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**APPLICATION OF NEW TECHNOLOGIES FOR
THE DEVELOPMENT OF THE SIMULATOR IN THE UPDATED
ALGEBRA PROGRAM FOR THE 7th GRADE LEARNERS**

Abstract. On the one hand, the development of digital technologies opens up new opportunities for us, on the other hand, it presents new challenges. Our time is the time of change. The society is interested in people of high professional level and business skills, able to make non-standard decisions and able to think creatively. The government of our country represented by President N.A. Nazarbayev indicated that one of the development priorities of Kazakhstan is education and it is a high-quality education. In the formation of these qualities, a large role is played by the school discipline - mathematics. The new education standards state that “one of the goals of mathematical education is mastery of the system of mathematical knowledge and skills necessary for practical application by the learners”. The modern stage in the development of society requires new approaches for teaching learners, especially in the exact disciplines: geometry, mathematics and algebra. Despite the state's request for a high-quality teaching of these disciplines, in recent years, the school curriculum has not been saturated with methodologically well-made manuals, collections of tasks for self-studying of the learners.

Keywords: paper material, format, simulator, LATEX.

In the Message of the President of the Republic of Kazakhstan N. Nazarbayev to the people of Kazakhstan on January 10, 2018 “New development opportunities in the conditions of the fourth industrial revolution” there was noted: “The transition to the updated content has begun in the secondary education. These are absolutely new programs, textbooks, standards and specialists. It will be necessary to reconsider the approaches of teaching and professional development of all the teachers. It is necessary to strengthen the quality of teaching mathematics and natural sciences at all the levels of education” [1].

Indeed, the modern stage in the development of society requires new approaches for teaching students, especially in the exact disciplines: geometry, mathematics, algebra. Despite the state's request for a high-quality teaching in these disciplines, the school curriculum has not been saturated with methodologically well-made manuals and collections of tasks for self-studying of the students in recent years.

The development of logic and mathematical thinking, respectively, fall to the middle and low levels, which affects the intellectual level of the students and the success of the entire educational activity.

Moreover, the adopted system of education in modern school is aimed for the effectiveness of independent work of the schoolchildren.

The situation should be corrected due to the saturation of independent work with various forms, types and methods of work. One of the ways is development and creation of new teaching and learning aids which can increase the intensity and effectiveness of the learning process. Algebra is the discipline of practical orientation, which is based on the acquisition of logical thinking skills and the main educational literature for its learning are textbooks, collection of tasks and simulators.

The ability to awake interest in mathematics is not easy. Much depends on how the question is posed and how all the learners are involved in the discussion of the current situation. The creative activity of the schoolchildren and the success of the lesson entirely depend on the teaching methods which the teacher chooses. How to generate student's interest for the subject? By means of independence and activity, with the help of search activities in the classroom and at home, creating a problem situation, variety of teaching methods, through the novelty of the material and the emotional color of the lesson. In pedagogical

practice, various ways of activating cognitive activity are used, so, the main among them are the variety of forms, methods, means of teaching, the choice of such combinations arise such situations which stimulate activity and independence of the learner.

The content of the collection should be accomplished taking into account psychological characteristics in the formation of thinking and the personality of a learner.

The necessary element of independent learning activities are monitoring and evaluation activities, which imply awareness on the degree of correctness of the task solution and the need to take additional steps for achieving the goal.

Monitoring and evaluation of the results by the learners of their activities encourage for the new goals, setting new tasks and for the continuation of the learning process.

The basis of creation should also take into account the psychological characteristics of the assimilation of information. From psychology's point of view the assimilation of information is considered in the interrelation of the processes of understanding and memorization, which occur simultaneously, regardless of the volitional orientation of consciousness [2].

Taking into account the psychological characteristics and the need for new approaches in the formation of the collection of tasks, it is proposed to create a modern simulator for thematic tests with the use of new technologies.

The basic elements of the collection were the independent testing system (for learners) and the effective technology of its creation (for teachers).

The collection was created for the learners of the 7th grade, taking into account the peculiarities of their psychology:

In the 7th grade, the intellectualization of cognitive processes continues: attention, memory, imagination, thinking, speech, the development of theoretical reflexive thinking takes place on the basis of the development of formal-logical operations.

Speaking about the testing system, it should be noted that at present the independent testing system has become an important direction of modernization of the control and assessment process improving the quality of education in the domestic education. One of the main and undoubted advantages of testing is the minimum time spent on obtaining reliable monitoring results.

Figure 1 shows the development of a simulator in LaTeX. The left pane displays the source code, and the right pane shows the rendered output.

Question 5: Среди данных таблиц укажите такую, которая является функцией y от x .

| | | | | |
|-----|---|----|----|----|
| x | 7 | 42 | -2 | -7 |
| y | 7 | 2 | 7 | 42 |

| | | | | |
|-----|---|----|----|----|
| x | 2 | 3 | -2 | -3 |
| y | 4 | -9 | 4 | -9 |

| | | | | |
|-----|----|---|---|----|
| x | -5 | 0 | 7 | -5 |
| y | 25 | 2 | 5 | 14 |

| | | | | |
|-----|-----|----|-----|-----|
| x | 5 | 50 | -2 | -18 |
| y | -40 | 50 | -54 | -86 |

Question 6: Какая из данных зависимостей является функцией?

The diagrams show mappings between sets X and Y with elements 10, 1, 0, -2, -7. The first diagram shows a one-to-one mapping. The second diagram shows a many-to-one mapping. The third diagram shows a one-to-many mapping. The fourth diagram shows a many-to-many mapping. The fifth diagram shows a one-to-one mapping. The sixth diagram shows a many-to-one mapping.

Figure 1 - Type of the development of the simulator. On the left is the text code and illustration code in TEX format

Modern information data makes it possible to fit a very large amount of paper material in electronic form, occupying much less physical space. For ensuring the educational process, special editions are required and one of them is collections of tasks or simulators. Our proposed simulator will be developed on a high-quality system of typing and imposition system LATEX, where words, formulas, punctuation marks and all the elements are accompanied by code fragments. For example, Figure 1 shows a part of the simulator, developed in the LATEX program on the topic of function, LATEX is designed to create fine books, especially books containing a lot of mathematical formulas.

LATEX is a publishing system, the documents created in it look like "printed", which is very difficult (if it is possible at all) to achieve with the help of other programs. Moreover, TEX and LATEX are interesting not only as tools for creating fine mathematical books, articles, coursework and dissertations. The work typed in TEX can also be used for online resources, such as games with mathematical tasks and special sites simulators. In Figures 2 and 3, you can see an example of the introduction of mathematical tasks encoded in TEX for an educational site. LATEX spares the author difficulties from thinking over the intricacies of typographic art, since here you can not only type the formulas, but also reproduce various drawings, graphs, etc. [3]

Математика в TeX-системе

Введите здесь TeX

```
\begin{cases} x+y=3 \\ x^2-y=-1 \end{cases}
```

[TeX документация](#)

$$\begin{cases} x + y = 3 \\ x^2 - y = -1 \end{cases}$$

OK Отмена

Figure 2 - Task entry in a coded form

ТЕСТ - I

$$\begin{cases} x + y = 3 \\ x^2 - y = -1 \end{cases}$$

A) (1; 2), (-2; 5)

B) (1; 2)

C) (0; 1), (1; 0)

D) (2; 1)(1; 2)

E) (2; 0), (0; 1)

Не знаете как решить? Мы рекомендуем в первую очередь посмотреть ВИДЕО-УРОКИ по данной теме

ОТВЕТИТЬ

СООБЩИТЬ ОБ ОШИБКЕ

Figure 3 - Final task view for the educational portal

The simulator is the author's development of the model on preparation for intermediate certification in the updated program on algebra for the 7th grade course. The simulator can be considered as the way to consolidate all the topics studied in algebra course of secondary school, the 7th grade. The simulator which we are developing for the learners of the 7th grade is an effective element of self-studying training. Educational objectives are concentrated on the principle of "nothing extra": only the most necessary information in the form which is the most convenient for a child to learn.

For a modern type of the educational process is necessary to change these positions, due to the high risks of mismatch between the obtained and evaluated knowledge, abilities and skills.

Thus, one of the fundamental principles for the construction of the collection of tasks in algebra is to take into account the psychology of the learners and the use of modern technologies in the information sphere.

In this regard, the collection of tasks in algebra acts as a project (model) of the educational process aimed at the effectiveness of the independent work of the schoolchildren and generally improves the quality of mathematical education. The essential objective of this simulator is a full recess into the topic covered, securing the skills by solving a large number of tasks at different levels.

There was the research analyzing the role of the simulator as a tool for preparing for thematic testing in the updated program on algebra for the learners of the 7th grade. The children studying at the "SMART BILIM" mathematical center were involved in the research. During the research, children with the same level of knowledge were divided into 2 groups of 15 people. Up to 40 tasks with three levels of complexity were allocated to the first group to consolidate any topic and from 40 to 100 tasks were allocated to the second group. At the end of the first term of the academic year, testing is conducted on the studied topics, which helps to identify shortcomings in the learners' work and further it helps to eliminate them and improve the preparation of the schoolchildren in mathematics.

While working out these tests, it was determined that the prepared tests are appropriate to the classical requirements for tests. The principle "from simple to complex" in compiling this test was observed.

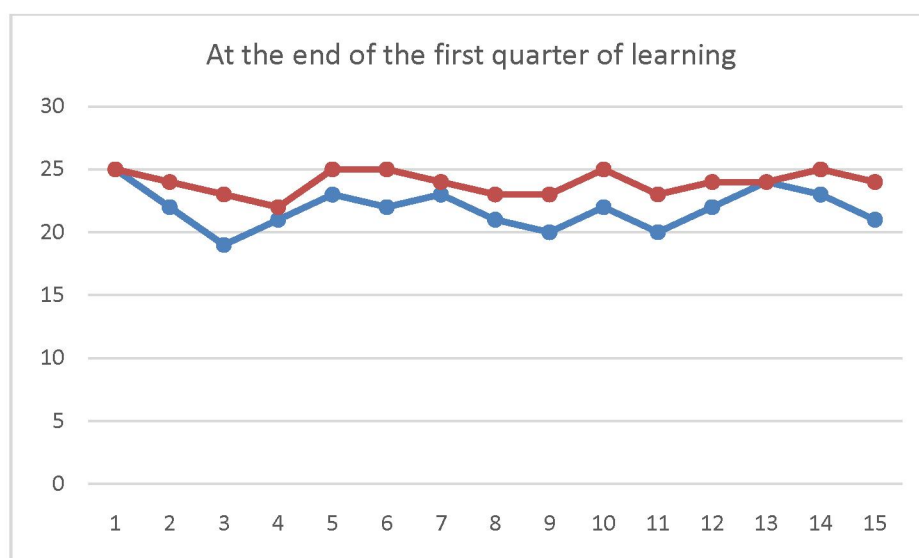


Figure 3 - Test results for two groups. Control group (blue), experimental group (red)

As we can see, in Figure 3, after the term of studying various topics and solving problems with the simulator, the experimental group is characterized by a small increase in knowledge, the average percentage of completing tasks increases only by 9%. At the end of the second term, we also conducted a verification test on the same topics and the result of these two groups you can see in Figure 2. After a long time, the difference is more noticeable and it is 29%. Comparison of these test results in control and experimental groups showed a statistically significant and positive effect of the factor - the use of the simulator - on the test results.

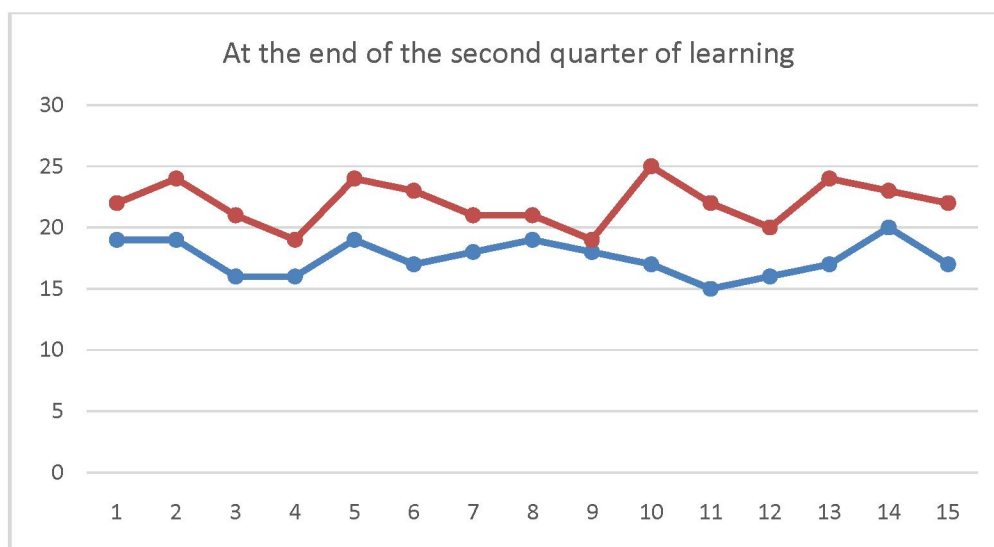


Figure 4 - Test results for two groups. Control group (blue), experimental group (red)

On the one hand, the development of digital technologies, opens up new opportunities for us, on the other hand, it presents new challenges. Our time is a time of change. The society is interested in people with high professional level and business skills, who are able to make non-standard decisions and able to think creatively. The government of our country represented by President N.A. Nazarbayev indicated that one of the development priorities of Kazakhstan is education and moreover, it is a high-quality education.

A large role in the formation of the most qualities is played by school subject - mathematics. The new standards of education state that "one of the goals of mathematical education is the mastery of the schoolchildren by the system of mathematical knowledge and skills necessary for application in practice."

To stay in trend and be effective and sought-after specialist, you need constantly learn and develop. Nowadays classical education is not enough, because there are new requirements, specialties, technologies and processes which are changing. Traditional schools do not have time to adapt to the demands of the market. All these facts contribute to the emergence of new forms and methods in teaching using modern technologies. All educational organizations of the Republic of Kazakhstan from September 2017 continue the transition to the updated content of education. The 1st, 2nd, 5th, 7th classes have been passed to the updated content in 2017-2018 academic year. It should be noted that at the moment the most difficult transition is noted in the 5th and the 7th grades of all educational organizations of the Republic. The difficulty is not in the content of education, not in children, but in the textbooks. There are a lot of questions in the work on the updated content of education. Because the new always raises questions and misunderstandings, requires new developments to work with the learners. What has already been started, you cannot undo, so you need to accept, delve into and study all the related updated content. In this regard, the simulator for the schoolchildren of the 7th grade has been developed.

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ЖАҢАРТЫЛҒАН ОҚУ БАҒДАРЛАМАСЫ БОЙЫНША 7 СЫНЫП ОҚУШЫЛАРЫНА АРНАЛҒАН ЖАҢА ФОРМАТТАҒЫ ЖАТТЫҚТЫРУШЫ

Аннотация. Математикаға қызығушылық ояту мүмкіндігі оңай емес. Көп нәрсе мәселенің қалай көтерілгеніне және оқушылардың жағдайды қалай талқылағанына байланысты. Оқушылардың шығармашылық қызметі, сабақтың сәтті өтуі, мұғалім таңдаған оқыту әдістеріне байланысты. Оқушының қызығушылығы тәуелсіздік пен белсенділік арқылы, сыныптағы және үйдегі проблемалық жағдайды іздеу іс-шараларын жасау, оқыту әдістерінің әртүрлілігі көмегімен, материалды жаңарту арқылы, сабақтың эмоционалды бояуы арқылы қалыптастырылады. Электронды түрдегі, заманауи ақпараттар, қағаз материалын өте көп мөлшерде қолдануға әкеледі, ал физикалық кеңістікті әлдеқайда аз игереді. Білім беруде оқу процесін

қамтамасыз ету үшін, арнайы басылымдар қажет немесе жаттықтырушылар керек. Біз жоғары сапалы терілген LATEX таңбалау жүйесін ұсынамыз. Онда сөздер, формулалар, тыныс белгілері және барлық элементтер код фрагменттері арқылы жүреді.

Түйін сөздер: қағаз материалдар, формат, жаттықтырушы. LATEX.

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ПО ОБНОВЛЕННОЙ ПРОГРАММЕ -ТРЕНАЖЕР В НОВОМ ФОРМАТЕ ДЛЯ УЧАЩИХСЯ 7 КЛАССА

Аннотация. Умение заинтересовать математикой – дело непростое. Многое зависит от того, как поставить вопрос, и от того, как вовлечь всех учащихся в обсуждение сложившейся ситуации. Творческая активность учащихся, успех урока целиком зависит от методических приемов, которые выбирает учитель. Интерес школьника сформируется через самостоятельность и активность, через поисковую деятельность на уроке и дома, создание проблемной ситуации, разнообразие методов обучения, через новизну материала, эмоциональную окраску урока. Современные носители информации позволяют уместить очень большое количество бумажного материала в электронном виде, занимая при этом намного меньше физического пространства. В образовании для обеспечения учебного процесса необходимы специальные издания, одними из таких изданий являются сборники задач или тренажеры. Нами предлагаемый тренажер будет разработан на высококачественной системе набора и вёрстке LATEX, где слова, формулы, знаки пунктуации и все элементы сопровождаются фрагментами кода.

Ключевые слова: бумажный материал, формат, тренажер, LATEX.

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