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THE USE OF ELEMENTS OF THE HISTORY OF MATHEMATICS IN TEACHING

Андатпа. Кез-келген мектеп пәндерінің тарихын зерттеу білім беру үдерісінің маңызды құрамдастарының бірі және оқушының жеке басын қалыптастыру болып табылады.

Бұл ғылыми мақалада тарихи материалдарды мектеп математикасын оқытуда тек сыныпта және сыныптан тыс уақытта ғана емес, сондай-ақ бағдарламалар негізінде өткізілетін элективті курстарда да пайдалануға болатыны туралы айтылады. Осы мақалада оқушыларды математика тарихының элементтерін пайдалануды үйренеміз. Зерттеу сауалнама түрінде 5-9 сынып оқушыларымен және оқытушыларымен жүргізілді.

Зерттеу нәтижелері тарихи материалды пайдалану қажеттілігін және оның маңыздылығын көрсетті. Бұдан басқа, зерттеу нәтижелерімен анықталған міндеттердің бірі математика тарихы элементтерінің презентация нысандарын іздеу және тарихи материалдарды пайдалану мақсаттарын анықтау болды.

Түйін сөздер: тарихи деректерді қолдану, математика педагогикасы, математика.

Аннотация. Изучение истории любого школьного предмета является одной из важнейших составляющих учебного процесса и формирования личности ученика.

Статья посвящена применению исторических материалов в школьной математике, не только на уроках и во внеклассное время, но и на элективных курсах, которые проводятся на основе программ. В этой работе мы исследуем использование элементов истории математики в обучении школьников. Исследование проводилось в форме анкет, интервью. В них приняли участие школьники 5-9 классов и учителя.

Результаты исследования показали необходимость использования исторического материала и его актуальность. Более того, одной из задач, выявленных по результатам исследования, стал поиск форм изложения элементов истории математики и определение целей использования исторического материала.

Ключевые слова: применение исторических данных, математическая педагогика, математика.

Abstract. The study of the history of any school subject is one of the most important components of the educational process and the formation of the student's personality. In this paper, we explore what is the use of elements of the history of mathematics in teaching schoolchildren. The study was conducted in the form of questionnaires, interviews with, schoolchildren of 5-9 grades and teachers.

The results of the study showed the need for the use of historical material and its relevance. Moreover, one of the tasks identified by the results of the study was the search for forms of presentation of elements of the history of mathematics and the definition of the purposes of using historical material.

Keywords: application of historical data, mathematics pedagogy, mathematics.

“...Who wants to limit himself to the present, without knowledge of the past, he will never understand ...” Leibniz.

The study of the history of any school subject is one of the most important components of the education process and the formation of the pupil's personality. The use of elements of the history of mathematics in school, the relevance of this work has been repeatedly discussed in the methodology of teaching by famous scientists.

One of the great scientists says that the history of mathematics allows us to see “living mathematics”, and not frozen abstract - deductive system, a deeper understanding of the epistemological process of knowledge in mathematics, methods of scientific knowledge, characteristic of each stage, to understand the dynamics of their development.

The question of using elements of history in teaching mathematics is not new. This issue has been repeatedly discussed at seminars of teachers of mathematics. The mathematician E.I. Popov said: “the usual way of teaching geometry with its theorems and proofs causes in children in the vast majority of cases, such invincible disgust and boredom. Few who have completed a secondary school, will retain at least some tendency to engage in geometry outside of school”.

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

1. Increasing students' interest in the study of mathematics and deepening their understanding of the material under study.
2. Expanding the mental outlook of students and increasing their overall culture.

Of course, these are the objectives of every teacher. But it is much easier to the teacher of geography, biology, history, literature to inculcate the interest of students in their subject.

What should a math teacher do?

The teacher needs to overcome two difficulties:

1. The difficulty of the subject itself.
2. The presumption of "boredom".

However, the program does not contain specific indications on what information on the history of mathematics should be communicated to students in the teaching process, in which classes, to what extent and in which sections of the school curriculum. In order to answer these questions, on the one hand, an empirical study of the requests of teachers and students in the historical material was conducted and, on the other hand, the existing school textbooks in mathematics were analyzed.

The study was conducted in the form of questionnaires, interviews, interviews with students and teachers. It was attended by students of 5, 6, 7, 8, 9 classes (300 people) in the schools of Karasay district. The results showed that teachers see the need to involve elements of the history of mathematics in the learning process as a means of increasing interest in the subject (30%), expanding the horizons of students (27%), a deeper understanding of the topic (24%). Teachers working in intellectual technologies (12%), pointed out the role of elements of the history of mathematics in creating sustainable ideas about the concepts studied, in expanding the ways of coding information in the development of the meanings of the terms studied.

Let us now turn to the students' answers. They would like to have such historical materials which: "would contain history of an origin of terms, their designations", "would show how in the history of science approached this or that conclusion of formulas, rules", "would show how great discoveries as mathematics arose and developed shared". Thus, students are interested in active forms of presentation of historical material. Consequently, schoolchildren need not just historical facts in mathematics lessons, as facts, but such educational texts, tasks that would have to analyze the materials of history, enriched by mental experience, which established temporary connections.

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of the study was the search for forms of presentation of elements of the history of mathematics and the definition of the purposes of using historical material. In this regard, the appeal to the educational and methodical literature containing historical materials was of interest. In particular, what is the nature of the use of historical material in existing textbooks on mathematics.

Today in many textbooks you can find material with elements of the history of mathematics. For example textbooks [2], [3], [4], [5].

The analysis of textbooks showed that most often historical materials are represented by special sections, or notes, which contain stories about ancient ways of solving problems, about the contribution of individual scientists to the development of a particular branch of mathematical knowledge, the history of mathematical concepts and mathematical disciplines.

It should be noted that the presentation of historical material is mainly narrative in nature, it is often offered as additional material, while performing an informative function, that is, provides students with information about a certain area of scientific knowledge within the subject.

Students are rarely asked to correlate their own experience of studying mathematics with the history of the relevant issue. They are mainly passive observers of historical processes, and are not included in active activities.

The original and rather controversial approach of acquaintance with the results of the activity of scientists-mathematicians was proposed by M.I. Bashmakov. In the Preface to the textbook, he gives the characteristics of individual scientists:

Al-Khwarizmi: an Arab mathematician of the VIII century, from which algebra began and whose name became the ancestor of the name of the most important mathematical concept - algorithm.

René Descartes: the French mathematician and philosopher of the XVII century, who owns the most important idea: using a coordinate system to establish a correspondence between pairs of numbers and figures (arithmetic and geometry).

Newton: English mathematician and physicist of the XVII century, who discovered the most important laws of nature and wrote them in the form of formulas and equations.

Euclid: the legendary Greek mathematician who lived more than 2300 years ago and laid the Foundation of mathematics as a science that formulates and proves its claims.

Diophantus: the great representative of the ancient mathematicians of the 3rd century, whose writings were the basis for reflection on the mysteries of the world of numbers until recently.

Euler: German mathematician of the 18th century, who lived most of his life in Russia and made so many mathematical studies that his works continue to publish until now.

Then in the section “Tasks to choose from” the author classifies them in accordance with the contribution of the scientist in the development of mathematics. For example, “al-Khorezmian Algorithms”, “Descartes Correspondences”, “Newton’s Formulas”, “Euclid’s Proofs”, “Diophantine Calculations” and “Euler’s Investigations”.

School textbooks, as a rule, contain little such information. One message of information on the history of mathematics does not always contribute to the achievement of the goals mentioned above. The acquaintance of students with history of mathematics means:

- Thoughtful systematic use of facts from the history of science in the lessons;

- Their close interlacing with the systematic study of the entire material of the program.

Only such a combination can contribute to the achievement of these goals. Coordinating the study of mathematics with other subjects, in particular with history, emphasizing the role and influence of practice on the development of mathematics. By specifying the condition, and sometimes the reasons for the origin and development of certain ideas and methods, we thereby contribute to the development of logical thinking among students; contribute to the process of their mental maturation and their conscious assimilation of educational material.

What sort of difficulties may arise?

1. Acquaintance of students with the history of mathematics should be carried out mainly in mathematics lessons and only secondarily in extracurricular activities. And we cannot count on any additional hours.

This raises a question. How to find the necessary time? But it can be found – it’s 5 -12 minutes, especially since on average for every 6 lessons there is one conversation. Material for some conversations may be redundant for use in a single lesson. In this case, the teacher himself selects from the material that, at his discretion, the most important and interesting, or distributes it to 2 – 3 lessons.

For example, the technology of using EDU (enlargement of didactic units) gives a positive result - additional hours. Interest in the subject and the effectiveness of classes do not appear immediately after the first lesson, the first conversation, but the result will be positive. Let it happen in a month or at the end of the semester. The time used to present facts from the history of mathematics in a lesson cannot be considered lost if the teacher is able to

present a historical fact in close connection with the program material presented in the lesson.

2. A great methodological difficulty is the decision on the selection of specific material on the history of mathematics and the order of its use in a particular class.

- In this matter it is necessary to be guided by the Mathematics Program.

- Take into account the age characteristics of students.

Naturally, the content and volume, style of presentation of questions on the history of mathematics cannot be the same in different classes.

For example, in grades 5-6 should be limited to the initial information from the history of mathematics and draw students' attention to the basic issues of the set and numerical algorithms, mathematical terminology and symbols. The emergence of measures, the creation of measurement methods and simple tools that accompany the measurement.

Partially touch on some core issues of the history of mathematics such as: - the development of the concept of number:

- the origin and some aspects of the development of geometry and algebra;
- it is advisable to give initial information from the history of equations;
- geometric tools;
- the origin of fractions, etc.

Large field of activity! There are many questions that are returned to the course of high school more than once.

3. The main methodological difficulty is the question of how to actually combine the study of a certain section of the program of mathematics with the presentation of the relevant historical material. Certainly, there are no specific proposals here. Every teacher will do it as he sees fit. Each will have their own methods and techniques. This difficulty can be overcome only gradually, in the course of systematic and scrupulous work.

Forms of work on the use of elements of the history of mathematics in the classroom.

- A brief conversation.
- Excursion.
- Laconic reference.
- The solution of historical problems.
- Display and explanation of the figure.
- Speech with the message of the student.

It should be widely used to get acquainted with the history of mathematics lessons consolidate the material, which will contribute to the revitalization of these lessons. If you start this work from grade 5 and carry it

out systematically, then over time the historical element will become for the students themselves a necessary part of the lesson.

Thus, the main purpose of educational texts on the history of mathematics we see the following: the use of specially designed learning materials in the teaching of mathematics will enable students to expand the methods of information coding, to motivate the need for the introduction of concepts, develop the value of the entered terms, to take the initiative, etc. Such materials as shown in the experiment, help students to be successful in the study of mathematics, teach them to think critically.

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