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Application of Information and Communication Technologies in Solving Geometric Problems

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ABSTRACT: In today's information age, the use of information and communication technologies in teaching geometry is one of the key factors in improving the quality and efficiency of education. To increase the motivation of students to study geometry and ensure an intersubject connection between geometry and computer science, geometry lessons need to use not only video projectors, presentations, historical materials downloaded from social networks, but also educational software in mathematics. The ability to use computer mathematical tools is available in Microsoft Office programs. Solving math problems in Microsoft Office programs requires students to have knowledge of computer science and information technology.

KEY WORDS: mathematical knowledge, information and communication technology tools, Microsoft Office programs, computer mathematical tools.

INTRODUCTION

The accelerated development of society, its globalization, the rapid development of information flows and information and communication technologies affect all spheres of public life, including education. This requires changes in educational content, teaching methods and technologies. In particular, regular updating of the educational content based on an integrated approach is one of the important strategic issues. In modern education, information and communication technologies directly depend on the professional competence and skills of teachers working in the education system.

The most important component of professional competence is the ability of a modern teacher to effectively apply their knowledge, skills and abilities in the quality organization of the educational process. In particular:

- knowledge of the stages of development of education in the world and in the country, to ensure the content, continuity and continuity of the educational process in the system of public education;
- have the skills to use computers, information and communication technologies in teaching;
- knowledge of the patterns of mental, physical development and age characteristics of students, in teaching based on a pedagogical and psychological approach;
- have the skills to correctly select and apply effective modern pedagogical and information technologies and methods for a specific stage of the lesson in the high-quality organization of the educational process;

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- in the process of educational and extracurricular activities, be ready to ensure the safety of life and health of children, technical and information security;
- during the lesson, the effective use of media resources and the capabilities of electronic networks, compliance with media security standards.

The increasing importance of information and communication technologies requires higher education institutions to change the content of education. In particular, when preparing future teachers in pedagogical universities, first of all, it is important to update the content of mathematics and computer science courses, which are the main basis for further professional activity. Updating the content of the course is based on the formation of universal mathematical models, methods and the use of high-quality software for solving general problems of information technology.

Analysis of the pedagogical software currently used in teaching mathematics in the practice of general secondary schools, academic lyceums and vocational colleges, as well as higher educational institutions, shows that they do not fully meet the pedagogical requirements of teachers. Therefore, it is necessary to make some methodological changes in the quality of novelty in traditional forms and methods of teaching based on information and communication technologies. This, in turn, requires the development of pedagogical and psychological foundations for the use of software in teaching. The article discusses the ways to improve the content of professional training of future mathematics teachers through an integrated approach.

Integration in education is a vivid manifestation of the integration processes taking place in the life of science and society today, and plays an important role in improving the professional training of future specialists in the field of higher education. Thanks to the integrative approach, the issues of training, development and education of students are not only solved at a qualitatively new level, but also the foundation is laid for an integrated view and solution of complex problems of real existence. Therefore, this is a necessary condition for an integrated approach to teaching and educating university students.

MAIN PART

The mathematical knowledge taught in the educational direction of the methods of teaching mathematics of pedagogical universities and knowledge on the subject "Informatics and Information Technologies" are closely interrelated. Since the use of their integration in teaching mathematics in higher educational institutions allows improving the quality of mathematical education, preparing qualified specialists who are able to apply and improve their knowledge in their future activities.

As you know, mathematics is important not only in general education, but from a professional point of view, it is just as important. Despite the close relationship between mathematics and computer science, this influence is never properly assessed or used in teaching.

Effective use of integration is, first of all, its use to overcome difficulties in mastering the curriculum. At the same time, the use of the integration of mathematics and computer science provides ample opportunities for increasing the efficiency of their teaching [2].

Integration can be done in two ways. 1) in the context of teaching; 2) in teaching. Let us consider these areas on the example of teaching geometry in the educational direction of the methods of teaching mathematics in pedagogical universities.

For this, first of all, it is necessary to analyze the nature of the content of vocational training of graduates of this field in order to determine the principles for the development of its integration with the science of computer science and information technologies in the educational process.

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In general education schools, vocational colleges and academic lyceums, Geometry has always been an interesting subject for students. Given the different level of knowledge of students in the classroom, this subject is considered more difficult to master.
The topic Polygons of the subject of Geometry, includes triangles, quadrangles, pentagons, polygons, inscribed and circumscribed around them.
The most effective way to expand students' understanding of these topics is by using information and communication technology tools. Using the tools of information and communication technologies while solving problems, students, according to its condition, to begin with, can clearly see the drawing of the problem and the desired value. This, firstly, expands the horizons and worldview of students, and secondly, it is the basis for finding a quick and accurate solution to the problem.
In fact, another convenience of information and communication technologies is that students can quickly identify a solution to a given problem if they know how to solve the problem.
Example: knowing the side length of a regular polygon and the number of sides, it finds all the required dimensions.

RESULTS AND DISCUSSION

Students should be familiar with all formulas related to the topic of polygons and be familiar with some of the computer science and information technology programs taught. Examples include Excel Office for elementary school, Turbo Pascal for high school and professional colleges, ABC Pascal, and C ++.
The math programs that are used on popular mobile phones today also work with the formulas that students learn. Considering the above, before they can find mathematical examples and solutions in information and communication technology, students need to know how to express mathematical expressions in a computer programming language.
For example, for n gon with side a:

1. *The number of sides, corners and vertices is n;*
2. *Number of diagonals:* $\frac{n(n-3)}{2}$
3. *Each corner of a regular n gon:* $\frac{180^o \cdot (n-2)}{n}$ *;*
4. *The sum of the inner angles of a regular n gon:* $180^o \cdot (n-2)$ *;*
5. *One outer corner of a regular n gon:* $\frac{360^0}{n}$ *;*
6. *The sum of all external angles, n of the gon, is* 360^0*;*
7. *Expression of the side of a regular n gon through the radius of the circumscribed circle:* $a_n = 2R\sin\frac{180^o}{n}$
8. *Expression of the radius of the circumscribed circle through the side of the regular n gon:* $R = \frac{a_n}{2\sin\frac{180^o}{n}}$
9. *Expression of the side of a regular n gon through the radius of the inscribed circle:* $a_n = 2r \cdot tg\frac{180^o}{n}$

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10. Expression of the radius of the inscribed circle in terms of the side of the regular n gon: $r = \frac{a_n}{2tg\frac{180^o}{n}}$

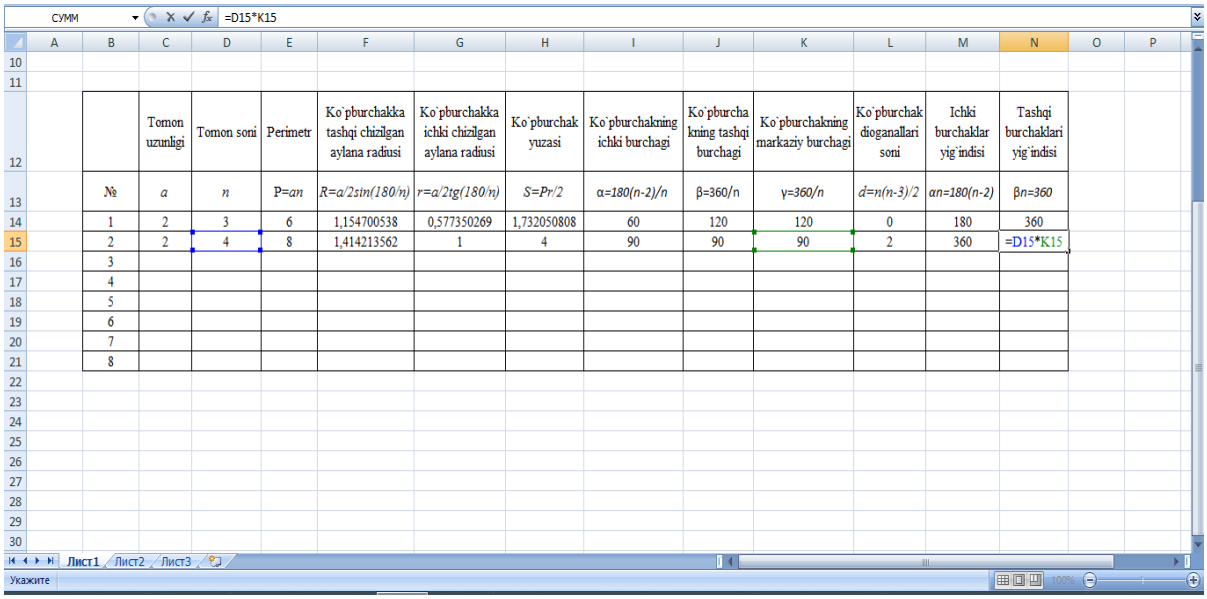
11. The connection between the radii of the inscribed and circumscribed circles in the regular n gon: $r = R\cos\frac{180^o}{n}$;

12. The area of a regular n gon: $S = \frac{1}{2}\Pr = \frac{nar}{2}$ *или* $S = \frac{1}{2}R^2 n \cdot \sin\frac{360^o}{n}$

13. The connection between the side of a regular n gon, the radii of the inscribed and circumscribed circles: $a = \sqrt{R^2 - r^2}$; $r = \frac{\sqrt{4R^2 - a^2}}{2}$.

We can use formulas to get information about this polygon. If these formulas are previously entered into the computer, we can find the rest using two parameters.

For example, in the Excel office, we can work on this issue in tabular form. To do this, it is enough to write the above formulas into a cell of the required size, and this task is solved for any task. Thus, the reader can quickly learn not only about one polygon, but also about other polygons.



№	Tomon uzunligi a	Tomon soni n	Perimetr P=an	Ko`pburchakka tashqi chizilgan aylana radiusi R=a/2sin(180/n)	Ko`pburchakka ichki chizilgan aylana radiusi r=a/2tg(180/n)	Ko`pburchak yuzasi S=Pr/2	Ko`pburchakning ichki burchagi α=180(n-2)/n	Ko`pburchakning tashqi burchagi β=360/n	Ko`pburchakning markaziy burchagi γ=360/n	Ko`pburchak dioganallari soni d=n(n-3)/2	Ichki burchaklar yig`indisi αn=180(n-2)	Tashqi burchaklari yig`indisi βn=360
1	2	3	6	1,154700538	0,577350269	1,732050808	60	120	120	0	180	360
2	2	4	8	1,414213562	1	4	90	90	90	2	360	=D15*K15
3												
4												
5												
6												
7												
8												

If we solve this problem in a programming language, then we need to compose the following program:

```
Var a, r1, r2, s1, s2, p: real;
n: Integer;
Begin
Write ('enter a, n');
ReadLn (a, n);
WriteLn ('Number of correct diagonals', n, 'gon', n * (n-3) / 2);
WriteLn ('Every corner is correct', n, 'gon', Pi * (n-2) / n);
WriteLn ('The sum of the interior angles of a regular', n, 'gon', Pi * (n-2));
WriteLn ('One outer corner of a regular', n, 'gon', 2 * Pi / n); r1: = a / (2 * sin (Pi / n));
```

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*WriteLn ('The radius of the circumscribed circle around the correct one', n, 'square', r1); r2: = a / (2 * sin (Pi / n) / cos (Pi / n));*
*WriteLn ('Inscribed circle radius in regular', n, 'square', r2); s1: = sqr (r1) * n * sin (2 * Pi / n) / 2;*
*WriteLn ('Area of the correct', n, 'gon', s1); s2: = n * a * r2 / 2;*
*WriteLn ('Area of the correct', n, 'gon', s2); p: = n * a;*
WriteLn ('Perimeter of correct', n, 'gon', ', p);
ReadLn;
End.

The function of processing mathematical programs in modern mobile phones is based on such an algorithm.
The development of the integration of geometry with computer science and information technology is based on the first principle that is considered appropriate. The concept of algorithms plays an important role in the science of geometry. The analysis of the algorithm can be viewed from a curve of the second order in geometry. Approaches to the study of algorithms are widespread in geometry, computer science and information technology. In particular, in mathematics, an algorithm is a process, and in computer science, an algorithm is a record of a process, a model of activity. It is important and expedient to strengthen the theoretical aspect of using special computer mathematical systems to harmonize and approximate approaches to the integration of integration in the disciplines "Geometry" and "Computer Science and Information Technologies" in the professional career of a future teacher of mathematics. At the same time, visual images created in the process of teaching the subject "Geometry" (drawings, animation, 3D graphics), according to the agreement of integrative approaches to their creation, belong to the bank of informatics algorithms. At the same time, such consistency and convergence allows students to understand the methods of individual activity in solving mathematical problems, which is associated with the need for a detailed description of algorithms in the science of geometry.
In the subject of computer science and information technology, there are such programs when solving problems with their help, you do not need to write formulas. These programs include the expression of mathematical formulas, with the help of which we can get acquainted not only with the solution of the problem, but also with its compilation. When solving geometric problems, it is important that students work with their drawings. Since the task can be solved using his drawing. Such programs are called computer math packages, and they include: Wolfram Mathematica, Maple, Matcad and others. Knowledge of such mathematical software packages enable modern young scientists to more easily describe complex problems or geometric shapes, as well as simultaneously increase their interest in both mathematics and computer science and information technology. The essence of the second principle of the development of the integration of mathematics and computer science in teaching geometry is as follows.

The traditional practice of teaching problem solving using computer mathematical packages in the discipline "Informatics and Information Technology" is that the main emphasis is on the development of algorithms and their implementation in a software system.
The successful solution of the problem depends on the correct execution of all stages of the chain of problem solving with the help of a computer mathematical package.

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CONCLUSION

When studying different subjects, students unconsciously come across mathematical models. An important part of the training is building a complete chain of computer applications: a real process, a mathematical model, a solution method, an algorithm, software implementation, numerical experiments and analysis of results.
Modeling is a complex, multifaceted process. At the first stage of modeling, it is necessary to determine the purpose of modeling.
However, it is important to remember that general education teachers must incorporate the concepts of media culture and media safety into their curriculum and teach them how to protect themselves from the negative consequences and consequences of information technology, as well as its many benefits and benefits. At the same time, it is advisable to develop students' competence in working with information, taking into account the following:
- to form students' understanding of the role, capabilities and scope of information technologies in life and society, as well as their negative consequences and protection from them;
- to teach to understand and use the advantages of electronic resources, curricula and other educational and methodological products in the learning process and personal development;
- remote exchange of information, search for information in the local and global network and prevention of potential risks in this process, as well as compliance with the rules of media culture.
It is the duty of our teachers to bring up such qualities in our youth so as not to be distracted by setting modern life goals, to find the right place in the information space with intelligence, honesty and diligence, to contribute to the development of the country and its prosperity.

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