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ACTIVE LEARNING – A SUCCESS PATH FOR STUDENTS IN PRIMARY SCHOOL TO THE NATIONAL EVALUATION

Petrovan Ramona Ștefana (a)*
*Corresponding author

(a) Department of Teacher Education, "1 Decembrie 1918" University, Alba Iulia, Romania

Abstract

The present paper aims to prove that the heuristic approach, learning through discovery and problematisation, significantly improves the students' performance to the national test and adds value to the motivational and behavioural aspects. In the present educational context, the educational process is characterised by successive transmission and accumulation of knowledge without offering a perspective for the studied discipline or the capacity to apply knowledge efficiently. Facts are easily memorised, but they are harder to describe, find, assimilate, and understand. Therefore, each student's individuality is necessary for the teaching materials to be organised depending on the student's specificity. We consider that a solution is represented by creating problem situations, where the student faces the situation and needs to create and discover the problem's path or solution. Our research aims to study the advantages and the limits of the heuristic approach, learning through discovery, and problematisation for the success of the primary school students to the National Evaluation.

Keywords: Active learning, evaluation, national evaluation, optimised teaching, problematisation

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1. Introduction

The uniqueness of people is revealed by the cognitive differences between individuals, the level of learning and adaptation in learning, and the fact that each person builds their learning strategies, paths, and particular trajectories of training and formation. In this context, the school is the one that transmits information that meets the needs, expectations, interests of each student, the result being the pleasure of learning. Therefore, the individualised approach is the educational approach that considers what each child brings to the situation. of teaching-learning-assessment, which is built starting from the in-depth knowledge of the factors that produce the differences between the way students learn. The paper aims to demonstrate that the heuristic approach, learning by discovery and problematisation, contributes significantly to improving school performance obtained by students in national tests. It adds value to the motivational-affective and behavioural-attitudinal. In educational practice, there are few procedures for individualisation that meet the needs, requirements and possibilities of each.

Based on these premises, the question arises: How should we teach? We consider that one of the solutions consists of creating problem situations to put the child both in the actual situation of knowledge and especially in that of elaborating and discovering the path or solution of the problem. Thus, directing concrete life situations with immediate applicability in everyday life can give the educational act authenticity and attractiveness. Furthermore, creating an emotional climate based on trust and cooperation determines the student to come to school with pleasure and actively participate in the educational activity.

2. Theoretical Foundation

2.1. Theoretical References on Active Learning in the Context of Curricular Integration

Active instruction is a challenge to self-reflection on those interested in innovating teaching approaches in the classroom. The phrase active training has been established by emphasising the positive role of the social dimension on learning. In the theory and practice of contemporary didactics, the issue of active training has new, interdisciplinary scientific approaches, supported by arguments such as active and reflective participation of students in the learning and assessment processes.

> Active training represents a superior type of training, which is based on the activation of the training subjects, respectively on their active and full involvement and participation (intellectual/cognitive, affective-motivational and psychomotor) in the process of their own training, by establishing intellectual, verbal interactions, social-emotional and affective with the didactic framework and interactions with the curricular contents. (Bocoș, 2013, p. 14)

The traditional pedagogical model no longer corresponds to the reality of today's educators because, in the current context, students live in a world that abounds in the information that comes to them from different sources. Access to knowledge is no longer the teacher's prerogative; he is no longer the central figure around whom information is acquired, skills and behaviours are formed, learning potential is developed, his role now being to decant the quantity and quality of information.

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In the current context, the need for knowledge is universal and mobile, but the possibilities for learning go beyond the school's walls. From this perspective, there is a need to develop in the young generation a complex of information skills to help them decant the multitude of credible information from the unbelievable ones they come in contact with, skills designed to guide them to use these new acquisitions in immediate social contexts. Here, the teacher must leave the role of the absolute holder of knowledge and become a guide to his students in acquiring new knowledge with immediate applicability in everyday life. Thus, the subjects of learning will no longer be "experts in memory acquisition" (Chiș, 2005, p. 23), whose primary purpose is to store in memory a huge amount of information that must be reproduced as faithfully as possible, but will have an active role in their formation.

Secondly, primary school students are prepared for end-of-year or apprenticeship tests, decontextualised tests, national tests focused on the multitude of acquired knowledge, with the ultimate goal of obtaining good results. A single assessment occurs after a certain period, corresponding to precise contents imposed by the documents in force. These assessments are also a way to regulate the teaching process, emphasising the impact of the way content is presented on learning in students. Thus, interpreting the results, the teacher can analyse the performance of his students' performance to reorganise the targeted assimilation process.

Third, due to the technical and informational expansion, students are part of the new generation called "digital natives" (Prensky, 2001). Technology is part of their lives, and the teacher has to adapt, re-orchestrate, build bridges with the new reality, develop digital skills to help them reformulate the teaching process, bring the computer to class and educational software. Starting from these realities, new paths are opened in daily practice, and new educational practices are developed, digital skills that lead students to a new role, that of an active participant in their training. Thus, students can find their answers when they need, looking for information on their own in the multitude of sources at their fingertips, opening new doors for knowledge, sharing the information acquired, promoting the sustainable integration of knowledge. The development of digital skills is on the list of the eight key competencies that are aimed at training human personality, adaptability to the requirements of today's knowledge-based society (Recommendation 2006/962/E.C. of the European Parliament and of the Council of Dec. 18, 2006, on key competences for lifelong learning). The introduction of new techniques in the educational activities will bring the world closer, will circumscribe other limits of the school space so that they will become "a new working strategy of the teacher and students, a new way of designing training and learning, which enriches the system, the teaching activities they carry out and which have important formative and informative values" (Ionescu, 2001, p. 158). Teachers must create educational climates in which, to be surprised by students, they must create an atmosphere of trust-based learning to accept stimulating, creative, meaningful school challenges, students being thus motivated to be actively involved in carrying out the tasks to be solved. "Learning to do means learning creativity" (Chiș, 2005, p. 38). It means conscious, determined and active engagement in an activity; it means taking on specific roles, giving up the state of non-involvement. In the 21st century, interpersonal collaboration appears in all forms and is present throughout the learning process. For most students today, teamwork comes down to gathering data and dividing work. The focus must be on moving from one team to another. Each member must be actively involved in solving the tasks, assisted by the teacher who supports the learning activities by

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directing and coordinating them. The teacher can suggest paths for the student to follow, which he can then practice in similar contexts to identify the paths that will lead him to success. Thus, the students have revealed new freedom, born from active, modelling learning.

Active pedagogy is anchored in action and focuses on forming skills and not the volume of information. Therefore, it is imperative to offer the student the leading role in showing his learning to make him active in the learning process.

2.2. Integrated Teaching

Integration represents "the action of making various elements inter-relate to constitute a harmonious whole, of a higher level, the integration of the parts leading to a product/result that exceeds the sum of these parts" (Ciolan, 2008, p. 114). The didactic orientation is directed towards the learner, the perspective being a metacognitive one. Metacognition refers to a person's ability to represent his or her cognitive activity and the ability to control, evaluate, and exploit the results of that representation. The student has the opportunity to adjust his cognitive approach according to the concrete objectives he has in mind. From the perspective of the new curricula, starting with 1998, the concept of "integrated teaching" is imposed, learning-teaching-assessment being seen from a holistic perspective, they are meant to reflect reality, an interactive reality. Integrated teaching is not a study discipline but a theme common to several disciplines. The success of such activity consists in the degree of structuring of the designed content, always having in mind the intended goals, and the result of combining the natural process of transmitting and assimilating information with the psychic, rigorous structures of the learning process.

Integrated teaching aims at activation that leads to the articulation of "processes of reflective, logical, critical, imaginative, evaluative and creative thinking" (Bocoș, 2013, p. 96) in students. Even if integration gives rise to controversial discussions in the literature, the attempts of the framework plan in our country prove the effort to find a solution in organising educational disciplines.

The features of the integrated curriculum are as follows:

1. harmonisation in a unitary whole of the study objects;
2. focusing the didactic approach on integrated activities;
3. relating the characteristics of different disciplines;
4. ensuring the correspondence between learning and daily life.

Currently, the literature "offers three models of integration" (Chiș, 2005):

1. interdisciplinarity
2. multidisciplinarity
3. transdisciplinarity

The interdisciplinary model captures the thematic interdependence of two or more disciplines of study. The concepts at the intersection of these thematic areas are extracted and retained as skills and abilities. Interdisciplinarity involves the open interaction between certain competencies or interdependent content from two or more disciplines, based on an epistemological support that involves the interpenetration of disciplines (Ciolan, 2008, p. 125). This model aims to make connections between disciplines, to highlight the connection, the unity, without abolishing the disciplines themselves.

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The multidisciplinary approach emphasises restructuring two or more study disciplines around the same themes or thematic topics. In teaching a topic, the teacher also appeals to the existing possibilities in other disciplines, thus capitalising on the full informational potential accessible to students. Thus, the multidisciplinary approach represents a correlation of several disciplines' approaches to clarify a problem from several points of view.

Transdisciplinary integration is a global curricular approach in which the entire learning activity is organised thematically without specifying the study disciplines. In the context of school learning, transdisciplinarity ensures the transfer of knowledge in various learning experiences, thus making students accountable concerning their learning. "Transdisciplinarity is the highest degree of curriculum integration, often leading to a merger" (Ciolan, 2008, p. 129). Transdisciplinarity is specific to research projects that address projects that cross the boundaries of two or more disciplines. Integration is a complex process that involves several hypostases of reality and manifests itself in different forms, requires the generation of teaching strategies, validated by everyday educational practice and literature (Ciolan, 2008): projects, team teaching, learning through cooperation, active learning, community involvement.

The project is an interactive teaching-learning method that usually involves a micro-research or a systematic investigation of a topic of interest to students. The project method ensures the combination of scientific research work with the student's activity, over a considerable period, and is an effective means of achieving the principle of integrating education with research and practice of everyday life. The projects represent the fruit of individual or group work and are characterised by originality and practical utility, a common activity for teachers and students.

Team teaching is a collaboration between two or more teachers who complement each other's expertise in favour of students. The advantages of this method are that it can contribute to creating a dynamic and interactive learning environment, ensuring modelling of thinking from a trans and interdisciplinary perspective and leading to finding new solutions, the teacher adapting the contents and work strategies to fully fruit the topic approached.

Cooperative learning is seen as the organisation of a collective work based on complementarity and teleological convergence to ensure the social aspect of learning. Students must learn to cooperate with others and realise that the joint product is more valuable than separate work.

Active learning represents "deep individual involvement (...) in the active and creative acquisition of knowledge, in the construction of knowledge, the formation and development of abilities, capacities, competencies, behaviours" (Bocoș, 2013, p. 85). Students will learn to reflect on their knowledge, ask questions about their intellectual turmoil, problematise, research outside of school, and be actively involved in the process of their formation.

The community's involvement in the act of integrated teaching "brings with it a welcome information, interpersonal relationships with parents, authorities, personalities of the community provide value to projects in which students are involved" (Ciolan, 2008, p. 208).

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2.3. Student-Centred Learning

Student-centred learning "involves new forms of organisation of the learning-teaching process, which emphasise the student's responsibility for activities such as planning, learning, interaction with teachers and other students, research and learning assessment" (Cannon & Newble, 2000, pp. 16-17). Student-centred learning involves shifting the focus on active learning, integrating each student's learning situations, and taking responsibility for their progress. The teacher is no longer considered a classic provider of information, the student becoming the main protagonist in the act of his training. Student-centred learning has as its central starting point the satisfaction of students' knowledge needs, the reorganisation of the teaching-learning-assessment process, and the comprehensive approach to teaching. Thus, by becoming active participants in the teaching-learning process, students are no longer put in a position to passively receive what is transmitted to them, what is taught to them, but will be an active part of learning. An active lesson is based on active methods and procedures, meeting the dynamism of any child. Active-participatory methods fulfil two functions: the formative/cognitive function because, in the act of learning, students acquire knowledge and a formative/educational function. After all, students acquire intellectual, motivational, affective abilities and skills and develop their personalities. The diversity of the methods responds to the needs of differentiation and particularisation of the didactic activities. Thus, the teaching experience is enriched, and the learning experience is diversified, customising for each child.

Methods specific to interactive training are grouped as follows (Bocoș, 2013):

1. methods for developing the active spirit (exercise and problem solving, experiential learning, problem-based learning, discovery, cooperation, model-based learning, problem-based learning, e-learning, etc.);
2. methods and techniques for developing the critical spirit (cube method, quintet technique, mutual teaching method, gallery tour technique, etc.);
3. methods for developing the creative spirit (brainstorming, engineering ideas, synectics, Frisco method, creative visualisation, etc.).

2.4. Integrated Learning

Integrated learning involves the educational process's organisation according to interdisciplinarity principles; it materialises in the organisation of learning by correlating the broad contents in a single disciplinary field. Thus, an integrated curriculum offers the chance to combine study objects, and the activity carried out takes the form of projects. Therefore, relationships are established between different concepts and processes, and the learning outcomes are related to concrete situations in everyday life. In this way, teaching experiences become transdisciplinary experiences, in which learning becomes a personal project of the student in an environment with various stimuli, making learning more attractive. This approach leads to the perception of the topic globally, and the topic investigated not knowing the boundaries between disciplines, in which the emphasis is on group work, cooperation and not competition. Integrated learning is based on integrated learning. There is an inseparable link between teaching and integrated learning. Teaching involves learning, the success of which ensures the

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effectiveness of teaching. Both teaching and learning are complex teaching activities that require different acting methods to achieve the proposed objectives. As long as the student is placed in activating learning situations, his involvement will make the path to skills development easier. "Learning in a way that is as natural as possible, natural on the one hand and, on the other hand, learning according to a rigorous structure are extremes that must exist in the integrated curriculum" (Mara, 2006, p. 133). Research has shown that students will be actively involved in learning when the proposed tasks answer their questions about areas of interest. Learning activities designed around the integrated curriculum and unique contexts allow students to discover new ideas, find new reasoning, transfer the knowledge and skills acquired in new contexts, and reflect on the world and their student status.

The active cognitive attitude of the students is, on the one hand, a consequence of how the teacher adapted the curricular offer, articulated the content elements and, on the other hand, the actual learning activity carried out by the student (Bocoș, 2013).

2.5. National Evaluation in Primary Education

According to ROFUIP, the assessment of students must be done throughout the semester, consistent and rhythmic, the teacher giving importance to all subjects (compulsory or optional). Each semester includes periods dedicated to consolidating and evaluating the skills acquired by students (formative and summative assessment) - decided by the teacher working with that class.

The evaluation periods are proposed towards the end of the semester, and the aim is:

1. improving the results of the teaching-learning process;
2. systematisation of knowledge acquired by students;
3. stimulating the performance of students with inferior and excellent results.

The teacher establishes assessment methods and tools according to the students' age and psychological characteristics, also taking into account the specificity of the discipline.

The assessment can be oral, written, based on practical activities, papers and projects, portfolios, interviews, portfolios, and other tools developed by the departments of the academic unit and approved by the principal or developed by the Ministry of Education and Research and school inspectorates.

In the primary cycle, each evaluation of the students, for each discipline, materialises in one of the grades: insufficient, sufficient, good and very good. Students are assessed based on the curricular standards established in the National Curriculum, the Assessment Standards and the Performance Descriptors established for each subject and each year of study.

In order to establish the final grade, teachers must consider the following:

1. following the summative evaluation carried out during the consolidation and evaluation period, the teacher chooses one of the grades assigned with the highest frequency during the continuous evaluations;
2. to establish the final annual grade for each discipline, choose one of the two final semester grades based on the following criteria:
3. the progress or regression registered by the student;
4. the ratio between effort and performance;the evolution of the student's motivation;
5. completion of the additional training or recovery program established by the teacher.

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2.6. Pisa Type Standardised Evaluation Tests

According to the "OECD International Student Assessment Program - PISA National Center Report", the International Student Assessment Program is an international standardised assessment initiated and designed jointly by all OECD (Organization for Economic Co-operation and Development) Member States and several non-member partner countries, "in order to measure how well students are prepared to face the challenges of today's society, active life or educational dynamics" (MECS & Pisa Center, 2014, p. 8).

The OECD PISA program aims at a broader approach to assessing knowledge, skills and attitudes that reflect changes in education systems, trying to approach them from outside the school, emphasising how they are used in the tasks and challenges of everyday life, thus preparing for learning for the rest of the life. In order to put this goal into practice, the evaluation process monitored by all participating countries seeks a common denominator to the educational policy interests of the participating countries, applying scientific expertise both nationally and internationally. PISA combines assessment of cognitive areas Research methodology According to the "OECD International Program for Student Assessment - PISA National Center Report", the International Student Assessment Program is an international standardised assessment, initiated and designed jointly by all OECD Member States and Economic Development) to which several non-member partner countries were subsequently added, "in order to measure how well students are prepared to meet the challenges of today's society, working life or educational dynamics" (MECS & Pisa Center, 2014, p. 8). PISA is an essential part of the OECD's ongoing program to monitor learning outcomes and report on educational indicators, first announced in the OECD's annual publication Education at a Glance in the early 1990s. The OECD has built a set of indicators of human and financial resources invested in education and how education systems operate. PISA was born out of the need to obtain systematic and reliable information on educational outcomes in different countries, particularly assessing students' abilities. Starting in 2000, the test program assesses students' ability to use the knowledge and skills they have acquired during compulsory schooling, taking into account lifelong learning. It emphasises that PISA testing does not assess the assimilation of a particular school curriculum but what students can do in a natural, practical way and the ability to reflect on their own learning experiences.

The evaluated fields (Reading / Reading, Mathematics and Sciences) aim at:

1. the content or structure of knowledge in each field;
2. processes that can be performed based on the acquired knowledge;
3. the contexts in which the knowledge and skills concerned are applied.

PISA dynamically builds the entire assessment process, with lifelong learning as the first benchmark, in which the knowledge and skills needed to adapt to a constantly changing society are acquired throughout life. "The focus of assessment is on what assessment participants know and can do concretely on what they have learned over time" (MECS & Pisa Center, 2014, p. 10).

Each test administration is evaluated in one area in detail (the main field) and is dedicated to up to two-thirds of the test time, while the rest of the items are for secondary areas. The time allotted for each student was two hours. In the end, students were encouraged to complete a context questionnaire on the socio-educational background of the student. According to the Ministry of Education and Research,

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Romania administered the assessment tools in a "traditional" way, in a printed format. In addition, each participating student received a two-hour test booklet containing a combination of items for investigating Science, Mathematics and Reading / Lecture skills.

Thirty test booklets containing combinations of work tasks/items from the three areas were administered. Students also completed a socio-educational environment questionnaire, with a response time of 35-45 minutes. The principals of the participating academic units completed a questionnaire to investigate the characteristics of the school ethos from the perspective of the school environment, the educational offer, the learning opportunities, etc. (Ministerul Educației Naționale, 2016).

In this evaluation program, the student performance reporting scales include six levels, level 1 being intended for the lowest performances, and level 6 representing the high performances. The grid is designed so that the average of OECD countries is set at 500 points, and the standard deviation is 100. Students placed at Level 1 can solve tasks specific to this level but may not be able to solve tasks higher level. Students assessed on level 6 of the scale can complete both the tasks at this level and all the work tasks classified as belonging to levels 1 to 5.

In the case of PISA 2012, for the primary subject Mathematics, the international report PISA 2012 points out that "PISA 2012 provides the most comprehensive picture of the mathematical skills developed by the school available so far, not only about what students know in different fields of mathematics, but also what I can do with what I know. The results show significant differences between countries in terms of the mathematical knowledge and skills of 15-year-old students. The equivalent of approximately six years of schooling, 245 score points on the PISA math scale, separates the highest performance from the lowest performance of the countries that participated in PISA 2012.

However, differences between countries are only part of the overall variation in student performance. The difference in mathematical performance in each country is generally even more significant, at over 300 points - the equivalent of more than seven years of schooling - often separating the highest performance from the lowest in a country. Addressing the educational needs of such diverse populations and reducing the observed differences in student performance remains a significant challenge for all countries (OECD, 2013, p. 252). The new assessment approach, as presented in the "Guide for the elaboration of the subjects for the assessment of the fundamental competencies of reading and writing and mathematics at the end of the second grade" (p. 4), has in its centre the student, because:

1. offers an objective, outstanding image of the degree of development achieved by the student;
2. ensures the observance of the principle of equal opportunities;
3. reduces and leads to the eradication of discrimination, as it does not intend to classify and label students according to the results obtained;
4. stimulates motivation and interest in learning activities because the student is part of their learning;
5. reduces the student's anxiety during the assessment, because it is intended to improve learning, and assessment is understood as a natural moment of the instructional-educational process

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3. Research Methodology

3.1. Purpose and Objectives of the Research

The research aims to study the advantages and limitations of the heuristic approach, learning by discovery and problematisation for the success of primary school students in the National Assessment in the current context.

3.1.1. Research Objectives

A. Pretesting

O1. Determining the level of training of students involved in research.

O2. Diagnosing the attitude of primary school students towards the tests applied to the National Assessment.

B. Experimenting / Implementing Strategies Based on Active Learning

O1. Carrying out a descriptive-explanatory study of the effects of active learning on the success of primary school students in the National Assessment.

O2. Designing teaching activities that offer students learning situations based on the heuristic approach, learning through discovery and problematisation.

O3. Experiment with these teaching activities and apply new work tools - tests and questionnaires.

O4. Highlighting the relationship between active learning and school success.

C. Evaluation - Comparative Analysis

O1. Recording, monitoring and comparing the results obtained by students in different stages of research.

O2. Illustrating the school evolution of students in experimental research conditions over a limited period of training.

3.1.2. Research Hypothesis and Variables

In the proposed experimental approach, we aimed to prove the following working hypothesis:

The valorisation of active learning through the heuristic approach, learning by discovery and problematisation in the study of the subjects Romanian language and literature, mathematics and sciences, in the 4th grade, contributes significantly to improving students' school results in the National Assessment.

Thus, the research variables can be identified as follows:

1. the independent variable: capitalising on the heuristic approach, learning through discovery and problematisation in the study of the subjects Romanian language and literature, mathematics and sciences, in the 4th grade
2. dependent variable: students' performance during the experiment

Starting from this hypothesis, we propose to organise the entire didactic act from the perspective of the integrated approach of the national curriculum, using as preferred didactic strategies the heuristic approach, the learning through discovery and the problematisation. This will allow students to build their

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approach to a better understanding of the educational act, the teaching tasks being designed in such a way as to claim transdisciplinary information in order to perform a holistic analysis of the surrounding reality. Even if there is no tradition in the initial training of teachers from the perspective of mastering the methodology of teaching - integrated learning in Romania, we try to approach the teaching act from an individualised perspective to create authentic learning experiences. As a result, each student's school development is real progress.

Group of students involved in research: 4th grade

The composition of the 4th grade: 16 students, of which ten girls and six boys.

The family environment in which the students come from is favourable for school success, in the sense that most students come from two-parent families concerned with the school development of their children. But there are:

1.3 cases in which the students come from families in which the divorce occurred;

2.1 student with parents abroad, in the care of grandparents.

3.In terms of parents' level of education:

4.3 students come from intellectual families;

5.11 students come from families in which their parents have a high school education;

6.2 students come from working families with a level of professional education

3.1.3. Human and Material Resources

Human resources: teachers, 4th-grade students

Material resources:

1. Romanian Language and Literature manual, 4th grade, A.R.T. Publishing House;
2. Mathematics Literature manual, 4th grade, A.R.T. Publishing House;
3. Sciences manual, 4th grade, A.R.T. Publishing House;
4. Câmpean I., Todea A., - Romanian Language and Literature Exercise Notebook, 4th grade, auxiliary material, Corint Educațional Publishing House, Bucharest;
5. Teofil A.,– Notebook - a collection of mathematics for the fourth grade, Pro Vita Publishing House, Cluj-Napoca;
6. School curricula, annual and unit planning;
7. Tests administered at the National Assessment.

3.2. Research Methods

The whole design included the use of a whole set of methods, as follows:

1. methods of data collection: pedagogical experiment, systematic observation, the study of curricular documents and other school documents, analysis of activity products, questionnaire-based survey, tests and written assessment tests;
2. methods of organising, presenting and processing research data;

The pedagogical research took place during the second semester of the 2020-2021 school year. The chosen teaching activities were dynamic, revolving around the heuristic approach.

The didactic intervention aims at:

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1. capitalising on the heuristic approach, learning by discovery and problematisation in the lessons of Romanian language and literature, mathematics and sciences;
2. choosing those activities that allow students to be actively involved in the learning act;
3. training students in the ability to solve problematic situations through multiple attempts;
4. encouraging students to ask questions about the world around them.

3.2.1. Finding Stage (pretesting)

The objectives of this stage, also called the ascertaining stage, are the following:

O1. Find out the opinion of teachers on the use of the heuristic approach, learning by discovery and problematisation as teaching strategies.

O2. Analysis and description of how teachers approach the heuristic approach, problematisation and learning through discovery.

O3. Establishing students' knowledge of Romanian language and literature, mathematics and science.

O4. Compilation of the list of contents by selecting the learning units that will be the research object.

O5. Composition of the experimental sample.

1.In order to carry out the training experiment, we undertook the following:

2.We had discussions with the teachers participating in this research.

3.We administered questionnaires to teachers to know their own opinion on the use of the heuristic approach in integrated teaching in the primary cycle.

4.We studied the methodology of administering the National Assessment and the subsequent evaluation and interpretation of the data.

In order to measure as accurately as possible the volume and quality of the knowledge acquired by students in Romanian Language and Literature, Mathematics and Sciences, we applied an initial test at the beginning of the second semester.

3.2.2. The Formative-Ameliorating Stage

The formative experiment is materialised by choosing those didactic activities that should be integrated into the teaching-learning process. In its development, the curricular products made at the beginning of the school year were followed: the annual, semester planning, the planning of the learning units, these being following the school curricula in force.

With the identification of the contents proposed for the experiment, the activities carried out during the second semester differed. The teaching-learning activities were influenced by the proposed independent variable - applying the heuristic approach in the study of the subjects Romanian language and literature, mathematics and sciences, in the 4th grade - which represented the entire formative pedagogical intervention.

The training experiment was also applied in science classes, even though there is no Sciences test in the national test, for two reasons:

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1. Mathematics and environmental exploration are studied until the second grade; the two areas of content are taught within the same class, with the notional transfer being made from one discipline to another;
2. Items of the National Assessment, both in the Romanian language and literature section and in mathematics, include notions that can be found in the field of Natural Sciences, a subject studied in the third grade.

Integrated planning is done starting from a topic that is studied multidisciplinary, in terms of each subject of study in the curriculum, requiring more time in its development and professional skills based on sound teaching knowledge.

3.2.3. Final Evaluation Stage

Test - National Assessment (EN IV- Romanian language - May 2021)

The National Assessments from the 4th grade aim to assess the students 'abilities to put into practice the information acquired in school, and the emphasis is not on the students' knowledge, but on:

1. the knowledge that the student must possess;
2. the skills, abilities that he must acquire
3. the context in which students will be faced with problems in everyday life to which they will have to respond.

The tests do not aim at reproducing information, being focused on skills, abilities to adapt to new situations; these tests focus on acquired skills, not on the reproduction of knowledge taught.

The tests assess:

Content area - Understanding the written text

Cognitive domains:

D1. Extract explicitly formulated information

D2. Formulation of direct conclusions

D3. Working with the main ideas of the text

D4. Interpretation and integration of ideas and information

D1- Extraction of Explicitly Formulated Information

Reference objectives:

1. to notice the role of the illustrations that accompany a text;
2. to read consciously, correctly, fluently and expressively familiar texts;
3. to read consciously and correctly a short unknown text;
4. to identify the narrative, dialogic and descriptive sequences from a text;
5. to recognise the construction elements of the learned communication in the texts.

D2 – Formulation of Direct Conclusions

Reference objectives:

1. consciously apply spelling and punctuation rules;
2. to write various short texts adapting them to the destination and purpose of communication;
3. to use correctly, in the written texts, the construction elements of the studied communication.

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D3 – Working with the Main Ideas of the Text

Reference objectives:

1. to extract main ideas and detailed information from a reading text;
2. to compose the story of a literary text according to a simple plan of ideas.

D4 - Interpretation And Integration Of Ideas And Information

Reference objectives:

1. to show interest and initiative for reading various literary or non-literary texts;
2. to correctly place the written texts, respecting the writing with paragraphs to mark the transition from one idea to another;
3. to show interest and critical spirit towards writing various types of texts.

Test - National Assessment (EN IV- Mathematics- May 2021)

According to the Teacher's Notebook, the *critical European competence* in the field of *Mathematics* is *mathematical competence* and *basic competence in science and technology*, which aims to train students in:

Knowledge – numbers, measures and structures, basic operations, introductory mathematical presentations, understanding mathematical terms and concepts, awareness of questions to which mathematics can provide answers.

Skills - the ability to apply basic mathematical principles and processes in everyday contexts at home or work, follow and evaluate arguments; reason mathematically, understand mathematical evidence, communicate in mathematical language, use appropriate resources.

Attitudes - respect for the truth and the desire to look for reasons and prove their validity.

The proposed test covers the following areas of content:

1.D1. Natural numbers

2.D2. Geometric figures, measurements, fractions

3.D3. Organising data into tables

D1- Natural numbers

Reference objectives:

1. to discover, recognise and use in various contexts simple correspondences and sequences of objects or associated numbers according to given rules;
2. to estimate the magnitude order for an exercise's result, after using at most two operations by rounding the numbers in order to limit the calculation errors;
3. explore various ways of composing and decomposing natural numbers;
4. to explore ways of performing multiplication and division using various ways of working;
5. solve, compose problems and use the significance of arithmetic operations in solving problem situations;
6. use symbols to highlight unknown numbers in problem-solving;
7. to appreciate the true value of a statement and to know the meaning of the implication "if-then" for simple examples, possibly from everyday life;
8. to show interest in analysing and solving practical problems by mathematical methods

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D2 – Geometric Figures, Measurements, Fractions

Reference objectives:

1. to observe and describe simple properties of plane and spatial shapes and to recognise simple symmetry properties of some drawings;
2. use standard and nonstandard instruments and units of measure for length, capacity, mass, area, time and monetary units in various situations;

3.to overcome obstacles in solving problems, to look for new ways to solve by trial and error.

D3 – Organising Data Into Tables

Reference objectives:

1. to collect data, to organise them in tables, to sort and classify them based on given criteria and to provide elementary interpretations of them;
2. be willing to learn from others and help others solve problems.

Following the application of the final test, in the post-experimental stage, a significant evolution was found due to the capitalisation of active learning through heuristic approach, learning by discovery and problematisation in the study of Romanian language and literature, mathematics and science, evolution reflected in improving the quality and quantity of information acquired by students (see Table 1, Table 2, Figure 1, Table 3).

Table 1. Table of items / fields aimed 2021- mathematics

ITEM	CONTENT DOMAIN AIMED	COGNITIVE DOMAIN AIMED
I1, I2, I3, I4	Numbers	Knowledge
I5, I6, I7, I8	Numbers	Application
I9, I10	Numbers	Reasoning
I11, I12, I13	Geometric figures and measurements	Knowledge
I14, I15, I16	Geometric figures and measurements	Application
I17	Geometric figures and measurements	Reasoning
I18	Data organization	Knowledge
I19	Data organization	Application
I20	Data organization	Reasoning

The results of applying the test to Mathematics were:

Table 2. Distribution of posttesting codes - mathematics

CODE	STUDENTS NUMBER	PERCENTAGE
10- correct	10	62%
11, 12, 13- partially correct	4	25%
79- incorrect	2	13%
3.3. 99- no answer	3.4. -	3.5. -

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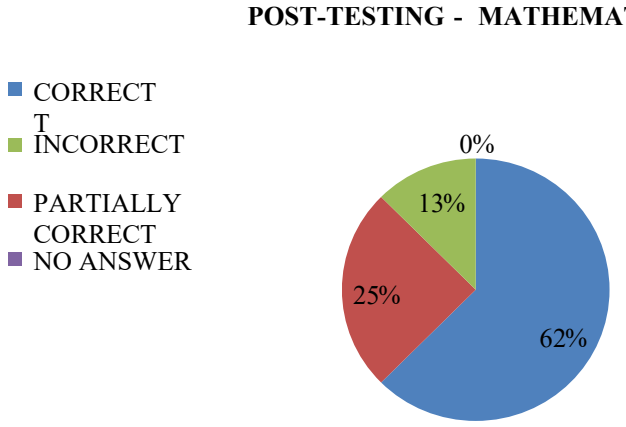

Figure 1. Percentage graphic circular diagram post-testing-mathematics

Table 3. Results obtained on each item post-testing-mathematics

ITEM	CORRECT ANSWER	PARTIALLY CORRECT ANSWER	INCORRECT ANSWER	NO ANSWER
I1	16	0	0	0
I2	16	0	0	0
I3	16	0	0	0
I4	16	0	0	0
I5	16	0	0	0
I6	16	0	0	0
I7	16	0	0	0
I8	15	1	0	0
I9	14	2	0	0
I10	14	2	0	0
I11	13	2	1	0
I12	14	2	0	0
I13	13	2	1	0
I14	13	2	1	0
I15	13	3	0	0
I16	13	2	1	0
I17	14	1	1	0
I18	15	0	1	0
I19	14	1	1	0
I20	13	3	0	0

4. Discussions

4.1. Analysis and Interpretation of Data Obtained

Following the application of the final test, in the post-experimental stage, a significant evolution was found due to the capitalisation of active learning through heuristic approach, learning by discovery

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and problematisation in the study of Romanian language and literature, mathematics and science, evolution reflected in improving the quality and quantity of information acquired by students.

The histogram allows a better comparison between the results obtained by students in the pretesting and post-testing (see Figure 2)

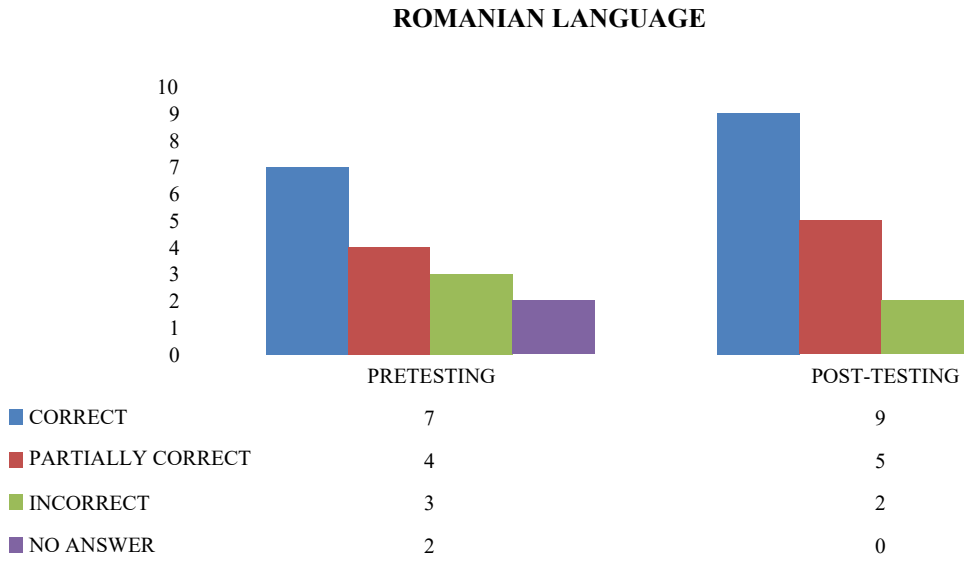

Figure 2. Pretesting – post-testing codes comparison for the results to romanian language

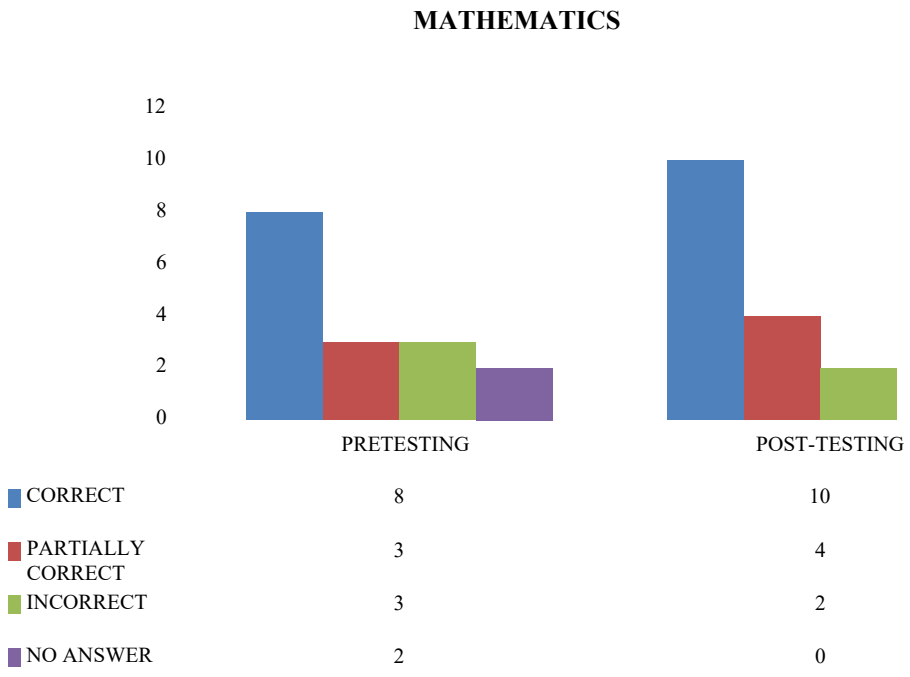

Figure 3. Histogram pretesting – post-testing codes comparison for the results to mathematics

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The comparison diagram of the initial and final tests shows the decrease of the partially correct and incorrect codes and the increase of the correct code frequency, both in the Romanian language discipline and in mathematics. Regarding the no answer code, unlike the initial stage when two students are registered, there is a significant evolution in the final stage, in the sense that no student has a missing answer. (see Figure 3.)

From a qualitative point of view, the performance of the group of students on whom the training experiment took place demonstrates good retention of information, which shows that the heuristic approach, learning by discovery and problematisation, play a significant role in improving school results in national testing. Furthermore, teaching content from active learning allows students to become the central pawns of their intellectual development, assuming roles and responsibilities.

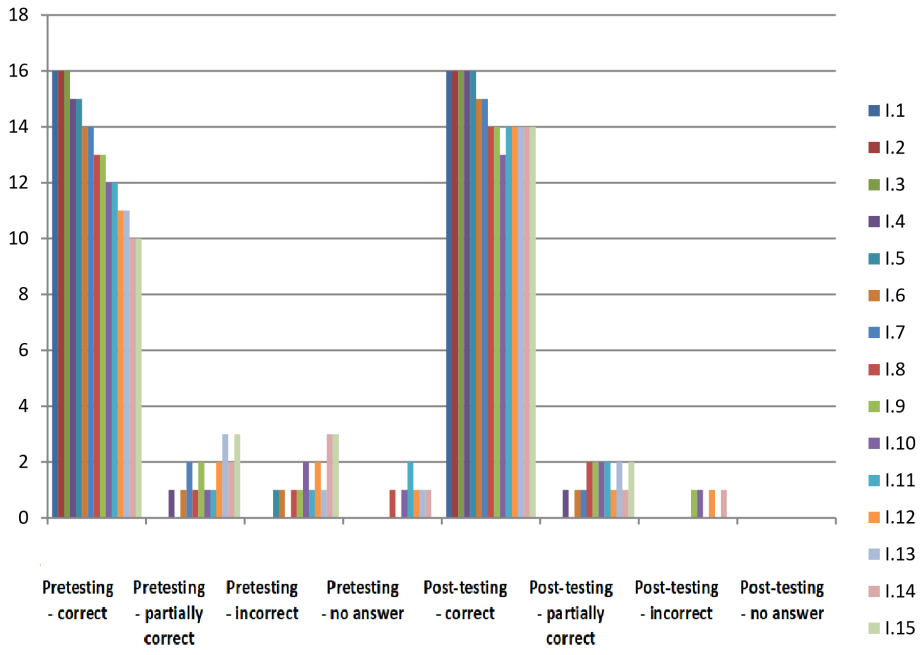

Figure 4. Pretesting – post-testing comparison for the results to romanian language items

Trying a comparative analysis of the results obtained by students, depending on the items of the pretest tests compared to the post-test in Romanian, it can be noticed that the number of partially correct answers decreased in the final test compared to the initial test. Exceptions are items 8 and 11 of the final test, which assesses the formulation of direct conclusions regarding the events in a text given, at first sight, accumulating a smaller number of correct answers than items 8 and 11 of the test considered initially, which assesses other skills: item 8 referred to extracting information from the text, and item 11 required the answer to a text question. (see Figure 4)

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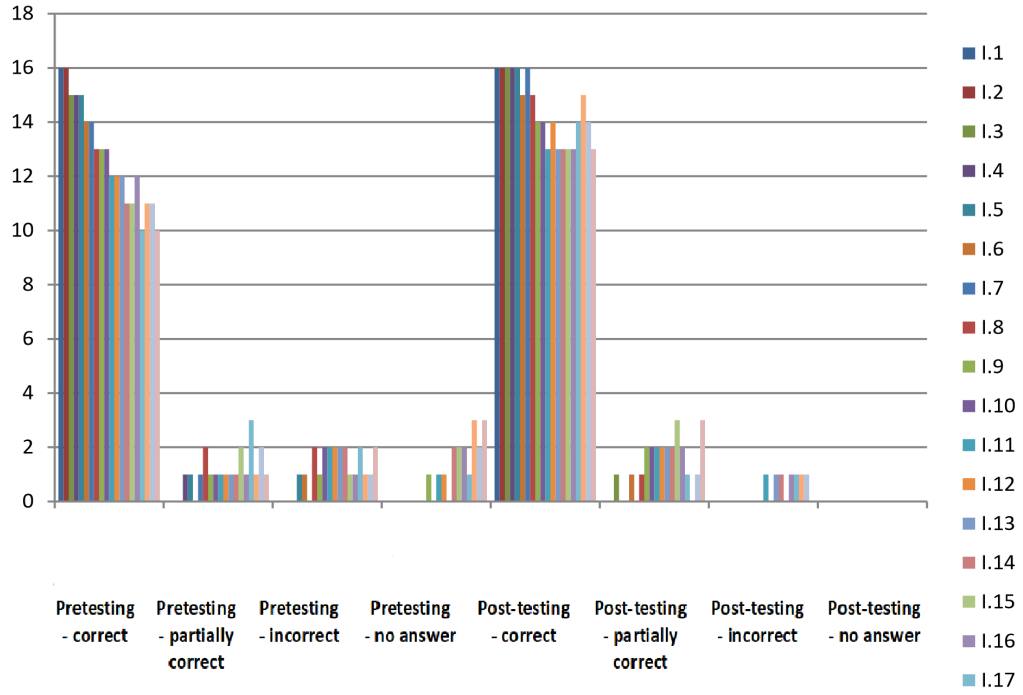

Figure 5. Pretesting – post-testing comparison for the results to mathematics items

Moreover, in the case of the math test, there may be a decrease in the number of partially correct answers compared to the initial stage, but an increase in incorrect answers to items 4, 9, 10 and 13 of the tests considered final. For example, item 4 aimed at evaluating writing with Roman numerals, items 9 and 10 refer to solving problems with more than four operations and, in addition, the requirement required explaining the reasoning found by students in solving the problem, and exercise 13 assessed geometric bodies (see Table 3, Figure 5).

5. Conclusions

The approach undertaken in the current research was intended to be edifying and argumentative in support of the idea that the heuristic approach, learning by discovery and problematisation, in the didactic approach, promoted systematically and intelligently, have positive effects on students' school performance. The experiment results' analysis confirms that the effects obtained in terms of training and information are due to the heuristic approach, learning by discovery and problematisation. Emphasising the heuristic approach in integrated learning in primary school gives students the subject's education status. Thus, they explore, reconstruct, rediscover, generalise scientific truths through their efforts. From this perspective, the development of teaching activities is an alternative to methods based on verbalisation and mechanical memorisation, on the reception without the involvement of creative thinking, logical memory, and imagination. The heuristic approach, learning by discovery and problematisation, aims for teaching-learning to be based on situations involving each student's direct and concrete experience.

The presented experiment considered the development of such learning situations in which the student had a central role. The educational approach has been enriched, diversified and individualised by valuing the heuristic approach, learning by discovery and problematisation in teaching activities. The research aims to present creative aspects of the new educational approach. From the perspective of the

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curricular approach of the contents, the teaching-learning process acquires new valences. The creativity of the tasks finds its source of inspiration in real life of the children, seeking to capture their interests and fantasies. The characters loved by the students, met in the readings or movies known to them, were allies of hope in building lessons that aimed to involve everyone actively.

Thus, a condition of active learning is the formulation of original tasks that arouse the curiosity and motivation of students to learn. Even if we learned "on the fly" the realisation of integrated content design, through classroom activities, activities that aimed to be unique, attractive and practical, we managed to overcome all the shortcomings, and the students were well prepared, as evidenced by the results obtained at the National Assessment in the subjects of mathematics, Romanian language.

Another aspect is the long-term increase in the level of performance of students who are used to discovering the world from a heuristic perspective. Developing the skills of reflection, analysis and synthesis, data comparison, generalisation, and abstraction helps the student develop intellectual, efficient and original work skills. Thus, a regular student with such learning will approach the acquisition of new knowledge with more confidence and, perhaps, will be among those who will be aware of the importance of lifelong learning.

One aspect strongly influenced by the use of the heuristic approach, learning by discovery and problematisation, is the reception of the written and oral message. During the proposed activities, the students were instructed to systematically observe, generalise the data obtained, and deduce possible definitions. In the 3rd and 4th grades, the components of dialogued communication are fixed, building dialogues in concrete or imaginary situations, punctuated with elements of nonverbal language. It was found that students approach with more confidence solving tasks that require their active involvement. Through such activities, the student's creativity is developed, the intellectual effort is favoured, and the attention is maintained for a longer time. Students will solve tasks that aim at their intellectual development by enriching vocabulary, identifying the meanings of words, notions, and mastering grammatical constructions that can be used in different contexts. The presentation of supporting texts that have strong links with the concerns and interests of students form the starting point for the development of activities that can be approached heuristically.

They can also be the starting point for individual reading, this goal being one of the great goals of 21st-century education. By the end of the fourth grade, the student must read correctly, consciously, fluently and expressively small literary and non-literary texts to detach the message transmitted by the text. Putting the student in the position of discoverer favours the formation and development of the ability to write written messages. Thus, under the teacher's guidance, students discover the parts of a composition, identify the situations using punctuation marks, formulate definitions of the parts of speech and sentence.

The systematic use of the heuristic approach, learning by discovery and problematisation, significantly influences the formation and development of mathematical skills: knowledge and use of mathematics-specific concepts applicable in everyday life and exploration/investigation and problem-solving skills.

Basic mathematical notions are notions that are used throughout life. These are the basis for forming logical, coherent, creative, critical thinking and, together with the formation of practical work

skills, will help the individual solve daily problems. Training through short exercises, limited in duration, helps form the flexibility of thinking. The students were involved in solving tasks that involved the relationship between the known and the unknown. Formation of language specific to this field, gradual complication of the degree of difficulty of exercises and problems, formation of computational algorithms, teacher-assisted discovery, and understanding mathematical reasoning are different facets of developing flexibility, work speed, and creativity.

A field strongly influenced by the heuristic approach, learning by discovery and problematisation, was mathematical calculation. The mental effort to solve the oral calculations involved dynamizing the knowledge and experience gained. The formation of automation in solving problems based on computational algorithms was supported by written calculation, marked by interactive methods. The presentation of current topics contributed fundamentally to understanding the notions of "problem" and "problem solving". The activities of composing and solving problems help form logical thinking and make analogies between notions, leading to the formation of abstraction processes.

The interactive and integrated teaching-learning activities, based on the heuristic approach - learning through discovery and problematisation - depend directly on the teacher's personality, on his availability to organise and carry out unique learning situations. The optimal combination of interactive methods with real heuristic potential, doubled by adequate guidance from the perspective of achieving the pre-established objectives, led to the capitalisation of the informative and formative valences of the contents. The lessons organised and conducted in this way were more interesting. The students were actively involved in carrying out the tasks, issuing reasoned judgments, discovering and experimenting with new ways, consolidating their acquired acquisitions by establishing intra- and interdisciplinary correlations.

The research undertaken, through the recorded results, proved that the heuristic approach, learning by discovery and problematisation, present in the teaching-learning process, significantly improve the results of students in national tests, the benefits of this approach are not only cognitive but also felt at the motivational-affective and behavioural-attitudinal level.

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