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ON THE SOLVING HISTORICAL CONTENT PROBLEMS IN PRIMARY GRADES

SOBRE LA SOLUCIÓN DE PROBLEMAS DE CONTENIDO HISTÓRICO EN GRADOS PRIMARIOS

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ABSTRACT

The teaching of mathematics is one of the most common pedagogical and didactic challenges in primary grades. Due to its high complexity and abstract nature, students usually feel unmotivated in their study, so it is usual to seek strategies with the purpose of facing this phenomenon, being the inclusion of historical topics for the teaching of this subject a relevant and significant aspect. Therefore, the objective of this work is to discuss the importance and relevance of achieving a synergy with history to facilitate the teaching of mathematics. To do this, the work examines the objectives of teaching mathematics in elementary grades, the didactic meanings of problem solving in elementary grades, the presentation of additional information through the content of mathematical problems in elementary grades and the solution of content problems. historical. Furthermore, recommendations are also provided to facilitate this synergy and ways to use it to teach students in primary grades.

Keywords:

Mathematics teaching, Problems solving skills, History and mathematics.

RESUMEN

La enseñanza de las matemáticas es uno de los retos pedagógicos y didácticos más comunes en los grados primarios. Debido a su alta complejidad y naturaleza abstracta, los estudiantes suelen sentirse desmotivados en su estudio, por lo que es habitual buscar estrategias con el propósito de enfrentar este fenómeno, siendo la inclusión de temas históricos para la enseñanza de esta asignatura un aspecto relevante y significativo. Por ello, el objetivo de este trabajo es discutir la importancia y pertinencia de lograr una sinergia con la historia para facilitar la enseñanza de las matemáticas. Para ello, el trabajo examina los objetivos de la enseñanza de las matemáticas en los grados de primaria, los significados didácticos de la resolución de problemas en los grados de primaria, la presentación de información adicional a través del contenido de los problemas matemáticos en los grados de primaria y la solución de problemas de contenido. histórico. Además, también se brindan recomendaciones para facilitar esta sinergia y formas de usarla para enseñar a los estudiantes en los grados primarios.

Palabras clave:

Enseñanza de las matemáticas, Habilidades para la resolución de problemas, Historia y matemáticas.

INTRODUCTION

The acronym STEM (Science, Technology, Engineering, and Mathematics) has become increasingly important in policy advocacy across the world, in relation to industry and research, to higher education participation, and to school curricula (Marginson, et al., 2013). STEM education and research are increasingly recognized as fundamental drivers of national development, economic productivity, and societal well-being. Yet, the particular juxtaposition of these subjects is only recent, is not universal, and is in many respects contested (Tytler, 2020). The term is also used with students from preschool to post graduate levels, and to describe careers in the respective fields (Marrero, et al., 2014). However according to Simamora, et al. (2019), even though mathematics is a very important subject in formal education and is closely related to human life, usually is not a subject of interest to students. This can be partially attributed because mathematics is too difficult for students. This and the low mathematical problem-solving ability of students has been also reported by other studies.

In order to improve this situation, the new education reform in Azerbaijan defined effective ways and means for improving the teaching of subjects in secondary schools, which includes of course mathematics. Implementation of mathematics based on the new teaching system in the I-IV grades and adoption of a student –centered approach, application of various approaches to teaching outcomes enable society to activate successfully school requirements. Minimum list of knowledge, skills and abilities was determined in the standard of primary mathematical education which includes:

- To ensure intellectual development and well thinking qualities, that are characteristics for mathematical activity and necessary for a full life in society.
- To form the ability to learning.
- To form the concept on ideas and methods of mathematics (including modeling as a leading method), as a form of description and a method of cognition of the world.
- To form ideas on mathematics as a part of universal culture, understanding the important of mathematics for social progress.
- To form a sustained interest to mathematics.
- To identify and develop mathematical and creative abilities (Tsareva, 1997).

In the educational process, the activation of cognitive activity appears, on the one hand, as an object of formation, on the other hand, as a condition for a solid and informed mastery of knowledge, skills, development of self-education needs. That is why the problem of enhancing the cognitive activity of students is one of the most relevant at the present stage of development of pedagogical theory and practice. But the severity of the problem is felt especially in primary school. In primary grades, children change their leading activities from playing to learning. Therefore, it is important that the child is actively involved in the learning process, so that he develops a persistent cognitive interest, so that learning is not perceived by him as boring compulsory work, but as the satisfaction of needs for new knowledge, as a diverse, intensive process of cognition of the surrounding reality.

The problem of the development of cognitive activity of schoolchildren can be solved in various ways using different methods, techniques, and technologies. In the new curriculum, it is recommended to use various pedagogical technologies to improve the quality of training, including interdisciplinary integration. Interdisciplinary integration includes coordination of understanding, knowledge and skills in each subject and determination the structure of the subject content. Dependence on this content becomes more versatile and the pupils can be developed by more comprehensive skills.

In this sense, using history has been a strategy for teaching mathematics since the beginning of the twentieth century, when history of mathematics was introduced as a new discipline of study. The initial aim for using history was to improve teachers' own mathematical education and also to provide a different pedagogical orientation for classroom mathematics. However, it may not be possible for teachers to employ history in their teaching without the relevant knowledge and favorable dispositions towards using it in their classrooms. Thus, teacher education is an appropriate place for training mathematics teachers for the potential uses of history and promoting the necessary positive attitudes and availing beliefs (Alpaslan, et al., 2014).

Taking the above into consideration the objective of this work is to discuss the importance and relevance of achieving a synergy with history to facilitate the teaching of mathematics.

DEVELOPMENT

It is essential to highlight that the objectives of teaching mathematics in primary school are due to: (1) the general objectives of teaching in primary school, (2) the concept of mathematical education. Also, the goals of math education in primary grade are as follows: (1) to familiarize pupils with mathematical concepts, properties, rules, statements (theoretical goal), (2) to equip the pupils with mathematical skills and abilities (practical goal), (3) to extract moral and ethical qualities from the content of educational material for pupils (educational goal) and (4) to ensure overall development (Gamidov & Mejidova, 2015). Because of this, it is important the formation of skills to apply the obtained knowledge to solve the simplest problems of life; skills to use measuring tools; inculcation of elementary skills of work on micro calculator; implementation of relations with other academic subjects, etc.

Since the course of primary grade mathematics has a spiral structure, interdisciplinary integration into the educational process is implemented horizontally and vertically. Vertical integration gradually deepens from the grade to the grade and represents the continuity between the content lines. It is known that history, geography, physics and other subjects are not taught in elementary grades. However, in the elementary grades, during the lesson it is necessary to give pupils vital knowledge that broadens the worldview of children and interdisciplinary integration plays an important role in this process. Methodists and teachers can emphasize the use of historical material as a way of developing cognitive activity of schoolchildren. Then, through the use of historical material, the cognitive activity of younger schoolchildren in mathematics lessons can be formed (Mejidova, 2015).

The importance of historical aspects in teaching is mentioned in many works, special studies, and statements by famous scientists - mathematicians, educators and methodologists. So, in the early XX century the first Russian historian of mathematics V. V. Bobynin (1849-1919) justified the need for the introduction of elements of the history of mathematics in teaching (Kozlovskaya, 2003). Also, the great naturalist, mathematician and historian G.W. Leibniz (1646-1716) emphasized that the history of science teaches the art of discovery, that is, contributes to the development of thinking (Beloshisty, 2007). It cannot be considered that the main goal of teaching in general, and mathematics in particular, is to inform the pupils as much as possible on specific knowledge, new concepts, and theorems. "Much knowledge does not teach the mind," said Heraclitus (Yushkevich, 1961). Because of that the use of historical information is one of the criteria of interest of the content of educational material, serves to develop pupils' cognitive interest to mathematics in an interesting and appealing way.

Historical information serves to develop pupils' creative abilities, allows to create a creative atmosphere in the lessons, helps to understand that there is nothing unusual or supernatural in

the creative process, but goals are achieved as a result of hard work. Acquaintance of pupils with knowledge in other subjects, especially with history that is not taught in elementary school, and, consequently, an improvement in their worldview, can be easily implemented in the mathematical process as a methodological problem. Also, it can be used in problem solving training as a specially organized interaction between a teacher and pupils, the purpose of which is to develop pupils' ability to solve problems (Sender & Nichishina, 2010).

Due to the above the general educational goals of teaching mathematics require the teacher to provide pupils with the assimilation of arithmetic operations, to form skills and abilities, the ability to observe and compare, match, analyze, conduct simple generalizations, and to assimilate mathematical terminology and symbolism. All these goals are realized more or less in all mathematics teaching programs, however, different priority goals are distinguished in different programs, and they affect all other components of the teaching system.

However, the last two goals of teaching mathematics (educational and general development) occupy a special position and play an important role in the implementation of interdisciplinary integration, and creative activity of the teacher is crucial. In primary school mathematics textbooks, it is impossible to give any specific contextual or scientific text, unlike a textbook on the native language. But how can you convey information that is accurate and necessary for pupils in a math lesson? The best way is to do this with mathematical tasks that can be solved in the primary grades. The quantities included into the content, the length, area, time, etc. and also, numerical data are connected with certain events.

In connection with this, events or information to which they relate, to the problems in the elementary grades, can be classified as follows (Gamidov & Mejidova, 2015):

1. Objectives related to historical events.
2. Objectives related to historical monuments.
3. Objectives related to geographic events and concepts.
4. Objectives related to the flora.
5. Objectives related to underground resources.
6. Objectives related to the animal world, and others.

School practice shows that solving these types of problems in elementary grades is of interest to pupils, and pupils are actively looking for a solution to the problem, and also receive additional "non-mathematical" information useful to them. Despite the fact that for most children, the problem solving is the most problematic part of mathematics learning, it acts as the main tool of teaching mathematics. The independence of pupils while solving problems occupies a central place in teaching. For the process of solving problems at all stages of its solutions take place consciously, you must always or when it is possible to move to the abstract from the concrete, using a variety of models, motivating the development of the theory with examples from reality or related educational items.

The teachers when solving problems should give priority to thinking and reasoning, to encourage pupils to their own statements, to listen and encourage individual ways to solve problems. The children should be given independence to record tasks. They should be independent when choosing the recording forms of the task. This work not only brings an element of the game to the solution of problems, but also contributes to know himself. It is necessary to direct the children to ask themselves the questions "What will help me while solving problem?", "What form of recording should I make for the task to help me solve it easier?"(Tsareva, 1997). As a result,

pupils have a wider worldview, although this worldview is actually another form of the look at objective reality, but the essence is the same.

According to mathematical science, "natural mathematics arises from practice, is separated from it, becomes abstract and is re-practiced". Since problems are mathematical objects that you most often have to deal with in mathematics, we dwell in more detail on historicism in a mathematical problem. Historicism in a mathematical problem takes place when a historical fact (included in the text of the problem or in addition) is added to the condition of the problem. Then, historical problems are mathematical problems that attract the attention of many mathematicians over a long period of time (for example, the famous problems of antiquity). Among historical tasks, nominal tasks also stand out.

Let us look at problems samples, classified above (Tikhomirova, 2002; Voronina, 2009):

Problem 1. The Maiden Tower was built in Icheri Sheher in the XII century. Its height is 29 meters. What century is it now? How old is the Maiden Tower?

Task 1. The first Azerbaijani national newspaper "Ekinchi" was published by Hasan Bey Zardabi on July 22nd, 1875. How much time has passed since the publication of the Ekinchi newspaper? Solve this problem on January 1st 2020.

Task 2. The Second World War began on September 1st 1939, and ended on September 6, 1946. How long did World War II last?

Task 3. The meaning of the world "Metropolitan" is "capital", "city". The metro was put into operation in Moscow on May 15th, 1935, and on November 6th, 1967, in Baku. After how many years did the Baku Metro appear?

Task 4. The first metro was put into operation in London in 1863, and 72 years later in Moscow. How much time has passed since of the metro in Moscow was put into operation for this period?

In addition, conversations on the history of mathematics can be carried out in combination with dramatizations, practical exercises, for example, when acquainting children with old measures of length. You can start the conversation with questions like:

- What measures of length do you know?
- Has a person always used these units?
- What vintage length measures do you know?

We can't imagine the life of a person who does not take measurements. Even primitive man resorted to measurements during the construction of his home. The first measuring instruments were body parts: fingers, palm, foot, step. Long distances were measured by transitions, halts, days. For example, they said that from one city to another 3 days journey. In Japan, for example, there was a measure called the "horseshoe". It was a path through which a straw sole tied to the horse's legs wore out. For many peoples, the distance was determined by the flight range of the arrow or core from the gun. To this day, the expression has remained: "Do not allow a cannon shot." These measures can measure long distances, but they are not applicable in determining the length of, say, matter, rope, etc.

To measure small segments, an elbow was often used - the distance from the end of the fingers to the bent elbow (the teacher demonstrates how to measure the length of the cord, tape with the elbow). Imagine that we were transported into the past by a time machine to buy fabric. Before us are shops of merchants of matter (several children of different sizes play the role of merchants). Which of the merchants will you go to buy fabric for? Why? Demonstrate (the number of elbows is different). Why did you get a different number of elbows?

In some countries, for example in Egypt, one elbow was prepared according to the model of sticks. These samples were used in the construction of structures and other works. The main

specimen - the “sacred elbow” - was kept in the temple by his servants. Then, during the stage plays and practical exercises, children “have the opportunity to observe, from what sources, mathematical truths come from” from their own experience (Gnedenko, 1979).

At a lesson of mathematics in primary grades the problems that given by the carriers of information are very important for pupils and because this fact the provision of such tasks, mainly in mathematics lessons of the III – IV grades will also have a positive impact on the overall development of pupils. The obligatory inclusion of the elements of history should be justified by the content of a specific material and methodically well thought out.

CONCLUSIONS

At different times, scientists and methodologists differently defined the goals of introducing elements of the history of mathematics into teaching. However, the following have almost always been common:

(1) historical material introduced in the classroom enhances students’ creative activity, (2) historical material is designed to increase literacy, expand knowledge, students’ horizons, this is one of the opportunities to increase the intellectual resource of students, to teach them to think, to be able to quickly make decisions in life situations

(3) mathematical development of a person is impossible without increasing the general culture. Historical material is capable of better than anything in the lesson to prevent the one-sided development of mathematical abilities

(4) discussion of the historical problems of mathematics helps to educate students in tolerance of others’ opinions, self-respect through respect for others

(5) with the help of historical departures in the lesson, the teacher can enable students to come to their own wordings and this helps to learn to be confident in their abilities and to defend their views and beliefs.

In this work, some recommendations were seen for the inclusion of historical content in the teaching of mathematics, which has proven to be relevant not only for the development of the instruction, but also for the motivation of the students, representing this a key point. for young pupils.

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