the CEFR for 56 hours.
2. Alternative Hypothesis ***Ha***: The evaluations of the virtual English I class of the UNAH DLE DO have the validity and security to reflect the acquisition of language skills acquired by students according to the CEFR corresponding to 56 hours.

To test the hypotheses, we followed the null hypothesis form suggested by Sheaham (2006), and five sources of validity evidence suggested by Downing, 2003; Messick and 1989:

1. Evidence based on the content of the test. (The evidence rests on the proposals of Sireci and Faulkner-Bond, 2014):

a. Domain definition. The detailed description of the content areas and cognitive skills to be assessed from the construct defined in the curriculum and the learning activity outcomes were analyzed. It was found that the content areas are framed in the descriptors of the CEFR with the cognitive linguistic skills typical of an A1 level of the same Framework.

b. Domain representation. We analyzed in the tests whether the questions were set according to the learning objectives or goals and found that they were.

c. Domain relevance. The items were found to be important with respect to the aspect of the construct being measured in the class.

d**.** Appropriate test design procedures. The test items were tested prior to the start of the class in pilot projects. The review of test items is done in each period by content experts to ensure their technical accuracy. They verify that they are well elaborated.

e. Credentials of test developers, item developers, and content experts. The evaluations were prepared by experts in language teaching and experts in content design and management of virtual platforms from the Directorate for Educational Innovation (DIE).

2. Evidence based on response processes. Although in the evaluations of the English I class, there are exams with multiple choice questions, the evaluations demand

oral and written productions to verify if the student applies the acquired knowledge to real life (introduce himself, talk about his activities, his family, among others). the validation of the correct answer sheet, the quality control of the report of the results, among others, as suggested by (Downing, 2003), was carried out by experts from the DLE and the DIE.

3. Evidence based on internal structure. Three basic characteristics were analyzed as suggested by Ríos and Wells, 2014:

a. Dimensionality. (oral and written comprehension, oral and written production, interaction).

b. Differential functioning (Leenen,2014; Rios and Wells, 2014). We analyzed 8,505 results of 45 tests applied to 189 students from 5 different sections of English I- III PAC 2022. The same test was applied to both men and women of different ages.

c. Reliability. A *Cronbach's Alpha reliability scale analysis was performed with a high score of .854.*

4. Evidence based on relationships with other variables. Another test with international standards such as IELTS, TOEFL, TOEIC, Cambridge, or others, could not be taken due to financial issues.

5. Evidence based on the consequences of the test. To this effect, respondents were asked about what had helped them most in the class c1.p25 providing evidence of the consequences of the tests. For future research work on the same problem, it is recommended, as Lane, 2014 does, to conduct interviews, focus groups, questionnaires, to find out what are the most important components of academic programs and their points of greatest impact in the area of language knowledge.

After the analysis, it is concluded that the validity complied with 4 of the 5 evidences, it cannot be said if it complies or not with evidence # 4 based on the relationships with other variables since it could not be analyzed with other variables because there is no similar test that is economically accessible to all respondents.

Although it was found that the evaluations do comply with the variable of validity of the evaluations according to 4 of the 5 evidences suggested by Downing, 2003 and Messick, 1989, the variable of security in the evaluations should also be analyzed so that the validity has ″a holistic and integrative evaluative judgment that requires multiple sources of evidence for its interpretation", and "that attempts to answer the question: ¿what inferences can be made about the person based on the test results?" (Downing, 2003).

The analyses of inferences made to the validity of the evaluations, in relation to their security variable, gave the following results that show latent threats to the validity of the evaluations:

- 14.7% of the respondents stated that the level of security for evaluations and tasks was weak or very weak.
- Forums, note taking, were the activities in which it is easiest to cheat or copy according to the respondents, and which present threats to validity.
- Respondents reported hearing in 16% that their peers had copied or cheated on assessments (C1.p18).
- The answers to question C1.p19 show the ways in which students cheat, in which they excel:
    - using an assignment already presented in previous classes c1.p18-c,
    - asking someone else to do homework, a family member, or paying someone bilingual c1.p18-a,

- having the internet, books, or notes open when taking the exam, committing plagiarism over the internet c1.p18-b,
- other forms of cheating are described in the descriptive table in question C1.p18 which summarizes the respondents' answers.

Therefore, the Null Hypothesis is tested, although the validity manages to comply with 4 out of 5 evidences of validity, there are inferences that put the security of the evaluations at risk due to the open possibility of cheating and plagiarism in the evaluations.

Recommendations

To ensure validity and safety in the evaluations, it is recommended:

1. Update the programs, methodology, and evaluation of the virtual English I class.
2. Create different versions of exams with a large bank of questions and answers so that different types of exams can be applied.
3. The review of note-taking assignments should be face-to-face to reduce the frequency of digital files being passed and/or modified. Note-taking should stay with the teacher. In the forums, the answer must be submitted before viewing the contributions of the other participants. Audio assignments should be transferred to video to avoid editing. If the teacher has doubts about the authenticity of the work, he/she should compare the voice and the student with the video presentation, which should be mandatory in order to start doing the homework. That the platform be configured in such a way that the student cannot advance if he/she does not have a grade in the presentation forum.
4. Conduct exams at class time to avoid passing questions and give feedback at a reasonable time afterwards to avoid displaying answers or give overall feedback via Zoom of corrections, without leaving answers open-ended.
5. A regulation should be created, socialized, and applied to sanction fraud or plagiarism in accordance with the Academic Norms and the Student Regulations of the UNAH.
6. Shortening the duration of video lessons, segmenting them, for note-taking.
7. To carry out a single face-to-face evaluation with a value of 60%, either oral and/or written, and that the value of the evaluations and assignments be converted to 40%. This will make the student worry about being more linguistically prepared for the final exam.
8. Evaluations should be done at class time with the camera on, and with the teacher's supervision, if it is on a platform specialized in exams, the better. To this end, a budget for licenses must be included in the Annual Operating Plan.
9. Create a values training program on honesty, ethics, and responsibility to be included in the course in order to reduce or eliminate fraud.
10. Create a plan for meetings, attendance, test proctoring, feedback to students from advisors.
11. Maintain ongoing meetings with classroom staff to identify, report, and correct threats to the validity and security of assessments, creation of resources to replace those that need to be updated.

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THE DEMOTIVATING FACTORS OF SOME EMPLOYEES OF THE MINISTRY OF LAND ADMINISTRATION (COMMUNAL ADMINISTRATION, MUNICIPAL ADMINISTRATION AND PROVINCIAL GOVERNMENT) IN ANGOLA AND ITS IMPACT ON CITIZENS' LIFE

OS FACTORES DE DESMOTIVAÇÃO DE ALGUNS FUNCIONÁRIOS DO MINISTÉRIO DA ADMINISTRAÇÃO DO TERRITÓRIO (ADMINISTRAÇÕES COMUNAIS, ADMINISTRAÇÕES MUNICIPAIS E GOVERNOS PROVINCIAIS) EM ANGOLA E O SEU IMPACTO NA VIDA DOS CIDADÃOS

LOS FACTORES DESMOTIVADORES DE ALGUNOS EMPLEADOS DEL MINISTERIO DE ADMINISTRACIÓN DE TIERRAS (ADMINISTRACIÓN COMUNAL, ADMINISTRACIÓN MUNICIPAL Y GOBIERNO PROVINCIAL) EN ANGOLA Y SU IMPACTO EN LA VIDA DE LOS CIUDADANOS

Mario Graça da Costa[1]
Instituto Superior Politécnico Caála, Ángola
(mario.graca@doctorado.unini.edu.mx) (https://orcid.org/0000-0002-6667-9576)

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ABSTRACT

Any organization, whether public or private, needs qualified, competent, committed, humble, responsible human resources capable of responding to the Institution's expectations and challenges. In this sense, it is necessary for bosses to become leaders, encouraging their employees, striving for harmonious dialogue, valuing their employees and offering better working conditions, a decent salary to improve the quality of life, as well as continuous motivation, as employee demotivation destroys organizations, no matter how strong they are. This descriptive, exploratory and bibliographical study, of a qualitative nature, aimed to describe some factors behind the lack of motivation of some Territorial Administration employees and their impact on the lives of citizens and propose strategies on how to mitigate the identified problem. 200 public servants from different areas spread across the 18 provinces and 164 Municipalities of Angola participated in the research, where a three-phase questionnaire was applied, with open and closed questions, created on Google Forms and shared in several WhatsApp groups. It was concluded that the lack of incentives from bosses to subordinates, mistreatment between equals, the spirit of superiority, the disrespect of some hierarchical superiors towards subordinates, low salaries, little recognition of the work performed, devaluation of meritocracy, the style of inadequate leadership, underutilization, lack of harmonious and constant dialogue, excessive bureaucracy in internal/external

[1] Correspondence author.

communication and the distance from reality in relation to public management adapted by State Institutions (Provincial Governments and Municipal Administrations, etc.), are in the basis of demotivation.

RESUMO

Palavras-chave:
desmotivação, baixos salarios, falta de incentivo, comunicação, burocracia.

Qualquer organização, seja ela pública ou privada, necessita de recursos humanos capacitados, competentes, comprometidos, humilde, responsáveis e em condições para responder as espectativas e os desafios da Instituição. Neste sentido, é necessário que, os chefes, tornem-se líderes, incentivando os seus colaboradores primando pelo diálogo harmonioso, a valorização dos seus funcionários e oferecer melhores condições de trabalho, um Salário digno para a melhoria da qualidade de vida, bem como a motivação contínua, pois a desmotivação dos funcionários, destrói as organizações, por mais fortes que elas sejam. O presente estudo descritivo, exploratório e bibliográfico, de natureza qualitativa, visou descrever alguns factores da desmotivação de alguns funcionários da Administração do Território e o seu impacto na vida dos cidadãos e propor estratégias de como mitigar o problema identificado. Participaram da pesquisa, 200 funcionários públicos de diversas áreas espalhados pelas 18 províncias e 164 Municípios de Angola, onde foi aplicado um questionário trifásico, com pergunstas abertas e fechadas, criado no *google forms* e partilhado em varios grupos do WhatsApp. Concluiu-se que, a falta de incentivos por partes dos chefes aos subordinados, maltratos entre iguais, o espiríto de superioridade, o desrespeito de alguns superiores hierárquicos aos subordinados, baixos salários, puco reconhecimento do trabalho prestado, desvalorização da meritocracia, o estilo de liderança inadequado, o sub aproveitamento, falta de diálogo harmonioso e constante, o exceso de burocracia na comunicação interna/externa e o distanciamiento da realidade em relação à gestão pública adaptada pelas Instituições do Estado, (Governos Provínciais e Administrações Municipais etc), estão na base da desmotivação.

RESUMEN

Palabras clave:
desmotivación, bajos salarios, falta de incentivos, comunicación, burocracia.

Cualquier organización, ya sea pública o privada, necesita recursos humanos calificados, competentes, comprometidos, humildes, responsables y capaces de responder a las expectativas y desafíos de la Institución. En este sentido, es necesario que los jefes se conviertan en líderes, incentivando a sus empleados, esforzándose por el diálogo armonioso, valorando a sus empleados y ofreciendo mejores condiciones laborales, un salario digno para mejorar la calidad de vida, así como motivación continua, como desmotivación de los empleados. Destruye las organizaciones, por fuertes que sean. Este estudio descriptivo, exploratorio y bibliográfico, de carácter cualitativo, tuvo como objetivo describir algunos factores detrás de la desmotivación de algunos empleados de la Administración Territorial y su impacto en la vida de los ciudadanos y proponer estrategias sobre cómo mitigar el problema identificado. Participaron de la investigación 200 servidores públicos de diferentes áreas repartidos en las 18 provincias y 164 Municipios de Angola, donde se aplicó un cuestionario de tres fases, con preguntas abiertas y cerradas, creado en Google Forms y compartido en varios grupos de WhatsApp. Se concluyó que la falta de incentivos de los jefes hacia los subordinados, el maltrato entre iguales, el espíritu de superioridad, la falta de respeto de algunos superiores jerárquicos hacia los subordinados, los bajos salarios, el poco reconocimiento del trabajo realizado, la devaluación de la meritocracia, el estilo de liderazgo inadecuado , la subutilización, la falta de diálogo armónico y constante, la excesiva burocracia en la comunicación interna/externa y el alejamiento de la realidad en relación a la gestión pública adaptada por las Instituciones del Estado (Gobiernos Provinciales y Administraciones Municipales, etc.), están en la base de la desmotivación.

Introduction

Demotivation at work is a problem that deserves a professional's full attention. After all, the workplace is the place where you spend most of your day-to-day life. The motivation of civil servants is a fundamental aspect for the smooth running of government institutions, especially in Angola's Ministry of Territorial Administration, which encompasses communal, municipal and provincial governments. However, it is important to recognize that some employees may feel demotivated due to various factors, such as lack of recognition, poor working conditions, lack of opportunities for professional growth, among others.

According to Dos Santos et al. (2020) this demotivation can have a significant impact on the lives of citizens, since demotivated employees tend to be less productive, less committed to their work and less inclined to provide a quality service. This can result in delays in the provision of public services, mismanagement of resources and, ultimately, harm to the population.

According to Rueda et al. (2021) it is essential to identify and address the factors that contribute to the demotivation of the employees of the Ministry of Territorial Administration in Angola, in order to promote a healthier and more productive working environment and ensure the provision of quality services to the population.

Usually, this demotivation arises when the professional feels, at least most of the time, less productive and more tired, thus being more exposed to the development of some illnesses, both physical and psychological, without favorable conditions. If you feel that you are experiencing this type of problem, it is essential that you immediately identify the possible reasons that may be demotivating you, so that you can quickly break out of the cycle that leaves you dissatisfied. We all know that there are some jobs that are more routine than others. According to Abel et al. (2022), state that mutual respect is necessary within an organization in order to achieve the desired objectives and meet the challenges of the future, looking towards democratic, participatory and inclusive leadership.

However, depending on the type of work you do on a daily basis, the routine can get tiring for you. It is clear that there is a need to briefly discuss the relationship between the problem in question and the noblest way for human beings to survive: work Sobral (2019). Because along with it often comes an unwelcome sensation: suffering, both physical and psychological. According to Scheer (2014, p.1), "this is not very surprising, since the word suffering is etymologically part of the term work. Which comes from the Latin, tripalium".

To understand it, you also need to understand what motivation is, or how it works. This is the only way to shed light on how it develops in a person's life or in an organization.

The lack of employee motivation is a huge danger in today's organizations, as is poor service in the performance of their duties, where the main victim is the citizen. Therefore, more attention needs to be paid to employees in order to guarantee the quality of care in public and private services (Canhanga, 2020).

The term "motivation" comes from the Latin "motivus, movere", meaning that which moves; that which makes people move. In other words, a motive that promotes a specific action. Whereas the term demotivation is intended to indicate just the opposite, i.e. the lack of a motive for action" (Scheer, 2014.p.2).

In order to improve the quality of the services provided by the public administration, it is necessary for it to have competent, committed and responsible staff, with skills that match their academic and professional profile, to respond to various

problems. Today, the world has completely changed the way it works and new information and communication technologies are essential in public administration. Some employees don't get the training they need and in the end want to hold management positions, while others are appointed through influence, even though they don't have the necessary requirements. Scheer (2014, p.2), states that;

> We are looking for an individual who has the most suitable profile for the job, so that they are able to do what is expected of them. As if it were a missing part of a machine, or needed to be replaced so that the "machine" could continue to function. The profile being sought is, in fact, the "right measurements" of the part, the right employee, for the perfect functioning of the "equipment" into which it has been "fitted". The worker is seen only as a skill capable of performing a certain task.

On the other hand, it is necessary to train leaders within the Public Administration who are able to recognize, encourage and motivate workers in the most difficult moments, knowing how to guide Maslow (2003a). Because the level of identification with their work is superficial, most of the employees surveyed feel undervalued and are unable to meet the expectations of the institution in question, or develop as professionals (Pastre, 2022). Some professionals cope better with routine than others, but it is essential that you take action as soon as you realize that your career has stagnated.

When we feel that our career is "at a standstill" for some reason when we feel that our career is at a standstill for some reason, it's because we have a great need to learn new things in addition to what we do during our normal working day, and when the Boss tries to belittle the position with tendencies to undermine, we become totally demotivated.

When you start asking yourself all the time what your chances are of growing in the company where you work, and if you still can't find the answer you're looking for, then you should be alert to the first signs of demotivation at work.

Lack of recognition is another cause of demotivation at work. After all, when you feel that your work isn't valued, it's understandable that you start to feel unwilling to go to work too, according to Caldas (2015).

According to (Chiavenato, 2006; Maslow, 2003b & Chipuca, 2020), the pyramid of needs, especially with regard to esteem needs, which aim to seek appreciation, respect, consideration and status, conveys the idea that, in order to perform any job properly, you need the will to do it, which can lead to job satisfaction. This leads us to reflect that it's not possible to ignore the issue of professional motivation when you want quality work.

In the Ministry of Territorial Administration, with greater emphasis on the Provincial Governments, Municipal and Communal Administrations, there has been some demotivation on the part of certain employees of the respective bodies, due to: unsatisfactory remuneration, lack of recognition, poor leadership, job insecurity, overload of activities and poor working environment, lack of benefits such as health insurance, lack of rapprochement between leaders and those led. In view of the causes mentioned, the following consequences can be seen: Poor service to citizens, a high rate of delays in processing documents, lack of punctuality and attendance, frustration, poor communication, anonymous letters to managers, etc.

As a proposal for resolving the problem mentioned and identified above, we propose readjusting the salaries of employees, promoting careers and functions, distributing tasks to everyone, valuing the work done by employees, encouraging the best employees with prizes, more dialogue between leaders and those led, creating recreational meetings, meeting periodically with employees to listen to their concerns and try their best to resolve them, avoiding conflicts between employees as much as possible, thus cultivating a healthy working environment, ensuring success in the tasks to be carried out, etc. The aim of this study was to describe the demotivating factors of some employees of the Ministry of Territorial Administration, with greater emphasis on the

Communal Administrations, Provincial Administrations and Governments in Angola, and their impact on the lives of the citizens who seek their services.

This research is of the utmost importance because it will help to understand the causes of demotivation on the part of some officials in the Ministry of Territorial Administration, with greater emphasis on the provincial governments and administrations, with the aim of helping the decision-making bodies to deal with the various problems they are experiencing, so that they can act in the performance of their duties in a positive way and also behave more proactively. This makes them feel good about themselves and they also transmit this energy to other employees, thus improving the organizational climate. As far as society is concerned, the topic will be relevant because it will encourage the employees of this body to pay more attention to their work so that they can be upstanding employees who can provide positive responses to the demands of the society that seeks the services of this body.

Motivation is one of the important elements in carrying out any human activity, both professional and social, because it reflects the will and desire to achieve something. According to Ribeiro and Pereira (2018) cited by Chipuca (2020, p.2), "motivation is a natural force that moves individuals and empowers them to achieve their goals based on emotions, thus emphasizing purely positive emotional experiences". Chipuca, (2020, p.3), states that;

> We can therefore consider it as the force that drives each person as a professional, to create taste in everything they do, always seeking perfection and difference from others. When they feel like doing something, they raise their feelings to an emotion that translates into self-esteem and this makes them a happy and fulfilled person who wants to do their job better.

To this end, we need to work hard to ensure that these professionals in the Bailundo Municipal Administration remain satisfied in their work, because if the individual does not bring with them an intrinsic motivation, there is little we can do to ensure that they derive satisfaction from their profession.

For (Almeida, 2013 & Teixeira, 2024), one of the greatest motivations for civil servants, and a very exciting one, is a fair salary for the work they do, because this gives them satisfaction. According to Chipuca (2020, p.10), intrinsic motivation is defined "as the internal stimulus that the individual brings to develop a task and this is related to their self-realization". It is necessary for the heads of local government to become leaders and human beings, considering the existence of extrinsic motivation to be relevant, which has to do with any external stimulus, namely rewards such as prizes or commendations (Ribeiro, 2018).

With regard to intrinsic motivation, Neves (2015) cited by Chipuca (2020), in describing the theory of social comparison, states that the model of job satisfaction is based on the level of affection and experience between what the person wants and what they acquire at the moment. Thus, the smaller the difference between what the individual wants and what they receive from their job, the greater the feeling of satisfaction (Neves, 2015). For Chipuca (2020, p.8);

> In other words, it's best when civil servants are able to reconcile their ideals with the organization's purposes in order to find professional fulfillment. In this context, we can say that when a person prepares for a job, they bring with them certain ambitions, taking into account what they want to receive as a reward. But if what you want doesn't match the offer, it could lead to frustration and despair.

According to Teixeira (2024), motivation is defined as a behavior that is driven by intense energy and that aims to achieve a specific goal.

Theories of Motivation

Motivation theories developed largely in the 1940s, as it was necessary to increase the effectiveness and efficiency of employees and there was a change in the perception of individuals in the organization, no longer seen as mere parts (Tavares, 2011). There are basically three main groups of motivation theories:

- Theories of necessity: These theories state that motivation is driven by basic human needs, such as the need for food, security, belonging, esteem and self-fulfillment. The best-known theory in this group is Maslow's Hierarchy of Needs, which suggests that human needs are organized in a hierarchy of levels, where basic needs must be satisfied before higher needs can be achieved.
- Theories of equity: These theories state that motivation is influenced by the perception of fairness in the distribution of rewards and benefits in the workplace. Theories such as Adams' Equity Theory suggest that individuals compare their relationship between effort and reward with that of their colleagues, and if they perceive themselves as being unfairly treated, they can become demotivated.
- Theories of expectation: These theories state that motivation is influenced by the belief that a specific effort will lead to a desired result. Vroom's Expectancy Theory, for example, suggests that individuals choose their actions based on the expectation that they will lead to certain rewards and that these rewards are valuable to them.

Each of these theories offers a unique perspective on what motivates people and how managers can use these theories to promote motivation in the workplace. It is important to recognize that motivation is a complex and multifaceted concept, and that different people can be motivated by different factors.

Theories of Content

These theories relate to the satisfaction of human needs. It's easy to accept that human beings constantly seek to satisfy their needs, however diverse and numerous they may be.

Maslow's Theory of Needs

The theory that emerged in the 1940s is based on the principle that there are unmet needs that motivate individuals, because according to this theory, as long as the most basic needs are not met, higher-level needs will not be evidenced (Camara et al., 2013; Chiavenato, 2006; Cunha, 2022; Tavares, 2011; Teixeira, 2024). Briefly, the first two categories of needs (physiological and safety needs) are considered primary needs, while the remaining three categories (social, esteem and self-actualization needs) are classified as secondary needs.

According to (Chiavenato, 2006; Neves et al., 2015; Teixeira, 2024), Herzberg's Two Factor Theory, which emerged in the 1950s, postulates that there are two essential factors for individuals' behavior: hygiene factors, which include aspects such as salary, working conditions, interpersonal relationships, safety, social benefits and work climate (factors external to the activity); and motivational factors, which encompass goals of personal achievement, recognition, responsibility, development, progress, status and professional growth (factors internal to the activity).

To a certain extent, this theory can be compared to Maslow's (2003), since the hygiene factors correspond to Maslow's physiological, safety and social needs, while the motivational factors correspond to Maslow's esteem and self-actualization needs. However, (Herzberg & Becker, 1995) differ in their conclusions, as hygiene factors reduce

dissatisfaction without necessarily motivating individuals, whereas motivational factors are capable of generating motivation (Camara et al., 2013; Chiavenato, 2006; Neves et. al., 2015; Tavares, 2011; Cunha, 2022; Teixeira, 2024). It is essential to value human capital, as it represents a country's greatest wealth.

McClelland's Needs Theory

According to Farias (2021), this theory emerged in the 1960s and focuses all its attention on the needs that individuals acquire throughout their lives, that is, as they interact with their environment, three of which are particularly relevant:

Achievement/success needs - related to the individual's desire to achieve challenges;

Power needs are based on the desire to control, influence and take responsibility for other individuals, as well as to obtain prestige. Affiliation needs are linked to the desire to establish and maintain personal relationships with other people. All individuals have these three needs, but one of them usually manifests itself predominantly (Almeida, 2013; Ribeiro & Pereira, 2018; Cunha, 2022; Teixeira, 2024), as cited by Almeida et al. (2017, p.8).

According to (Teixeira, 2024) McClelland's Needs Theory is a theory of motivation that was developed by psychologist David McClelland in the 1960s. According to this theory, people have three basic needs that influence their behavior: the need for achievement, the need for power and the need for affiliation.

The need for achievement is the need to excel and reach challenging goals. People who have this need tend to be entrepreneurial, motivated and constantly seek to improve their performance (Cunha, 2022). They like to take on responsibilities and challenges, and they value feedback to find out how they are doing.

The need for power refers to the desire to control others and influence their environment. According to (De Oliveira & Silva, 2021) people with this need tend to be leaders, seek positions of authority and feel motivated by power and recognition. They like to compete and show their superiority over others.

The need for affiliation is the need to relate and feel part of a group. People with this need value cooperation, teamwork and care about the well-being of others. They seek social approval and feel motivated by a sense of belonging.

According to McClelland's Needs Theory, people can possess one or more of these needs to varying degrees. Understanding these needs can help in managing teams, motivating employees and developing effective leadership strategies. It is important to consider the different needs of individuals in order to promote a healthy and productive work environment Settinieri et al. (2019).

Alderfer's ERG Theory

According to Almeida et al. (2017, p.8), they state that "this theory, which dates back to the early 1970s, proposes that employee motivation is related to the satisfaction of hierarchical needs". According to this theory, there are three levels of needs: existence, relationship and growth. Existence needs refer to physiological and safety needs, relationship needs correspond to social needs and growth needs encompass esteem and self-realization needs (Lima, 2023).

According to Almeida et al. (2017, p.8) "In this theory, it is believed that the needs of higher levels only arise after the needs of lower levels have been met". However, there are situations in which this sequence is not observed, as pointed out by Cunha et al. (2022) and Teixeira (2024).

Alderfer's ERG Theory (1977) states that it is an alternative model to Maslow's hierarchy of needs, which proposes that human needs are grouped into three main categories: Existence, Relationship and Growth.

According to Keffer et al. (2023) argues that people can simultaneously seek to satisfy different types of needs, rather than following a linear progression as proposed by Maslow (2003). Existence needs refer to basic material needs, such as food, shelter and security. Relationship needs involve the need for social interaction, belonging and interpersonal relationships. Finally, Growth needs include the need for self-development, personal fulfillment and personal growth.

According to ERG Theory, if a higher-level need cannot be satisfied, the individual can redirect their attention to lower-level needs. This means that people can jump from one category to another, depending on the circumstances and context in which they find themselves (Alderfer, 1969 & Pichère, 2023).

According to Rojas (2024) Alderfer's ERG Theory offers a more flexible and dynamic approach to understanding human needs, highlighting the interconnection between the different categories of needs. It also recognizes that people may have different priorities and values, which influences their quest to satisfy their needs.

In short, Alderfer's ERG Theory highlights the complexity and malleability of human behavior in relation to their needs, providing valuable insights to better understand people's motivation and well-being.

Theories of Process

From this perspective, motivation is analyzed in terms of how individuals choose processes to achieve their goals (Lima, 2023). According to (Didier & Oliveira, 2020) process theories are a set of ideas and concepts that seek to understand and explain how social, economic and political processes occur and develop over time. According to Pastre & Augusto (2022), these theories are fundamental to understanding the dynamics that govern the relationships between individuals, groups and institutions in a society.

Borges et al. (2024) state that the main process theories include the functionalism theory, which emphasizes the interdependence of the parts of a social system and their contribution to the functioning of society as a whole; the conflict theory, which analyzes power struggles and interests between different social groups and how these conflicts influence social dynamics; and the symbolic interaction theory, which emphasizes the importance of meanings and symbols in the construction of social relations.

According to (Didier & Oliveira, 2020), there are other process theories that focus on different aspects of social life, such as modernization theory, which discusses the social and cultural transformations resulting from industrialization and urbanization; development theory, which analyses the processes of evolution and change in different societies; and globalization theory, which explores the interconnections and interdependencies between different regions of the world.

In short, process theories are fundamental to understanding social dynamics and the evolution of societies over time. They not only make it possible to analyze and interpret the transformations taking place in the various spheres of social life, but also contribute to the formulation of public policies and actions aimed at promoting well-being and human development.

Vroom's Theory of Expectations

According to Almeida et al. (2017) Vroom's expectancy theory is a psychological model that seeks to understand people's behavior in the workplace. Developed by psychologist Victor Vroom in the 1960s, the theory is based on the premise that people

make decisions about their behavior at work based on their expectations of achieving certain results.

According to Vroom, work performance is influenced by three main factors: expectation, instrumentability and valence. Expectancy refers to a person's belief in their ability to perform a task successfully. Freire & de Freitas (2007) instrumentability refers to the perception that performance will lead to desired results. Valence, on the other hand, relates to the value that the person attributes to the results obtained.

These three factors interact to determine people's motivation and behavior in the workplace. If expectations of achieving certain results are high, if the person believes that their performance is instrumental in achieving these results and if these results are valued by the person, motivation will be higher Almeida et al. (2017).

According to Díaz Espinosa (2023), Vroom's Theory of Expectations has been widely applied in the organizational context, helping managers to understand what motivates their employees and to develop strategies to increase performance at work. Lima, (2023) by considering the interaction between expectations, instrumentability and valence, companies can create a more motivating and productive work environment. It appeared in 1964 and is also called the contingency model of motivation and can be expressed by the following formula according to Almeida et al. (2017);

Motivation Strength (M) = Valence (V) × Expectation (E)

The members of this concept have the following meanings: Valence refers to the intensity of the individual's preference to achieve a certain result; Expectancy refers to the perception of the probability of a certain action leading to the desired result; Motivation Strength is the motivation perceived by the employee (Chiavenato, 2006; Cunha, 2022; Santos, 2014; Neves et al., 2015; Teixeira, 2024).

Adams' Theory of Fairness

This theory emerged in the 1960s and focuses on each individual's perception of the reasonableness of work situations, always comparing individual performance and benefits with the performance and benefits of their peers in similar situations, i.e. it is strongly related to the concept of individual justice (Neves et al., 2015; Cunha, 2022; Teixeira, 2024). In this sense, individuals are motivated to reduce perceived inequalities in treatment (Teixeira, 2024), considering two types of equity: internal equity (within the organization) and external equity (with the outside of the organization) (Cunha, 2022).

Enriched Task Theory

According to the studies by (Neves et al., 2015; Almeida et al., 2017) the theory in question is based on fundamental principles. The first principle is that the task should be structured in such a way that the employee feels personally responsible for a certain amount of work, which implies autonomy and responsibility. In addition, the task as a whole needs to be meaningful and proportionate to the benefits for those carrying it out. In the context of the employees of the Ministry of Territorial Administration, it is essential that they realize the importance of the work they do for society and that they are always meeting the needs of citizens. It is therefore essential that these employees are not demotivated.

These same authors also stress the importance of providing feedback on how the task is being carried out and on the results achieved.

According to (Katz, 2009 & Monastersky, 2024) Enriched Task Theory is a psychological model that was developed by Robert Katz and John R. Pfeiffer in the 1960s. Monastersky (2024) states that this theory proposes that individuals' motivation and

performance are influenced by the nature of the tasks they perform. According to the Enriched Task Theory, tasks that have greater complexity, variety and meaning tend to be more motivating and result in more satisfactory performance on the part of workers (Katz, 2009 & Monastersky, 2024). Pfeffer (2019) & Monastersky (2024) point out that the key elements of Enriched Task Theory are:

Variety of skills: Tasks should allow individuals to use a variety of skills and knowledge in order to challenge and stimulate their potential.

Identifying the importance of the task: Workers must be able to see the relevance and impact of their tasks for the organization as a whole, so that they feel more motivated to do them.

Immediate feedback: It is important that workers receive constant feedback on their performance, so that they can make adjustments and improvements to the tasks they carry out.

Autonomy and responsibility: Workers must have the autonomy to make decisions and act independently, which contributes to a greater sense of responsibility and commitment to their tasks.

Enriched Task Theory argues that organizations should seek to develop tasks that are challenging, meaningful and varied, in order to stimulate the motivation and performance of their employees Pfeffer (2019). By providing an enriched work environment, companies can increase employee satisfaction and engagement, resulting in advantages for both individuals and the organization as a whole.

Theories of Result

This theory holds that organizations, as social partners of the state, aim to achieve people's individual and collective goals. According to de Locke and Latham (1981) the Goal Setting Theory was developed in the 1970s and argues that setting goals implies that the individual wants to achieve certain results, knows how to go about it and measures their effectiveness in carrying out the tasks. It is believed that good performance increases the likelihood of achieving these goals. Within organizations, this theory usually manifests itself as a system of management by objectives, which performs the functions of controlling and motivating employees. According to (Dos Santos & Do Santos et al., 2011) and (Borges & Dias 2020) Skinner's Reinforcement Theory emerged in the 1970s and suggests that an individual's behavior can be explained by the more or less positive/negative expectation of the consequences of that behavior.

Concepts and Characteristics of Work

A job consists of a set of activities carried out by individuals in order to achieve certain goals. These activities can be approached in different ways and in different areas, such as economics, physics, philosophy, history, among others.

The characteristics of a job include demands, risks, workload and human performance, which are present in any work activity. These characteristics are expressions of an open socio-technical system that encompasses technical, physiological, moral and social dimensions.

An employee is a person who works permanently in a public or private establishment and is also known as an employee. According to Prodanov & De Freitas (2013), they can perform specific functions for a certain period of time in a company, store or any other type of organization. For example, an employee could be a bakery worker.

Method

This is a descriptive, exploratory and bibliographical study with a qualitative approach. The aim was to describe the demotivating factors of some public administration employees in Angola, as well as their impact on the lives of citizens, and to propose strategies to mitigate the problem identified. To this end, experiences were systematized and documents such as decrees, annual reports, performance evaluation forms, laws and scientific articles, among others, were analyzed. Descriptive statistics were also used to produce graphs, tables and percentage demonstrations to complement the qualitative-quantitative approach. The survey involved 200 civil servants from different areas, spread across the country's 18 provinces and 164 municipalities. A three-phase questionnaire was applied, with open and closed questions, developed in google forms and shared in various WhatsApp groups where the authors are added, where each participant went on to say which Municipality or Province of Angola they were working in. According to Da Costa et al. (2022), it is important to determine the population and select the sample appropriately, especially when working with social groups, in order to obtain representative results. It is recommended to consider at least 30% of the population to be investigated (Marconi & Lakatos 2004; Bockorni & Alves, 2021). The criteria for participating in the survey consisted of showing interest in taking part, being a senior official and being linked to the Ministry of Public Administration, Labor and Social Security.

IBM SPSS software, version 25 (Statistical Package for the Social Sciences), and Microsoft Office Word, version 2016, were used to analyze and process the data. The quantitative method was used to analyze the statistical data collected online on demotivation, while the qualitative method was used to analyze the research instruments applied qualitatively. The bibliographic analysis was carried out to understand, analyze and compile the information found in various bibliographic sources, such as books, decrees, laws, normative documents, articles and theses.

Results

The tables and graphs show the main results of the survey carried out on some employees of the Ministry of Territorial Administration in Angola's 18 provinces, using descriptive statistics, on the factors of demotivation in their workplaces. Table 1 shows the data on the ages of the participants in the survey.

Tabla 1
Age

	Age	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	40 years	21	10,5	10,5	10,5
	37 years old	59	29,5	29,5	40,0
	45 Years	43	21,5	21,5	61,5
	50 Years	20	10,0	10,0	71,5
	52 Years	21	10,5	10,5	82,0
	39 Years	18	9,0	9,0	91,0
	33 Years	18	9,0	9,0	100,0
	Total	200	100,0	100,0	

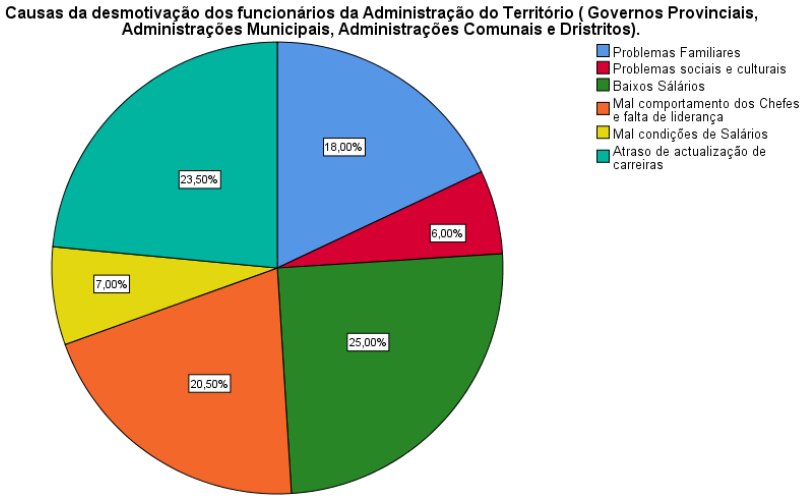
From the results of the ages obtained from the participants, 21, corresponding to 10.5%, are 40 years old, 50, corresponding to 29.5%, are 37 years old, 43, corresponding to 21.5%, are 45 years old, 20, corresponding to 10%, are 50 years old, 21, corresponding to 10.5%, are 52 years old, 18, corresponding to 9%, are 39 years old and 18, corresponding to 9%, are 33 years old, making 200 individuals, corresponding to 100%. They are suitable people with extensive professional experience in the Public Administration, specifically in the Ministry of Territorial Administration.

Tabla 2
Gender

	Gender	Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	Male	127	63,5	63,5	63,5
	Female	73	36,5	36,5	100,0
	Total	200	100,0	100,0	

Of the participants in the online survey, 127, corresponding to 63.5%, are male, and 73, corresponding to 36.5%, are female, taking into account the inclusion of the female sex in various areas of social life that the Angolan government has set itself in order to banish discrimination and advance the valorization of women in decision-making in public life.

Figure 1
Results obtained in question 1



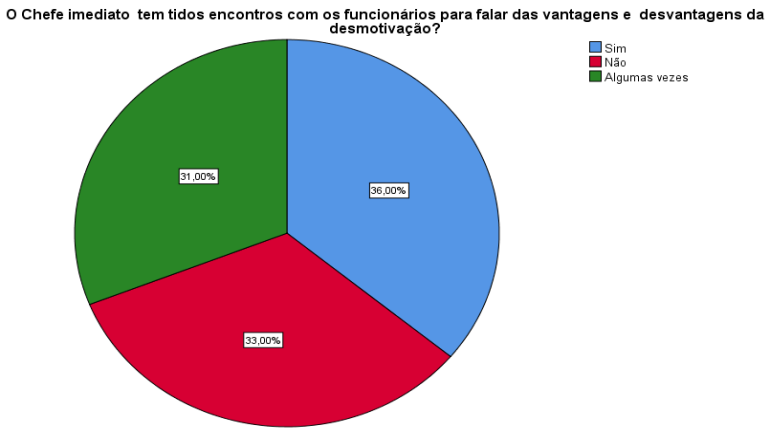
According to the results obtained in the 3rd question, the causes of demotivation among some employees of the Territorial Administration are as follows: 18% said that the cause of demotivation was related to family problems. 6% indicated that demotivation is due to social and cultural problems. 25% pointed to low salaries as the cause of demotivation. 20.50% mentioned that demotivation stems from the bad behavior of their bosses and a lack of leadership. 7% said that demotivation comes from salary conditions that don't correspond to their academic level. 23.50% said that demotivation was related to the lack of career updates. These results total 100%, representing all the possible

causes of demotivation mentioned by the employees, where the organizational climate of any institution is also very important, according to Rocha (2023).

According to (Fernandes, 2009 & Matias, 2018), the demotivation of public sector employees in Angola is a recurring problem that can have several causes. It is important to recognize these causes in order to find effective solutions and improve the motivation of these professionals. Demotivation is a negative feeling that causes a lack of interest, energy and enthusiasm to carry out tasks or pursue goals. It often happens at times of difficulty, frustration, tiredness and lack of recognition. According to Silva & Costa (2023), demotivation can lead to a decrease in productivity, quality of work and even compromise emotional and mental well-being according to De Araúj (2022). However, it is possible to combat demotivation by adopting some strategies. However, it is important to identify the causes of demotivation and seek solutions to overcome them. Setting clear and achievable goals, establishing an action plan, seeking support and encouragement, finding ways to make the work environment more pleasant and rewarding, practicing self-care and self-motivation are some of the actions that can help overcome demotivation.

Figure 2

Results obtained in question 4



Of the answers, i.e. the results of figure 2, obtained in question 4, when asked if the immediate managers have held constant meetings, 31% said that they have sometimes met, 36% said that yes, they have met and 33% have not met. This shows that it's not always the bosses who are to blame, but that we need to improve our dialog with employees and help solve the problems that cause demotivation. According to Matias (2018), leadership in the workplace is extremely important, as it helps to create a healthy, collaborative and productive working environment. According to (Fernandes, 2009 & Borge, 2020), dialog is of paramount importance in working relationships because:

Improves communication: Open and constant dialog between leader and subordinates helps to improve communication within the team. This avoids misunderstandings, promotes transparency and creates an environment where information is shared clearly and directly.

It creates a sense of belonging: Dialogue allows leaders to feel heard and valued in their opinions, ideas and concerns. This creates a sense of belonging and engagement, as they feel an important part of the decision-making process.

Promotes professional development: Dialogue makes it easier to identify the training and development needs of the people you lead. The leader can understand the

skills that need to be improved and offer guidance and constructive feedback to help them grow professionally.

Identify problems and solutions: Through dialog, leaders can express concerns, challenges or problems they are facing. This allows the leader to learn about and seek solutions together with the team, promoting a more efficient and productive working environment.

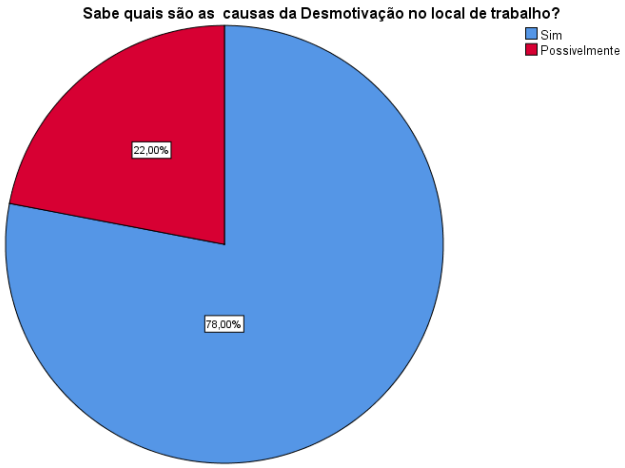
It strengthens commitment and motivation: When leaders feel listened to, understood and respected, they become more committed to the organization's objectives, goals and values. This results in an increase in motivation and individual and collective performance.

Establish a relationship of trust: Through dialog, leaders can build a relationship of trust with their subordinates. This is fundamental to the growth and success of the team, as trust allows information and feedback to be shared openly, facilitating problem-solving and cooperation between all members.

In short, dialogue between leaders and subordinates in the workplace is fundamental to the success of the team and the organization as a whole. It fosters a culture of open communication, professional development, problem-solving and collaboration, strengthening employee commitment and motivation.

Figure 3

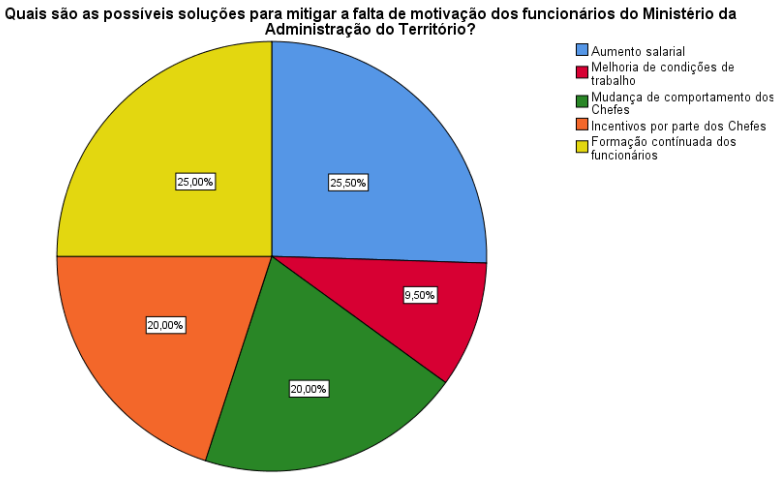
Results obtained in question 5



The results in figure 3 come from question 5 asking whether the employees who took part in the online survey were aware of the causes of demotivation, where 78% said that yes, they were aware and 22% said that they were unaware, as they only know that they are demotivated because life is difficult. According to Da Costa and Toledo (2024), to combat the demotivation of public sector employees in Angola, it is necessary to adopt measures that address these causes. This can involve implementing fairer pay policies, establishing recognition and reward programs, creating training and development opportunities, improving working conditions and promoting effective and inspiring leadership. Silva & Costa (2023) point out that, in addition, simplifying bureaucratic processes and seeking greater agility in decision-making are also essential for motivating public sector employees in Angola.

Figure 4

Results obtained in question 6



Looking at the possible solutions, shown in figure 4 of the results from question 6, 25.50% said that the solution is to increase salaries, 9.50% said that working conditions should be improved, 20% suggested changing the behavior of managers in the way they act with their colleagues, 20% said that in addition to their salaries, employees should receive constant incentives of all kinds, 25% said that the continued training of employees, both academically and professionally, should be at the center of their superiors' attention in order to improve service delivery.

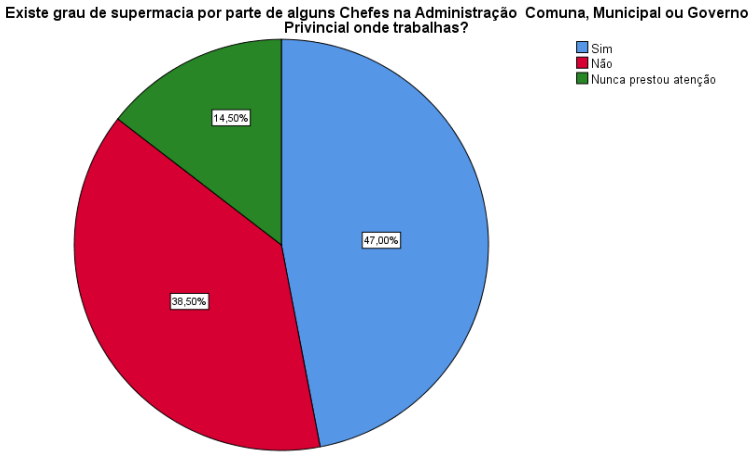
Table 3

Does the Ministry of Territorial Administration have a Trade Union?

		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	No	200	100,0	100,0	100,0

When asked if the Ministry of Public Administration has a trade union, 100% of respondents said no. Any organization without a union is a joke to work for, because no one looks after the rights of the employees. It's necessary for all ministries to have a union, because the only body that couldn't have a union is the Ministry of Justice and Human Rights, because they administer justice in the country, but they have a union. According to Silva & Costa (2023), it is necessary for the employees of the Ministry of Territorial Administration to negotiate with the government in order to create their own union as soon as possible as a way of overcoming the various problems.

Figure 5
Results obtained in question 8



From the survey carried out, the results of figure 5 and question 8, on the existence of supermale behavior in the workplace, 47% said that yes, it does exist and it is the most prevalent in Provincial Administrations and Governments, 38.50% said that it does not exist and they feel well served, 14.50% said that they have never paid attention to these behaviors. These results show how worrying it is that leadership training in institutions is ongoing.

Analyzing the results obtained from the problem raised, it is proposed that the Communal and Municipal Administrations work with the Provincial Governments and the Ministry of Territorial Administration to adopt better strategies for the motivation and job satisfaction of unmotivated employees to adjust salaries, incentives such as bonuses, considering the competencies of each person, promotion in functions and categories, so that they can perform their tasks better, thus helping (users) to build solid knowledge, skills and attitudes and to provide public services well to the citizen, obeying the laws, as well as deontology and professional ethics. Furthermore, it is suggested that there is a need to adopt strategies aimed at increasing the motivation and job satisfaction of the employees of the Communal and Municipal Administrations and the employees of the Provincial Governments:

- Highlighting the best employees without looking at nepotism or flattery during each year and promoting recognition actions by awarding honors, scholarships for training, public praise, etc;
- Recognizing the human needs of civil servants and administrative agents; continuous training to enable and professionalize officials;
- Participation of local government officials in analyzing problems and determining solutions for the local government system, implementing democratic and participatory management;
- Appointments to subcommittees to support sections, municipal directorates, and other areas of public interest and the institution, knowing how to listen to and address the concerns of employees;
- We therefore call on those with the right to reflect on this dilemma and change the framework so that public administration in Angola is in line with international practice;
- Creation of a union for workers in the Ministry of Territorial Administration.

Discussion and Conclusions

Discussions on the demotivating factors of Territorial Administration employees, with special emphasis on Municipal Administrations and Provincial Governments, have been the subject of debate in various forums. The aim of this study was to describe the demotivating factors of some Territorial Administration employees, with a focus on Communal Administrations, Municipal Administrations and Provincial Governments in Angola, and their impact on the lives of the citizens who seek their services. A number of factors were identified, such as a lack of encouragement from bosses to subordinates, mistreatment among colleagues, disrespect from some hierarchical superiors towards subordinates, low salaries, little appreciation of the work done, devaluation of meritocracy, inadequate leadership style, underutilization, lack of harmonious and constant dialogue, excessive bureaucracy, lack of internal communication and the distancing of reality in relation to the public management adopted by the Bailundo Municipal Administration from others. It can be concluded that demotivation can be minimized if the demotivating factors are mitigated. According to Simões (2023), during the process of selecting and recruiting employees for organizations, it is important to select the best professionals to ensure efficient support for the company, thus avoiding hiring external specialists to solve specific problems. This has led some employees to feel demotivated and hopeless about the future, due to the behavior of some bosses. However, it is necessary to establish a relationship between the three main concepts discussed above: organization, communication and motivation. Organization and communication: the organization is made up of individuals who establish relationships and communicate with each other. Communication is a process of joint construction of discourse, in which the members of an organization do not limit themselves to a simple exchange of messages, but build a common discourse, sharing information between all the parties involved. According to Da Costa and Toledo (2024), every organization has a formal structure represented in its organization chart. On the other hand, motivation at work is important because it promotes collaboration between teams and improves employee performance in their individual activities. Motivated employees achieve better results, while unmotivated ones decrease their productivity and can influence other employees. In addition, discouraged employees are less attentive when carrying out their tasks and may make mistakes that jeopardize the team's work. Chiavenato (2006) states that motivation in the workplace encourages employees to dedicate themselves more and perform better, which has a direct impact on the company's good results. It is therefore something that should be encouraged, as it not only affects the well-being of employees, but also the organization as a whole. The word "motivation" means the set of factors that drive an action, in other words, it's what stimulates us to do something. Motivation in the workplace is the feeling that drives our actions at work. When a person is motivated, they have the will to achieve goals and obtain good results, which positively influences their behavior in the workplace, making them more engaged. The greater the employee's motivation, the greater their effort to perform their duties, which increases their productivity. An encouraging and stimulating work environment attracts talent to stay with the company, resulting in greater commitment and good performance.

In short, there are a number of reasons that contribute to these employees' lack of motivation, which ends up being directly reflected in their activities and in the services provided to the population.

One of the main demotivating factors is the lack of professional recognition and appreciation. Many employees don't have a clear system of promotions and salary

progression, which discourages commitment and the development of their skills. In addition, the lack of adequate financial incentives makes these workers feel undervalued and demotivated.

Another relevant factor is the lack of adequate working conditions. Often, these employees work in precarious facilities, with poor infrastructure and a lack of basic equipment. The absence of a suitable working environment is detrimental to performance and productivity, generating dissatisfaction and demotivation.

The lack of training and professional qualification is also an important factor in demotivating these employees. Updating knowledge and the opportunity to develop new skills are essential for professional growth and employee motivation. However, there is often not enough investment in this area, which limits the opportunities for learning and growth.

This lack of motivation among Ministry of Territorial Administration officials has a direct impact on the lives of citizens. Demotivation is reflected in the provision of poor quality services, lack of interest and lack of commitment to solving citizens' problems. This results in inefficient public administration, making it difficult for citizens to access quality public services and negatively affecting their quality of life.

In a nutshell, the demotivating factors for employees of the Ministry of Territorial Administration in Angola have a significant impact on the lives of citizens. The lack of professional recognition and appreciation, precarious working conditions and the lack of adequate training all contribute to a lack of motivation among these employees, which results in poor quality public services and compromised quality of life for citizens. Measures need to be implemented to encourage the motivation and professional development of these workers, in order to improve the quality of public administration and the well-being of the population. In order to invest in the staff, it is essential that the Ministry of Territorial Administration (MAT) makes an appropriate adjustment to the sector's employees, providing them with due recognition and professional appreciation. This implies promotions or reassignments, as well as continuous motivation, training and professional development. In addition, it is important that salaries are in line with the length of service and academic background of each individual, as well as establishing a special salary scale for those who represent the government and the state.

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