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Pedagogical Innovation: An Analysis of Teaching Practice in Mathematics Professionals to Improve Students Learning

Nelson Bacon Salazar
Universidad Católica de Trujillo Benedicto XVI, Peru, *nbaconsalazar@gmail.com*

Itala Esperanza Navarro Montenegro
Universidad Católica de Trujillo Benedicto XVI, Peru, *italanavarro@yahoo.com*

Manuel Tomás Gonzales Benites
Universidad Tecnológica del Perú, Peru, *mtgonzalesb@gmail.com*

Jenny Dina Mendoza Lacma
Universidad Nacional Federico Villarreal, Peru, *jennymendozal@yahoo.com*

Mirtha Eliana Mesía Nomberto
Universidad Católica De Trujillo Benedicto XVI, Peru, *elianamn31@hotmail.com*

The aim of this research was to examine the teaching practice of professionals of the Secondary Specialization in Mathematics Didactics (SSMD) in secondary education, using a qualitative research design, cross-sectional type. Furthermore, we selected 11 teachers that finished their first education cycle in SSMD as sample. Two data collection instruments; observation technique and interview were used in this study. These instruments were used to collect information on the planning of learning sessions; description of learning session; critical reflection of learning session, intervention to overcome deficiencies; and commitment to improvements. The results showed many failures in the planning process of learning sessions, as well as in the execution and subsequent reflection, intervention and commitments to overcome them; these were consequences of the work of non-specialized professionals. Also, more than 50% of the teachers observed did not start with motivation that awaken the interest of the students based on situation in the environment, an organization in teams without established criteria, the use of inadequate didactic materials and the lack of strategies applied.

Keywords: teaching practice, mathematics, learning session, critical reflection, intervention, commitments

INTRODUCTION

After the pandemic that started four years ago, almost all educational and training process has returned to a face-to-face education style in many countries (Ramos et al.,

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2021). Therefore, it is necessary to recount certain results regarding the quality of education that have brought concerns among the authorities of the education sector in Peru (Taipe et al., 2022). Palafox Pérez de Salazar (2023) states that it is necessary to review and contextualize the Program for International Student Assessment (PISA), last version, to the current educational system in Peru. Such results, published by the Organization for Economic Cooperation and Development (OECD), are binding and put Peru in one of the last places of the participating countries in Latin America. It is relevant to recognize that the PISA-2022 tests showed the performance of students, whose average was 15 years old, in areas such as mathematics, science and reading comprehension (OECD, 2022) However, according to test applied, many Latin American countries ranked last; in terms of mathematics results, Chile stands out as it occupied 46th position with 412 points (mathematics score), a situation that places it below the average of 472 points by the evaluators of PISA tests. They also scored 448 points in reading and 444 points in science. Worrisomely, Peru ranked 56th on mathematics. It is worth emphasize that countries with outstanding scores focus on the selection of teachers, disregarding the number of students in a class and allowing autonomy to teachers (Lennert da Silva, 2020).

The deficient results of the PISA-2022 test obtained by Peru Students have generated concerns about the work of institutions involved in ensuring the quality of education. Hence, it is crucial to reform the Peruvian education system. For example, the Peruvian Institute for the Evaluation, Accreditation and Certification of the Quality of Basic Education (Ipeba, for Spanish acronym) —the operating agency of the National System for the Evaluation, Accreditation and Certification of the Quality of Education (Sineace, for Spanish acronym), which is a specialized technical agency attached to the Ministry of Education (Minedu, for Spanish acronym)— are established to ensure the quality of Peru's public and private educations institutions. Therefore, they offered their views on these results. The representatives of the agency Ipeba also argues that the society should be concerned about improving education, demanding a quality education. These unsatisfactory results may be due to several factors, but teaching practice is one of the main contributors to this problematic situation (VanWyngaarden et al., 2024).

Despite the efforts of teacher training and updating carried out by the Ministry of Education, Regional Education Department and private companies over almost two decades, inadequate pedagogical strategies applied by teachers in many schools has still not been reversed and persist (Taipe et al., 2022). This also leads to the importance of evaluating the performance of the teachers, which must consider skills, competences, performance and effectiveness. Ferreira et al. (2024) also declare that "the planning, the teaching method, the implementation of learning activities and the assessment criteria" (p. 68) are essential for the evaluation of teaching performance. It should be noted that this effectiveness depends not only on the competence and performance of the professional, but also on how the students respond. Therefore, to improve teaching and optimize learning, the development of professional competences, resources and didactic materials implemented in a class should be taken into account (Kumarage & Silva, 2024). For this reason, the Ministry of Education in Peru, with the aim of revaluing the performance of teachers, has organized programs to improve teaching practice. To this end, a program of Secondary Specialization in Mathematics Didactics has been

implemented in agreement with various universities. Thus, in the present research, we have worked with a sample of teachers from this program, in order to analyze the teaching practice of professionals in Mathematics, and the factors related to it (the strategies that were implemented in secondary education, the motivation involved during learning sessions, and other factors).

LITERATURE REVIEW

The reality of teachers' professional practice

Several skills that teachers develop in their professional teaching practice in basic education can be described from their own point of view or for their assessor. For instance, the formation of an adequate environment for teaching and learning mathematics to a group of students in a specified school could be evaluate by the director (Miranda-Núñez, 2020). According to Vega Cerda (2018), the content of the discipline is the first criterion to be considered, as reflected in the national curriculum; in other words, the professional skills that the teacher applies to the principles and concepts of mathematics and transmit to their students. Furthermore, the teacher must consider the various perspectives and new developments of these contents.

Hence, there are some concerns about teachers planning and relating mathematics content to the environment and to other curricular units, such as the lack of updating of the content taught. On that basis, a contradiction can be projected: first, students would be subject to teaching outdated content and, second, teachers would reflect an insufficient mastery of mathematics content and a weakness related to other disciplines (Cardona Hurtado & Corica, 2021). Another key fact to remember is that teachers must be commitment to the development of students' abilities, as Perdana Prasetya et al. (2024) state, they must be able to "connect useful concepts to solve problems" (p. 216). Moreover, teachers that contemplate in their planning the strengths and weaknesses of their students with respect to the mathematics objectives, should oriented the classroom environments towards the characteristics of these students. However, the application of mathematics teaching-learning methodologies is not only decontextualized, also disconnected from the knowledge of the development stages of students who received them. This evaluation of professional teaching practice is related to the commitment to a clear and precise educational project, considering that their own evaluation show "practice" as a clear ethical option, associated with fulfilling the teaching profession well, so that their students learn mathematics appropriately.

In the Peruvian context, most teachers are involved with an educational project characterized by its quality, which truly contributes to the development of the teaching profession. Of course, this project should really promote participation and reflection on ways to improve inefficient educational practices in mathematics teaching, in such a way that it meets the expectations of students and their social context (Esquerre Ramos & Pérez Azahuanche, 2021). It is a fact that teachers not only stand out for prepare learning sessions wisely, but also contribute to educate individuals who are just and worthy. They conceive the process of teaching-learning as the critical and ethical appropriation of the mathematics objective and the roles that these implies.

Teaching performance

According to Carrera Tapia and Silva Cruz (2021), it refers to an action perform by a person, in relation to what is assigned to them as a responsibility and measured in terms of its results. In summarize, the evaluation of any person, in order to maximize their motivation and individual needs, must lead to an adequate assessment of their performance. These authors agree that the failure or success of the entire education system is directly related to the quality of the work or pedagogical practice.

On the other hand, Chiavenato (2002) states that performance is the effectiveness of the personnel working in organizations, so the worker performs a task and feels satisfaction for it. Likewise, performance is perceived by people as the combination of behaviour and results, which leads to the need to modify what is executed, in order to measure and observe the action. Also, it is considered the ability of an individual to produce work for a short time, with less effort and higher quality, being oriented towards the assessment of which will result in their performance. Meanwhile, Montenegro Aldana (2003) suggests that the performance of the education professionals is defined as the fulfilment of their functions; this is determined by factors associated with the teacher, student and environment. In summary, performance is exercised in different fields or levels, in the sociocultural, institutional, classroom and teaching context, through reflexive action. It is also important to develop creative in teachers to improve their pedagogical strategies (Mulyoto et al., 2024).

Factors determining teachers' performance

Three types of factors are considered: first, those associated with the teachers themselves, second, those associated with the student, and third, those associated with the context (Montenegro Aldana, 2003). The first factor is related to teachers' professional training, health, motivation and commitment to their educational work. Teacher training provides the knowledge to carry out educational praxis with clarity, planning, organized execution and constant assessment. Hence, a higher quality of training, teachers will perform efficiently. Likewise, the better the physical and mental health conditions, higher possibilities of exercising appropriate functions (Gascón & Nicolás, 2021). It is a fact that health and general well-being depend on living conditions and the satisfaction of basic needs. However, you can have excellent training, very good health, but if you do not have sufficient motivation for what you do, the results of management will be inadequate (De Sousa et al., 2021).

On the other hand, motivation can be reinforced by the level of commitment, a conviction that educational practice is necessary for individual and collective development in any society. In addition, it is important to demonstrate punctuality, compliance with task daily, excellent relations with students and other teachers, applying pedagogical activities with organization, dedication, concentration and enthusiasm.

Thus, Cardona Hurtado and Corica (2021) suggest that are four factors with a major influence, these are training, health, motivation and commitment, which are mutually

reinforcing and generate a kind of unifying force that keeps the teacher in continuous improvement and a high level of satisfaction.

Field of action of the teaching performance

Montenegro Aldana (2003) considers that the characterization of the factors could allowed to identify the fields in which the teachers carry out their work. It can be divided into four levels: the teachers' action on themselves; the action carried out in the classroom and other learning environments; the action executed in the institutional environment; and the action accomplished in a socio-cultural context.

Professional training involves the development of undergraduate and postgraduate university education programs, but also a constant updating activity in the various fields of knowledge related to education, such as pedagogy, auxiliary sciences, educational regulations and educational policies, as well as State guidelines and directives on educational matters in every country (Komariah et al., 2023). The work that teachers accomplish on themselves is related to their training and the organization of their personal lives. According to Montenegro Aldana (2003), the organization of teachers' personal life is fundamental for the development of their profession, to work with motivation, serenity and dedication.

The field of greatest impact is the performance in the classroom and other learning environments such as laboratories, library, playgrounds, sports fields, etc. This work is the most diverse and complex; it is also the most directly related to student learning. It can also be defined as an attempt to systematize the performance of teachers on three moments: first, the previous activities; second, the execution of the learning activities; and, third, the subsequent activities.

Purpose and criteria of teaching performance evaluation

It is understood that evaluation is indispensable and is a basic aspect of the administrative process. As all human conduct demands an assessment, it is also necessary to evaluate achievements in terms of the purposes that are outlined in every institution (Monroy Lorelei & Marroquín, 2020). Performance evaluation is used for different purposes in organizations. It is often used by the management of the institution to make relevant decisions such as promotions, transfers and dismissals. Alvarez et al. (2018) states that when a worker is selected or hired for a particular position, he or she has the right to know from time to time how they are performing on the job, according to the performance standards.

These performance appraisals are used as criteria to validate recruitment and development programs. Thus, new workers who perform poorly can be identified through performance evaluation. Also, the effectiveness of training and development programs can be determined by assessing how well employees will perform on their tasks (Vega Cerda, 2018). Such assessments lead to the identification of training needs and point to inadequate employee skills and attitudes, for which programs can be created to remedy these attitudes.

In addition, management evaluations provide employees with feedback that is used as a basis for assigning rewards, and choosing who should receive certain salary increases or other compensation, which is usually determined by the results obtained from the performance evaluation. All these functions and purposes are important for both the tester and the assessed (Miranda-Núñez, 2020). Some criteria are necessary to evaluate teacher performance (Esquerre Ramos & Pérez Azahuanche, 2021):

- *The results of activities implemented in the institution*. What is valid is the objective, teachers are evaluated for the achievement in their performance.
- *Behavior*. Despite the difficulties to identify specific results that may assigned to some actions of teachers, the director of the institution must examine their behavior on the basis of their work, including the promptness in executing their tasks, leadership and behaviors relevant to their activities, etc.

The characteristics associated with a good attitude or experience possibly be correlated with the positive results of the activities performed, but even so, institutions use these characteristics as criteria for assessing the level of worker performance (Esquerre Ramos & Pérez Azahuanche, 2021).

On the other hand, an adequate teaching performance evaluation should fulfil at least the following functions:

- *Diagnosis*. The evaluation should describe the teacher's performance at a specific and precise stage, and also constitute a synthesis of the teacher's most outstanding successes and failures, as they appear in reality. This could contribute to overcoming imperfections and weaknesses in teaching-learning processes.
- *Instructive*. Individuals educate themselves, learn from the assessment process, try to incorporate a new learning experience as education professionals and as people.
- *Educative*. Teachers assume that there is an important relationship between the results of the evaluation of their teaching practice and the motivations and attitudes that they experience in themselves towards their work.
- *Developer*. Teachers acquire the ability to constantly and critically evaluate their teaching practice, which reduce the fear of their own mistakes and limitations, but also learns from different situations and adopts a new attitude that will allow them to be more aware of their teaching (Huamán Ramos et al., 2021).

In summary, teachers become aware of and understand more clearly all that they do not know and needs to know; and as a result of this process of personal maturity, the need for improvement becomes their existential task as a professional and as a person.

Good Teacher Performance Framework

According to the planned teacher performance appraisal system in Peru (Minedu, 2020b), there are three professional domains:

- Domain A: This refers to the planning and organization of teaching-learning process, which should include the curricular content that they teach, as well as the

pedagogical principles and skills needed to ensure that students acquire quality learning, taking into account their socio-economic, cultural and personal characteristics. This domain acquires special importance due to the treatment of the contents of the discipline and the national curricular framework, which implies sequential and coherent planning of curricular programming, didactic and learning units, selection of teaching-learning strategies, diversification of contents and the organization of assessment activities (Peñafiel Arévalo, 2023).

- Domain B: It consists of the learning environment in the classroom where students interact with the teacher. It also refers to the various pedagogical skills that teachers develop during the learning sessions, articulating the mastery of the discipline. It also implies clear and simple communication of the contents with the application of strategies and methodologies that place the student at the center of the teaching-learning process.
- Domain C: It involves the fulfilment of previously established work and professional responsibilities, the interest in professional improvement, the ability to reflect on their practice and colleagues, and their identification with the purposes and institutional performance. It also includes support and communication with students, parents and community representatives.

Mathematical strategies development: Polya's Method

According to Taipe et al. (2022), the teachers' perceptions of how to improve the teaching strategy are varied despite their formative, because through time it is develop new methods to improve mathematical skills in students (Al-Ramama & Jreisat, 2023).

Hence, it is important to develop the mathematics teaching strategy based on Polya's four steps. For this reason, it is showed every step of this method:

a. *Step 1: Understand the problem*. This step is developed through questions about the data and the situation of the problem. The step is difficult to overcome to some students, because they have to affirm that the procedures formulate can be implemented in the context of the problem.

b. *Step 2: Set up a plan*. This can be based on information about similar problem that have already been solved. It is necessary that the teacher guides the students to plan efficient strategies.

c. *Step 3: Execute the plan*. After the plan design, it must be executed an observed the results.

d. *Step 4: Look back*. The solution of the problem leads to a great discovery that involves something more significant, which is the use of the strategy implies in this problem to another situation.

METHOD

Research Design

This is a qualitative research design, also has a cross-sectional type. According to Lafrancesco (2003), qualitative research differs from quantitative research in terms of their preferential or predominant us of qualitative information and respective methodology. Even if the research is predominantly qualitative, might involve quantitative aspects, for a better understanding of the problem (Angrosino, 2019).

Area of study

This study was carried out in six different schools localized in the province of Huamanga, the region of Ayacucho, Peru, to observed the learning sessions of each teacher that is included in the Secondary Specialization in Mathematics Didactics in secondary education at the Universidad Nacional San Cristóbal de Huamanga. All teachers impart their knowledge to solve mathematical problems in Spanish during the learning sessions to the secondary level.

Table 1
Location of schools selected

Number of teachers	School	Level	Location
4	I.E. San Ramón	Secondary	Huamanga, Ayacucho
3	I.E. Los Libertadores	Secondary	Huamanga, Ayacucho
1	I.E. Alfredo Parra Carreño	Secondary	Huamanga, Ayacucho
1	I.E. José Faustino Sánchez Carrión	Secondary	Huamanga, Ayacucho
1	I.E. Mariscal Cáceres	Secondary	Huamanga, Ayacucho
1	I.E. Enrique López Albújar	Secondary	San José de Ticlas, Huamanga, Ayacucho

Participants

The sample of this study consisted of eleven teachers, who completed the first education cycle of the Secondary Specialization in Mathematics Didactics in secondary education at the Universidad Nacional San Cristóbal de Huamanga in 2021. This sample were selected for the non-probabilistic parameters It is important to indicated that each teacher has their pedagogical practices in the school that they work before attended this Specialization.

In each learning session, the teacher applied the Polya's method in order implemented this strategy to solve mathematical problems adequately.

Table 2
Characteristics of each school per teacher

Code name of teachers	School	Grade	Level	Time of observation	Time of interview
AR	I.E. San Ramón	3rd	Secondary	2 h	15 min
AQ	I.E. Alfredo Parra Carreño	4th	Secondary	2 h	15 min
EB	I.E. José Faustino Sánchez Carrión	4th	Secondary	2 h	15 min
IH	I.E. Los Libertadores	2nd	Secondary	2 h	15 min
IP	I.E. Los Libertadores	5th	Secondary	2 h	15 min
JM	I.E. San Ramón	1st	Secondary	2 h	15 min
JV	I.E. San Ramón	4th	Secondary	2 h	15 min
LG	I.E. Los Libertadores	1st	Secondary	2 h	15 min
NC	I.E. Mariscal Cáceres	5th	Secondary	2 h	15 min
RG	I.E. San Ramón	2nd	Secondary	2 h	15 min
RO	I.E. Enrique López Albújar	5th	Secondary	2 h	15 min

Data collection

Two data collection instruments; observation technique and interview were used in this study. Firstly, the observation technique was applied to obtain primary information on teaching practice and aspects related to the learning sessions, which was registered in the research field notebook, instrument applied with the following characteristics: name of the school and teacher evaluated, learning strategy applied, description of the learning sessions (number of children, mathematical problems explained, application of Polya's method to solve the mathematical problem), critical reflection about the purpose of the session (difficulties in the redaction of the mathematical problem and the solution), comments about what is necessary to applied and change (intervention), commitments about improving the learning session based on the Polya's method and evaluation instruments adequate (refer to Figure 1). This instrument was design and validated by the Minister of Education in Peru, which they applied to evaluate the progress of the teachers during learning sessions in Secondary Specialization in Mathematics Didactics Program (Minedu, 2020a).

RESEARCH FIELD NOTEBOOK			
School name:	Grade:	Level:	Date:
Code of the research teacher: Participant observer data:			
Session title:	Start time:		End time:
ARP title:			
CATEGORY		SUBCATEGORY	
EVALUATION INDICATORS		KNOWLEDGE	
DESCRIPTION CRITICAL REFLECTION INTERVENTION COMMITMENTS			

Figure 1
Registration of data in the research field notebook

Secondly, the interview, which is complementary to the other instrument, consisted in a questionary with semi-structure questions about the development of the learning session, which a period of 15 minutes after the end of each learning session. This questionary consisted on the aspects of teaching strategies that can be improv, the evaluation of the implementation of the strategy based on Polya's Method, and resource or materials appropriate for the development of the pedagogical strategies. This instrument was design and validated by one participant observer to each learning sessions, principal researcher of this study, to evaluate the competences of each professional during their activities.

Furthermore, all the participants in this study were willing to collaborated with the questionnaires applied and with information about their learning sessions.

Data analysis

As Báez y Pérez de Tudela (2012) states, qualitative analysis aims to extract the main meaning of the subject under investigation, in other words, to investigate not only its components, but also its essence. For this purpose, the content of analysis technique was used in this study to classify the information collected, which implies the description, interpretation and explanation of the data. We have been able to organized the information related to the teaching practice in five categories: observation of the planning of the learning session; description of the learning session; critical reflection of the learning session, intervention to overcome deficiencies; and commitment to improvements.

Table 3
Categories of analysis

Categories of analysis	Abbreviation	Instruments	Information registered
Observation of the planning of the learning session	OPLS	Observation and interview	- Title of the learning session - Title of activities of the Action Research Project (ARP) - Method applied - Indicators of evaluation
Description of the learning session	DLS	Observation and interview	- Number of students in class - Details of the mathematical problem presents with motivate situation (related to student's experience) - Prior knowledge of students about the topic - Resources and materials used during the learning session
Critical reflection of the learning session	CRLS	Observation and interview	- Aspects that the teacher needs to improve to applied the Polya's Method successfully - Aspects to improve the evaluation of the Polya's Method - Quality of resources and materials used
Intervention to overcome deficiencies	IOD	Observation and interview	- Inconsistency on the indicators of evaluation about the Polya's Method - Homework must be related to the topic develop it classroom
Commitment to improvements	CTO	Observation and interview	Suggestions made for the teacher observer about aspects that need to improve in learning strategies

On the basis of the recorded texts (speeches) for every teacher interviewed an observed, the content of analysis (CA) was carried out in order to interpret the communicative products (refer to Table 3). For instances, each category involves certain aspects that were registered after the observation and the interviews: the category OPLS implies the record of the general title of the learning session, the title of the activities of the Action Research Project (ARP), which is important because it includes the mathematical competences that must be develop in the students, and the strategies applied. The category DLS is related to the motivation, methodology and didactic material applied for the teachers during classes; the third category (CRLS) includes a questionnaire about the strategies that the teachers need to improve, how teachers evaluate if their students applied the Polya's Method with accuracy; the category IOD is focus on the problems that requires solutions in the learning sessions; and the category CTO contains information related to the commitments of each teacher to improve their students' knowledge in Mathematics.

FINDINGS

Observation of the planning of the learning session

In the development of a learning session, the teacher requires prior planning, taking into account that each session is framed within the activities programmed in the Action Research Project (ARP) to improve the mathematical competences in the students. Some elements of the learning session that have been observed are related to the ARP, such as the title, methodology (categories and subcategories), knowledge and evaluation indicators based on the Good Teacher Performance framework, which indicated that. This development also includes different moments: motivation, didactic material, among others. On the other hand, the teachers' perceptions of how to improve the teaching strategy are varied and scattered, leaving a trail of doubt as to the full understanding of how the mathematics teaching strategy based on Polya's four steps should be applied.

However, 40% of the titles of the learning sessions observed had not been related to the ARP. Likewise, just 36% of teachers interviewed indicated the use of teaching strategies, and 45% show the application of learning strategies based on problem solving (Polya's Method).

ARP title: Learning strategies to develop the solve problem skills in students	
CATEGORY	SUBCATEGORY
Learning strategy to solve problems	Strategy based on the Polya's Method
EVALUATION INDICATORS	KNOWLEDGE
- Develop heuristic strategies to solve problems involving quadratic inequalities and system of linear equations with two variables. - Use methods (reduction, substitution, graphing, equating) to solve problems with system of equation	- Equation system - Solving method

Figure 2
Example of category and evaluation indicators in a learning session

In the Figure 2, it is showed that the evaluation indicators about the solution of mathematical problems skills related to the title of the ARP, they must be related to the variety of mathematical abilities that implies these skills.

Description of the learning session

After observed in detail each learning sessions and register them in the researcher filed notebook; in this category we have found that 82% of teachers had reunited students in groups of four members, but without specifying criteria in terms of quantity or other patterns. This situation has led to disorder because they were not grouped according to well-defined criteria and were not properly assigned the relevant tasks. Regarding the factor about didactic material and the development of the activities, 55% of teachers

observed slightly used the Polya's Method in each session, whereas 45% emphasized the use of this methodology.

The motivation is another factor quantitative analyzed in this category. In the Table 2 it is showed that 27% of teachers interviewed do not motivate their students in the beginning of the learning sessions, whereas 55% just mention some aspects that are not related to the course, and 18% motivated their students in the beginning of the learning session.

Table 4
Motivation in learning sessions

Motivational aspects	%
Motivation without aspects of daily life	55
Motivation with aspects of daily life	18
Lack of motivation	27

These results demonstrate that they do not have the appropriate competences to exercise their profession with accuracy.

Critical reflection of the learning session

This category is related to the responds of the teachers interviewed. We considered these aspects:

Changes to improve teaching strategy

Notably, some teachers say that it is better to improve the motivation in students, cooperative learning management, asking them more questions to develop their knowledge, to applied the Polya's four step in more exercises, to provide working material in every session, to enhance mentoring for students who are experiencing difficulties. However, these teachers do not implement what they said in the learning sessions.

Implementation of Polya's Method to solve problems efficiently

When each teacher guided the execution of some exercises with questions, lots of student did not have the right answer because they did not know the basic properties of solving equation. Notably, there is no precise knowledge of the students about the various Polya's steps. In addition, insufficiency knowledge resulted in a lack of proper application. Also, there is a limited expertise of the teachers to conduct the respective activities according to the strategy in a relevant manner.

Use of resources and materials

In the development of the learning sessions, it is noticeable that the intention of some teachers is adequate as the didactics explanation of some mathematics concepts to solve exercises with integers, but it is necessary to improve other aspect. It is also important to facilitate some developed examples and consider questions to reflect on and arrive at practical rules for finding the sum, difference and product of integers.

Intervention to overcome deficiencies

Considering the results obtained in the prior categories, it is suggested more intervention by the teacher in the form of better accompaniment, asking students questions related to the course, emphasizing motivation, supporting the more advanced student, allowing the student to formulate his or her strategy, providing the material, among others. This suggest that there are no clear and systematic proposals for the different steps of Polya's Method. This accumulation of proposals with indicators of disorientation and lack of a clear focus would be complemented by the fact that most of the teachers observed (64%) did not achieve the proposed purposes (Barrón Parado et al., 2021). Another significant aspect of this intervention is that students should engage in extension activities and activities outside the learning sessions in order to achieve autonomous learning (Jago Duda et al., 2023). The activities should be oriented so that the student develop the ability of learn to learn.

Commitment to improvements

Compelling the aspects taken into account in the category IOD, in this category it is emphasized that teachers should consider that addressing professional responsibility involves the fulfilment of previously established duties at work. These are associated with the teacher's commitment to the teaching-learning processes, the interest in professional development, the ability to reflect on their practice and that of their colleagues, as well as their identification with institutional purposes and performance. Similarly, Carrera Tapia and Silva Cruz (2021) argue that professional responsibility includes support and communication with students, parents and community representatives, as stipulated in the framework of good pedagogical practices of the Teacher Performance Evaluation System.

A professional responsibility is to assume the commitment to be evaluated on an ongoing basis, to improve their daily teaching practice, as part of the commitment to be assumed by the organization where they work. Moreover, one of the factors that facilitate success in teacher evaluation systems, according to Peñafiel Arévalo (2023), is organizational commitment, in that teacher evaluation cannot be an activity detached from the system, it cannot be an isolated process, but rather the organization must insist on the importance of evaluation from the highest levels and provide sufficient resources for such a process, which is very necessary.

DISCUSSION

These results have been important to demonstrate the objective of this research. In order to make teaching evaluation more complete, the evaluation of skills, teaching competence and learning outcomes should be taken into account to the above-mentioned aspects. Firstly, the results evidence that teachers do not fulfill the profile: create a climate conducive to learning, democratic coexistence and the experience of diversity in all its expressions with a view to forming critical citizens. Secondly, in the observations carried out, there is no evidence of effective student's participation that has benefited their learning or the development of mathematical skills or abilities (Suleman Arshad & Aldawasari, 2023). More significantly, for students to learning to learn, they

must carry out extension activities outside the learning sessions in order to achieve autonomous learning (Tobón Tobón et al., 2010).

According to the results of the study Silva Mojallot (2020), only 39.2% of the teachers stated that they always relate the contents of the disciplines with the context and other disciplines; in other words, 60% of the teachers elaborate content that only reflect the lack of contextualization and updating of the contents. This suggest that it is possible to project a duality: students are being taught decontextualized content, whereas teachers are reflecting a deficient mastery of the content and an inability to relate it to other disciplines of knowledge. In the case of the Peruvian teachers in the present study, similarly worrying results were found, since 27% do not motivate their students and 55% motivate them with aspects that are far removed from reality, and at the beginning of the learning session they motivate their students with aspects of daily life. In comparison, 54.4% of Chilean teachers' state that they always consider in their planning the strengths and weaknesses of their students with respect to the content they teach, as well as the application of teaching and learning methodologies, which implies that the percentage difference programs methodologies that are not only decontextualized, but are also disjointed with the knowledge of the students' state of development (Saadati et al., 2023). By contrary, in the case of the teachers in this research, in the teaching material and in the development of the activities, more than half of the teachers observed (55%) only slightly noted the methodology to be followed in the development of the session, such as Polya's Method.

Above all, the contrasts in the Latin American realities are marked in relation to certain aspects of teaching performance, key aspects in which the issue in question lies, in particular, the evaluative culture of each country.

This suggest that the teaching practice of the secondary school mathematics teachers in the sample is deficient, since, in general, failures are observed in the process of planning the learning sessions, as well as in the execution and subsequent reflection, intervention and commitments assumed in order to overcome them; these are the consequence of the work of non-specialized professionals, as they are all students of the Specialization Program in Didactics of Mathematics, and whose performance is the result of inadequate initial professional training, a low degree of motivation and insufficient commitment to their work.

CONCLUSION

With the data collected, the objective of the research has been achieved. These data have made it possible to appreciate the process of planning, development and reflection around the mathematics learning session. To summarize, many failures could be observed in the planning process of learning sessions, as well as in the execution and subsequent reflection, intervention and commitments made with the aim of overcoming them; these are the consequence of the work of non-specialized professionals.

In addition, it is not frequent to observe a content display of attitude that show commitment to their work, to demonstrate, carrying out the pedagogical activities with organization, dedication and enthusiasm. However, since the beginning of the learning

sessions, more than 50% of the teachers observed did not start with motivation that awaken the interest of the students based on situation in the environment, an organization in teams without established criteria, the use of inadequate didactic materials and the lack of strategies applied. Most significantly, the critical reflection on the work carried out in the development of the learning sessions was incomplete and insufficient, because there were no clear self-criticism of the success and shortcoming shown.

To conclude, teacher training is necessary and obligatory, because is the only way to contribute to reversing the low quality of education in underdeveloped countries such as Peru.

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