

CONSIDERATIONS UPON THE METHODS OF TEACHING MATHEMATICS IN PRIMARY SCHOOL

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Abstract: *The Mathematical science was born out of practical necessities and then was transformed into an open type of science, since then being in a continuous development. Mathematical principles could and should always be applied in resolving numerous problems in various domains: informatics, physics, chemistry, medicine, architecture and finances.*

This paper analyzes modern approaches of mathematics (in primary school) by means of interdisciplinary approaches, and affects the various aspects of the students daily life.

The positive attitude towards Mathematics is a primordial condition in overcoming problems and having success in school, and therefore, the teacher in primary school has many responsibilities in creating mathematical competence.

In the final part of the paper we draw conclusions upon the above studied matters.

Keywords: *scholar success, interdisciplinarity, didactic games, positive attitude, practical tests*

1. INTRODUCTION

“Mathematics are studied and learned not only for knowledge purposes, but for applicational purposes, creating a meaning for learning math. It is said that Math is the most operative science, having multiple complex connexions with life itself” (quoted from N. Oprescu).

The culture of Mathematics has to be integrated more and more in our general knowledge, even beginning with the primary classes. The stimulation of intellect, creating a logical way of thinking, and applying correct judgements in real life situations for students must transform Math in a pleasant scholar discipline, one that is attractive and develops correct reasoning, creativity, and stimulates independent work.

In primary classes love or repulsion are born towards mathematics, and since this period in a students life is the one where a base of the transfer between an abstract notion and the practical applications of this abstract notion is accomplished, joy must be brought in studying mathematics.

Even at the beginning of elementary school, the student is conducted to learn to appreciate every aspect of school related matter, therefore games and toys are combined actively and consciously with the study of Math, so that the student should remain interested in this domain.

The Swiss psychologist Jean Piaget used to mention that “a game is a functional exercise, that has the role of extending perceptions of surrounding environment, transforming what is perceived as real, by assimilating and adapting with every new condition”. [2]

Out of all the types of games presented to students at small ages, the most important role in the development of our youth is assigned to the “didactic game”.

The didactic game was defined as “an ansamble of actions and activities, based on good moods and deconcentration from stress, that realises the objectives of intellectual, moral, and physical education”. [2]

Besides the didactic game, modern methods such as: the cube, the R.A.I. dials, “Știu, vreau să știu, am învățat”, and other effective methods such as: “Learning by discovery (Guilford)”, and “Learning by doing (John Dewey)” should be taken into consideration.

The professor’s didactical activity efficiency is determined by his personality, the quality and quantity of the information transmitted, as well as the degree of reception coming from the students.

In order to manifest his good practices in his domain, and demonstrate one’s good professional preparation, the teacher involved in activities at primary school may always have an enormous influence on students, using the clarity and precision of the concepts presented in the classroom, and maintaining a permanent interdisciplinary relationship with other sciences, and being informed constantly upon other related fields of work.

2. LEARNING BY DISCOVERING. LEARNING BY DOING

2.1. The process of learning by discovering (Guilford)

„The process of learning by discovering (Guilford)” – is the process of involving the student in practical situations, determining his abilities to discover, process new information in order for him to obtain preoccupations and skills of intellectual work.

In teaching activities it is also used the method of *inductive discovery* – that relates to the concept of analyzing and structuring ideas followed by generalization. For example, setting the necessary elements for accomplishing a mathematical or arithmetical problem solving plan, or finding a term in a string by a rule discovered within the terms given initially (to answer questions like: who, with who, when, where how?). [4]

The deductive discovery is the process that determines the student to start his learning from a general case, in order to become able to individualise for the concerned matter only. For example, such methods are: writing the terms in a numeric string of a recurrence formula, given by general terms assigned to particular cases of “n” (the third, the seventh), or by using the mathematical language in various domains.

2.2. Learning by doing (John Dewey)

“Learning by doing (John Dewey)” is an active method, used preponderantly in modern pedagogy, and it consists of the total engagement of the student in the process of learning. [4]

We may propose the students some learning tasks, such as:

- measuring with the palm of their hand the length of the desk, or the length of their belts, or the classroom black board, afterwards mentioning the result in a table;
- analyzing which of the three afore-mentioned objects is the longest;
- comparing results with other classmates.
- water filling a recipient of 5 litres using a tea-cup; counting how many cups are needed to fill the entire 5 litre bottle? Repeating the same action by filling the bottle with another bottle of ½ litre.

- Filling the same 5 litre bottle with a small glass. What are the observations upon this actions? Which of the three options should be faster when trying to fill a 5 litre bottle? A tea cup, a bottle of $\frac{1}{2}$ litre, or a small glass? These three actions should be mentioned in a table, that should contain: the used instrument, the no. of tries, and the necessary time for filling.

Another example could be: Using which unit of measurement can the result of measuring the following distances be given: A) the distance between the different classrooms, B) the distance between home and your school, C) the distance between two buttons of your jacket.

Using this type of learning, the student is determined to consciously understand the efficiency and the necessity of making exact measurements, working with the appropriate working tools, the required measuring unit, the appropriate mathematical language when making divisions/ multiplications, comparisons, analysis, applications with elements of geometry.

Making primary school students more acquainted with the practical side of math is considered to be very useful, especially by the teachers in Romania, since results such as a 48th place in the Pissa competition for Romania this year is considered not a triumph, but a constant need of development on this matter (out of 70 participating countries).

“The nature of the true teacher is characterized by the simultaneous movement of his mind along with the minds of his students, and by the way he perceives the difficulties and the victories of each and every one of them” (John Dewey).

Teaching math in primary school takes on the future learning activities, therefore, the instrumental function along with the accumulation of general culture elements determines the information function of the primary cycle of students. [3]

3. THE INFLUENCE OF PRACTICAL-APPLICATIONAL METHODS IN THE TRAINING OF THE COMPETENCY TO APPLY MATHEMATICS IN DIFFERENT ASPECTS OF LIFE

Every child enters school with some previous mathematical experiences, this way proving the natural curiosity upon the mathematical field, and therefore becomes capable of discovering the surrounding reality through a mathematical point of view (I am taller than ...? How much is ...? When is ... ending? How much until we reach ...?). The teachers must take advantage of this curiosity and give a meaning to mathematical information. Moreover, they must capitalize on children's mathematical related experiences, and set bonds between the math concepts and the children's known reality.

In teaching math three main tendencies are distinguished, mainly determined by the preponderance of the learning process factors.

Therefore, the verbal method of teaching is strongly affected by the use of words, symbols and is manifested by mechanical learning or formal learning based on the mechanical application of rules.

Intuitive learning of mathematics is considering the acknowledgement of first arithmetical and geometrical calculations by direct contact with objects and pictures of object, without the use of mathematical rationing. The role of intuition with children is a major one, but if the children are not to create logical connections with the concepts created, they risk to remain at a lower stage of intellectual development.

Learning by doing is offering intuition a primordial role, thus emphasizing on the child's action on objects themselves. The manipulation of objects leads faster to the formation of perceptions, thus speeding up the formation of the operating structures of thinking.

The manipulation of the objects leads to the manipulation of their image, and finally to the drawing of graphic schemes followed by symbols.

By manipulating different objects (geometric elements, chopsticks, natural materials, objects used by the student in everyday life, measuring instruments such as clock, scale, or the meter) the student easily explores mathematical concepts. The teacher has the role of establishing the materials needed to understand the content, their role, the necessary quantity, and also to make sure that the pupils become familiar with them and understand how to use them.

An effective learning of mathematics also requires an efficient collaboration with other study disciplines. The interaction and complementarity of different learning activities allows the realization of interdisciplinary and transdisciplinary approaches to the content, and the use of active and participatory didactic strategies to maximize the potential of pupils.

Interdisciplinary treatment will be a major task of learning from the perspective of understanding reality because a school content designed, developed and used in an interdisciplinary manner corresponds much better to the presented reality, leading to a better understanding of the students.

Through the transdisciplinary approach, the pedagogical value of the lessons increases because students can express themselves freely, every student's daily experience is valued, and each student is placed in the middle of the action, reserving an active and main role, able to translate into practice and to manifest himself in the fields in which he has obvious ability, provides an effective learning, offers the chance to plan his / her own activities, assuring them order in later thinking. These activities leave more freedom of expression and action for both the student and the teacher.

The primary school teacher has to organize various activities for all pupils, depending on their own pace and level of development, to achieve in the classroom a stimulating and diversified environment so as to provide the student with a sustained and favorable motivation in learning mathematics and the acquired knowledge to be effectively used and applied in everyday life.

One of the active-participatory methods used with great success in mathematical activities is the use of educational software. Exercises in these softwares are present in an attractive graphical form with animation and sound elements. Thus, animation enhances the individual ability of children to properly view the concepts.

The images allow restructuring, which is easier to process by the visual and perceptual system of students, enhancing their ability to understand more difficult phenomena. Also, most exercises incorporate narrative segments that allow students to develop appropriate work strategies.

All of these exercises contain many challenging elements of the game, trigger curiosity, keep the attention for a long time and develop students' fantasies, while providing an intrinsic motivation that is particularly important for improving school performance. Children like to learn through educational software rather than traditional methods, helping to develop positive attitudes toward learning and improving the results.

Positive attitude towards mathematics can be cultivated and can be easily achieved through activities with and for the student, but it is necessary to elevate prejudices, fear of using new ways of working, lack of boldness and imagination, routine.

Below we will exemplify the above through an "Autumn perfume" theme.

After the establishment of a favorable climate for the activity, the word "mathematics" will be written on the board and students will be asked to say all the words that come to mind when hearing this word (exercises, problems, division, play, creativity, sum, term unknown, product, team, fairness, etc.). We will complete the brainstorming with all the words proposed by students.

Each student will have an autumn flower petal in his hand, on which an exercise will be written, and the result will correspond to a letter and a number that will be given on the board by the title of the lesson.

We will then continue with the updating of knowledge, with oral computing exercises, where the RAI method is successfully applied, and then continue with the "magic tree" game, which transmits in lyrics to the children a message with the work tasks. In the classroom, autumn fruits are brought, and each fruit is associated with a mathematical task (children choose the favorite fruit they describe and solve the math problem) and pick up the chosen fruit in the magic tree.

Obtaining results will be done by using the "I want to know, I know, I have learned" method, and the other issues will be solved by the "quadrants" method.

After the ordering of the results, an environmental message will be obtained.

The class time can be completed with a fall fair or a personal development game called "if I were a fruit (or a flower) I would like to be ... because ...". With the materials which the "autumn fair" was organized with - fruits, vegetables - chestnuts, pumpkins, leaves, etc. (Elements that encompass the theme) children will pose problems with intuitive support, thus proving a lot of creativity, imagination and active participation, cooperation and dynamism.

During such activities it can be seen that successful forms of individual work can be combined with work in pairs, classical methods with active methods, thus capitalizing on the specific didactic material.

By participating with interest and responsiveness of the students to such forms of education, this type of experience of assimilation and understanding processes has capitalized the potential of each child, resulting in the development of attitudes, behaviors, flexibility of thinking, curiosity and complex motivation.

CONCLUSIONS

Numerical, mathematical and digital skills and understanding of the sciences are also vital for active participation in the knowledge society and the competitiveness of modern economies. Children's first experiences are essential, but students often have the fear of learning math and therefore some of them are trying to avoid this discipline. Different didactic strategies can change this attitude, improve the level of achievement, and open up to new learning opportunities.

The curriculum of mathematical discipline is developed on the basis of a new model of curricular design, centered on competencies. Through its structure, it contributes to the development of the pupil's primary education profile. From the perspective of the subject of study, the orientation of the didactic approach starting from competencies allows to emphasize the purpose for which it is learned and the importance of the dimensional action in forming the pupil's personality.

In the drafting process, the authors took into account the European recommendations on key competences, the results of national and international tests on primary education in recent years as well as the requirements of the TIMMS Reference Framework 2011. From this perspective, students are helped to critically think about problems, identify solutions and solve problems using various methods.

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