International Journal of Engineering & Technology, 7 (4.7) (2018) 276-282

International Journal of Engineering & Technology

Website: www.sciencepubco.com/index.php/IJET

Research paper

Information Technologies in Education: Forming the Competences of the Future

Sergey A. Averin[1], Evgenii A. Alisov[2], Natalia S. Murodhodjaeva[2*], Igor A. Noskov[3], Olga V. Tsaplina[4], Lyudmila E. Osipenko[2]

[1]Department of teaching methods of institute of Pedagogics and Psychology of Education, Moscow City Pedagogical University, 2nd Selskokhozyaystvenny proezd, 4., 129226, Moscow, Russian Federation
[2]Department of pedagogics of institute of Pedagogics and Psychology of Education, Moscow City Pedagogical University, 2nd Selskokhozyaystvenny proezd, 4., 129226, Moscow, Russian Federation
[3]Department of pedagogics, The Moscow City University (Samara Branch), Stara Zagora street, 76, 443081, Samara, Russian Federation
[4]Department of psychology of institute of Pedagogics and Psychology of Education, Moscow City Pedagogical University, 2nd Selskokhozyaystvenny proezd, 4., 129226, Moscow, Russian Federation
**Corresponding author: aver1nserg@yandex.ru*

Abstract

Specialists in the field of programming create a huge flow of software, which is mainly aimed at attracting children to specific software products that have a developing effect, rather, as a side effect. The developing effect is not diagnosed in such programs, but it is often declared by the developers. Scientific and methodological response of the pedagogical community to information challenges in the field of preschool education was the creation of the methodology of author's children's animation and the corresponding educational module. In the article two important competences of preschool children are considered, which are basic in relation to many other competences formed at an older age: developed imaginative thinking and developed research abilities. The development of these competences projects as a methodical waymark for the technical development of the methodology of author's children's animation.
Thereby, the purpose of the article is to justify the creation of methods for author's children's animation that determines the development of imaginative thinking and research abilities of preschool-age children, taking into account the requirements of the modern information society.
To achieve this goal, the following methods were used: content analysis; method of contrastive-comparative analysis of scientific and methodical materials; method of system analysis; method of mathematical and statistical data processing; expert appraisement, generalization of research results.
Based on the results of the study, the theoretical foundations of the preschool-age child's competence were determined, a pilot study of the development of preschoolers' competencies, the development and introduction of the educational module "Multstudio I CREATE THE WORLD" into the practice of pre-school pedagogy as a potentially effective means of developing imaginative thinking and research abilities of children, development of recommendations for software providing multstudios in kindergarten.

***Keywords*:** competences, STEM-pedagogy, imaginative thinking, research abilities, author's animation.

1. Introduction

Information and computer technologies are an integral part of the life of a modern child [13], [5]. Because of this fact, you can worry, consider it as an evil or a blessing, you can earn on it, to a greater or lesser extent thinking about the benefits to the development of the child's personality, but the situation will not change: nowadays childhood is connected with gadgets, programs, and technology. Even if the child is "fenced" from the world of computers, telephones and tablets at home or in an educational organization that implements appropriate programs (for example, pedagogy in Waldorf), he will face information technology when communicating with fellows, in the process of further study or work [1].
This statement is only a statement of fact, since immersion in polemics on the topic of harm and the benefits of technology will inevitably lead to the exchange of theses and antitheses, but not to concrete solutions. At the same time, the article is aimed at a reasoned presentation of the theoretical model and practices of realizing the potential of information technologies in the education of preschool-age children, in which it is possible not only to "reconcile" opponents and adherents of adults, but also to achieve the most important point: to use technologies for the benefit of development, education and upbringing of children [6].
The assumption of the effectiveness of the use of a pedagogical tool can be refuted or confirmed only if specific indicators are determined, the dynamics of which can be measured and recorded. And here we touch the second most important aspect: what is the determining factor for the personality of modern man? What principles need to be laid in preschool childhood so that in a few decades (that for a modern dynamic world can become a period of significant transformations) a person could quickly adapt, find his place in society and see the opportunities for self-realization and development? Obviously, the answer must be sought not in the cognitive or activity-oriented paradigm, but namely in the competence-based paradigm. Different competencies and

competence formed on their basis as an integrative personality quality will allow a person to be flexible, socialized, emotionally responsive and learnable and to remain active and working for a long time. That is why today science is aimed at defining and justifying the so-called "competences of the XXI century" [8].
It should be noted that the problem of identifying and justifying key competencies, despite the fact that for several decades it has been developed both in foreign and domestic sciences, does not lose its relevance and continues to cause the scientific controversy. Agreeing with the importance and perspective of the competence approach, scholars differ in their views when classifying key competences [14], [19], [20], [22], [23], and in determining the main educational tools that develop competences. In particular, in contemporary foreign sources such funds include: motivation [25], interpersonal interaction [17], extension of experience [18], use of information technology, preservation of health [21] etc.
In the context of one article, it seems difficult to show the interrelation of all key competences with the process under study. And within the declared age (the period of preschool childhood) - not necessary, because many competences at this age simply impossible and wrong to form, because it contradicts the concept of reliance on the zone of the child's immediate development. For example, the competence of personnel or systems management. Given the psycho-physiological characteristics of a child from 3 to 7 years "in pure state" to form this competence will be profanity. We can only talk about the formation of prerequisites, which will create a good and strong foundation for its further formation [9].
With the support of the principles of verifiability (diagnostability) and age-matched relevance, two important competences are considered in this article that are basic in relation to many other competences formed at an older age (the so-called competencies of the future): developed imaginative thinking, developed research abilities.
Scientific and methodological response to information challenges in the field of preschool education was the creation of the methodic of author's children's animation. The purpose of this article is the scientific and methodological substantiation of the phenomena "development of figurative thinking" of preschool – age children and "the development of research abilities of preschool-age children" and the justification of the aspects of the influence of the developed methodology of author's children's animation on the basis of the use of animation for the development of imaginative thinking and research abilities of preschool-age children.
The innovative work carried out since 2016 in the pre-school departments of GBOU "School 2103" in Moscow and GBOU DSRR No. 14 of Reutov (under the scientific guidance of N.S. Murodkhodzhaeva) allowed the development and implementation of technology in over 200 Russian and Kazakhstan preschool educational organizations author's children's animation, create the appropriate equipment, select a computer animation program and develop specific recommendations for new animated computer programs that will be necessary and at the same time will be understood by both children and educators to become a really often used pedagogical tool. The created methodology of the author's children's animation is dressed in the structure of the module "Multstudio I'm a Create the World", in which science, methodology, industrial achievements and full implementation support are combined. The very idea of such modules was developed by the educational and methodological center of CJSC «Elti-Kudits» and implemented in the modular partial program of the Institute for the Study of Childhood, Family and Education of RAO "STEM education of preschool-age and primary school-age children" (under the guidance of T. V. Volosovets, S. A. Averina, V. A. Markova) [3].
Thus, the article considers the necessity to create a methodic for author's children's animation that determines the development of imaginative thinking and research abilities of preschool-age children, taking into account the requirements of the modern information society.

2. Imaginative Thinking

2.1. Theoretical Basics

Thinking is a mental process of reflecting reality, the highest form of cognitive and transforming human activity [11].
The process of thinking development occurs not as a successive change of visual-figurative forms of mental activity by conceptual forms, but as a gradual complication of information processing mechanisms. It is important that the development of logical thinking must not lead to the suppression of visual-effective and imaginative thinking [4].
It is well known that depending on the nature of the problem being solved, on what the thought operates with, three types or levels of thinking stand out:
- ✓ subject-efficient, thought-provoking operations take place in actions with specific objects;
- ✓ visual-shaped, in which the basic unit of thinking is the image;
- ✓ verbal-logical (conceptual).

These types of thinking develop in the process of ontogeny consistently from the subject-effective to the conceptual.
Following A.V. Petrovsky and M. G. Yaroshevsky we know figurative thinking as a set of processes and ways of figurative solution of problems that presuppose a visual representation of conditions and situations, operating with their constituent images, without real practical actions with them [15].
Visual thinking operates mainly with images: they are the source material, the operational unit of the immediate sensory perception of the real world [2].
Visual thinking is a kind of mental activity that performs a gnostic function that provides cognition of the most essential aspects of reality in the form of visual images. It is often consider as the basis of creative thinking, creativity. In psychological science it is often associated with originative, artistic, creative, visual, descriptive and emotional.
At the same time, imaginative thinking is an extremely complicated formation that acts as a specific system of interconnected heterogeneous elements. It includes three thought processes:
- ✓ creating an image;
- ✓ operating it;
- ✓ orientation in space (both visible and imaginary).

In the system of these elements, the various types of representations and operating skills are the leading ones. All three processes "have a common foundation, which depends not so much on the type and content of the activity (drawing, solving mental problems, guessing riddles, etc.), but rather on the type of visual relationships that a person stands when working with an image or visual object" [2].

2.2. The System of Diagnosing the Levels of Development of Preschooler's Figurative Thinking

As methods for identifying and assessing the level of development of preschooler's figurative thinking, we used the well-known techniques of such authors as: R.I. Bardina, O.M. Dyachenko, A.F. Luria, R. S. Nemov, which are easy to use, fairly objective and standardized. An important indicator of the selection of these methods was the opportunity to use them by educators who do not have a special psychological education [15].

Table 1:. System of levels of development of preschooler's figurative thinking

№	The criterion of the development of figurative thinking	The indicator of the development of figurative thinking	The methodology of studying the indicator of the development of figurative thinking	Author
1.	***Visual analysis and synthesis***	Investigation of the level of development of visual-figurative thinking	"What objects are hidden in the drawings?"	Nemov R.S.
2.	***Tentative actions***	Study of the ability of using conditional-schematic images for orientation in the space	"Schematization" (Labyrinth)	Bardina R.I.
3.	***Visual encoding***	Study of the ability to translate text into the symbolic language (coding)	"Pictograph"	Luria A.F.
4.	***Correlation of the scheme and the real situation***	Diagnostics of the level of development of perception and correlation forms of objects with given samples (standards)	"Standards"	Dyachenko O.M.

The pre-school department of Moscow schools № 883, 1210, 1216, 1430, 1523 became the base of the pilot study. 123 children of the senior preschool age participated in the ascertaining experiment, the average age of the subjects 6 years 2 months. The general development of children is within the norm, there is no delay in mental and speech development, that is, when sampling was performed, the requirements of representativeness and homogeneity were hold. A random selection of natural groups was also used. These educational institutions do not apply any special procedures for enrolling children in the pre-school organization, so there is a random sample of children from different families that are close in social status, which allows getting objective scientific data.

The results of the pilot study, shown in Fig. 1 and in Tables 2-5, showed that when assessing the above criteria on a five-point scale, the highest arithmetic mean 4.15 was revealed in the criterion for correlating the scheme and the actual situation (the "Standards" method, by O. M. Dyachenko). The average indicators were revealed in the ability to produce visual synthesis (3.34 points) and orienting actions (3.89 points). The lower-range were the criteria - figurative coding (3.16, «Pictograph» by A. F. Luria) and visual analysis (3.05, "What objects are hidden in the drawings?" by R. S. Nemov).

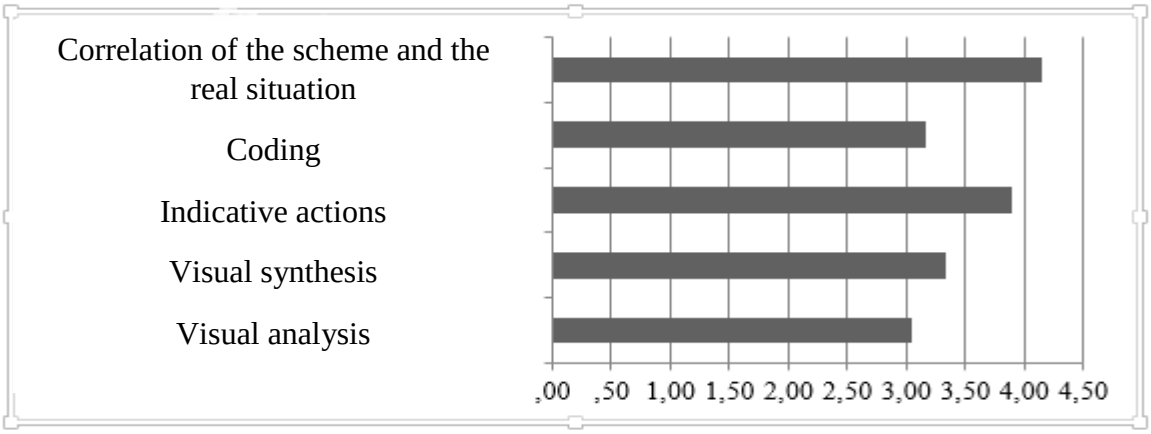

Figure 1:. The results of the psychological and pedagogical assessment of the levels of formation of the development of older preschool children's figurative thinking

Table 2:. The average values of the development of criteria for the formation of the development of older preschool children's figurative thinking

Criterion for the development of figurative thinking	Average value
Visual analysis	**3,05**
Visual synthesis	**3,34**
Indicative actions	**3,89**
Visual encoding	**3,16**
Correlation of the Scheme and the Real Situation	**4,15**

Table 3:. Descriptive statistics of the criteria for the formation of the development of figurative thinking of older preschool children

Indicators	Minimum	Maximum	Average	Standard Deviation	Dispersion
Age	5,0	7,3	6,211	,6000	,360
Visual analysis	1	5	3,05	,952	,907
Visual synthesis	1	5	3,34	1,001	1,002
Labyrinth	1	5	3,89	1,112	1,236
Pictograph	1	5	3,16	,754	,568
Standards	1	5	4,15	1,050	1,102

The estimation of root-mean-square deviation and dispersion confirms the obtained average values of development of the criteria of the formation of the development of figurative thinking of older preschool children.

Table 4:. Group statistics of the criteria of the formation of the development of figurative thinking of senior preschoolers

Indicators	Gender	Average	Standard deviation	Standard error of average	t	Significance
The visual analysis	B	3,06	,998	,124	,152	,879
	G	3,04	,906	,120		

The visual synthesis	B	3,29	1,086	,135	-,514	,608
	G	3,39	,901	,119		
Labyrinth	B	3,91	1,234	,153	,151	,881
	G	3,88	,965	,128		
Pictogram	B	3,15	,690	,086	-,157	,875
	G	3,18	,826	,109		
Reference standards	B	4,17	1,009	,125	,243	,809
	G	4,12	1,103	,146		

Assessing the group statistics of the criteria for the formation of the development of figurative thinking of older preschoolers, we did not find any significant differences between the indicators in the group of boys and in the group of girls.

Table 5:. Correlation analysis of the development of figurative thinking of older preschool children (why not all the data? It seems that the values have slipped)

Indicators	**Age**	**Vision analysis**	**Visual synthesis**	**Labyrinth**	**Pictogram**	**Standards**
Age	1	,000	,000	,491**	,349**	,000
	122	122	122	122	122	122
Visual analysis		1		,240*	,222*	,550**
		122		122	122	122
Visual synthesis			1	,008	,014	,000
			122	122	122	122
Labyrinth				1	,277*	,002
				122	122	122
Pictogram					1	,000
					122	122
Standards						1
						122

Correlation analysis of the development of figurative thinking of older preschool-age children showed an insignificant dependence between the level of development of visual analysis and orientation actions, figurative coding and correlation of the scheme and the real situation. Also, a small correlation in the level of development of orienting actions and figurative coding was revealed.

Thus, pilot research showed that children have a well-formed ability to correlate the scheme and the real situation, and to conduct indicative actions. Ability to produce imaginative coding and visual analysis are developed at an average level.

2.3. The Potential of Information Technologies as a Means of Developing the Figurative Thinking of a Child.

The authors of this article realized the potential of information technologies for a child of preschool age in the created method of author's children's animation based on the use of animation studio. Work in the animation studio, as an example of the use of information and computer technology in preschool education, has a huge potential for the development of imaginative thinking. And, in particular, for the development of figurative coding and visual analysis, which, according to the data of our pilot study, can be called "problem points" of this competence.

We have developed over 80 game assignments, the implementation of which contributes to the development of imaginative thinking. There are, for example, the following types of tasks:

• Make the mini cartoon with the children about how the ball rolls and how the cube can move. The basis for the plot about the shape of the ball and the cube, can serve a fairy tale "Kolobok", the protagonist of which must roll.

• Prepare scenarios of small cartoons with "heroes", reflecting different sensory standards. For example, how three balls of different sizes "turn" into a snowman, how flowers of different colors bloom, etc.

• Remove a small cartoon where objects "disappear" and "appear", for watching with children and stimulating comments "one", "none", "many." For example, there may be a different number of frogs on the lake, like "one" or "many", then they jump into the water and disappear "none".

3. Research ability

3.1. Theoretical Basis

Research training has acquired high relevance in recent decades, which is easily explained by socio-economic changes, and the change in the ideological paradigm, and the need for a new generation in the post-informational society [12]. At the same time, the research education of children, as, perhaps, nothing else in modern pedagogy, is pursued by the problem of superficial, mechanistic understanding. When, both in theory and in practice, the mantra about the relevance and topicality is repeated, and then the algorithmically arranged stages of including the child in the research search are listed [7].

Undoubtedly, in the stages of scientific research from the definition of the object and the problem of research, the formulation of the topic, the setting of goals and objectives to their consistent solution and the derivation of conclusions is an extremely important task. But it is unlikely that it should be placed in the center of research training. In the end, the very sense of research activity - creative search, placing the child in the active position of the researcher, the discoverer is lost. And the answer to the question "how to do this?" is not as simple to answer, as it may seem to the amateurs to explain everything, divide into a number of consecutive operations and describe the necessary conditions. In the end, as professor A.I. Savenkov stressed in his speeches, a periodic table, dreamed D.I. Mendeleev, but not his cook. Just like

an apple that allegedly fell on the head of Isaac Newton, also repeatedly touched the heads of different representatives of the human race through the history of mankind. And you can talk as much as you like about the causes, conditions and mechanisms of creative insight, but it is obvious that not every physicist, placed under a conditional apple tree on a conditionally ideal day, will open the law of universal gravitation.

In the children's study, as in the research activity of an adult, the key is the presence of a special sensitivity, allowing one to see the problem of research, while as other people would go by. And most importantly, most often it is born by accident, in the process of searching for something else. Research education involves developing of sensitivity to this accidently appeared by-product; to predict or calculate it's emerging a person cannot in advance.

At the same time, as Alexander Ilyich Savenkov notes in his articles, the objective difficulty of the task of placing a child in the position of a researcher does not relieve the need to look for its answer. Moreover, in the very desire to understand how to professionally help a child to take part in research, there is nothing unnatural and fundamentally insoluble [10], [11].

3.2. Experimental Work

During the 2016-2017 school year, research studies of children on basis of the system "one child - one student-tutor" were organized in the seven pre-school structural divisions of the GBOU "School 2103" (Moscow). The training was realized by the students of the direction "Pedagogical Education" of the profile of the preparation "Preschool education" of the Institute of Pedagogy and Psychology of Education of the Moscow City Pedagogical University. And determining aspect in this organization of work was that students comprehended the method of research training almost in parallel with the actual meetings with the child. The responsibility, the need to explain everything in detail, the unpredictability of practical situations - this is the context that has become a factor of deep and serious immersion of students into the problem.

In 2017-2018 the experiment continued, however, teachers of pre-school departments already acted as tutors, and the experiment itself "moved" from the group rooms to the animation studios specially created for GBOU "School 2103" (Moscow) (which were equipped with separate premises in each preschool structural unit under the guidance of the director of the educational complex N. P. Ilyina).

To more fully reflect the theoretical results of the experiment, we note that the research study program in the kindergarten includes three subprograms: the training of research skills; children's research practice; monitoring of research activities of preschool-age children.

The subprogram "Independent research practice" - is the conduct of independent research (first training (subgroup), then individual). The lessons in this subprogram are arranged in such a way that the degree of the child's autonomy in the process of teaching and researching is gradually increasing.

The subprogram "Monitoring" is the content and organization of activities which are necessary for managing the process of solving research study tasks: protecting research and creative projects of children, festivals, competitions for children's works, etc. As the author of the methodology, professor A.I. Savenkov notes, this part of the program is smaller than others in volume, but it is just as important as the two previous ones. The child should know that the results of his research are interesting to others, and he will be surely heard. Gradually every child should understand that the results of his research should not be simply stated, they must be also protected. To do this, we must encourage children to listen to others, to ask questions, to learn to hear other people's arguments. It is absolutely necessary to complete each study of the child with protection [11]. And it was in the quality of protection that the author's cartoons were created and presented in the framework of the experiment we conducted.

We can distinguish two main directions of our work in this experiment:

• The plot of the author's cartoon repeats the stages of the research;

• The author's cartoon creatively interprets the research problem and the received findings.

1) Creation of the protagonist in accordance with the object of study.

Each study assumes the existence of an object. For example, if a child studies how cockroaches sleep, the object of research is a cockroach's dream. If he studies why the squirrel has a fluffy tail, the object of investigation is a squirrel's tail. We intend to give examples which can show that the object and the character are close concepts, but not identical. It is impossible to mold dream from plasticine. But it is quite possible to create an interesting cartoon image of a cockroach. Also, the tail of a squirrel is unlikely to become a cartoon hero by itself. Most likely, the role of the main character will perform a squirrel.

2) Correlation of the plot with a working hypothesis.

The hypothesis underlying the research is working. For example, the child suggested that tassels on the ears are needed for the squirrel to determine the height of the ceiling in the hollow. So in the cartoon there should be a tree with a hollow, as well as some playing around with the situation of what can squirrel do in the summer, when the brushes practically "fall out". If in the study of the problem "Why do fish have different eyes?" the child suggested that this is related to the habitat form, then the plot cannot do without a fragment of life of deep-sea fish and those living in shallow water.

3) The relationship of pictograms and composite design of the cartoon.

In the process of collecting information from various sources, a small researcher not only gets a volume of knowledge, but also encounters the fact that the nature of information is different. Dad, for example, explains this or that phenomenon in his own way, mom or grandmother - in their own ways. And in the Internet article, the encyclopedia or in the book can be found a completely different approach.

The pictography allows fixing the whole multifaceted flow of facts and judgments, extracting the main thing and finding out the structural links. The preschooler should not be able to write and, accordingly, he cannot note. But it is extremely important to teach him how to pictograph. Pictographs are not drawings and schemes that the adult creates, and the child copies. From the experience of work, you can safely say that the pictograms, the author of which is a child, are often understandable only to himself. What, in fact, is their direct meaning.

When pictograms are accumulated in the process of research, their grouping will be necessary to create the author's cartoon. We are talking about the division into groups according to a certain principle. For example, pictograms reflecting the conditions of the course of action, habitat, etc., will prompt ideas for the design of the background of the screen, which is a part of the equipment of the Multistudio "I create the World". Pictograms reflecting the characteristics of the object, its properties, the relationships between objects or phenomena - will clarify the development of the plot of the cartoon.

For example, in the course of the research of the problem "Where do puddles come from?" The child pictographed that on the horizontal surface (road) should be trapped water (rain); that water flows from high places into depressions and cavities; that the deeper and wider the pit is, the more water flows into it. It is obvious that the pictogram of rain and road will prompt the choice backgrounds of a road image in sunny weather and an image of the same road while raining.

These backgrounds the child will draw with the help of a teacher or parents and attach to the magnetic walls of the screen of the animation studio. Other pictograms, discussed earlier, will push

the child onto the plot of the cartoon (for example, about a droplet travel through the mountain or how it slid into a pit on the road, and the sun helped to get out).
4) Reflection of the conclusions of the study in the cartoon.
Generalizations and conclusions, which the child came to in the course of the research, must be necessarily "played" in the author's cartoon. The most simple and logical way is the voice acting. The child should independently sound the whole cartoon by putting in the mouth of the characters phrases, voicing the hypothesis, questions, basic facts, data analysis and conclusion.

5. Conclusions

Requirements for a computer program for the effective implementation of the methodic of author's children's animation
Thus, the scientific and methodic response to information challenges in the field of pre-school education was the creation of a methodic for author's children's animation based on the use of animation studio, which determines the development of imaginative thinking and research abilities of preschoolers.
To ensure that all of the above does not remain in the field of theoretical inferences and local practice of experimental sites, it is necessary to create computer animation programs which would be the most simple and "friendly" to the user. There is no need to overload the functionality of the program, since the main goal is not to create a high-quality and complex cartoon (this is the prerogative of professionals), but opportunity for real use by preschoolers and educators, with guaranteed results.
In this regard, there should be a function of frame-by-frame shooting (should be the ability of the following actions: put the figure of the cartoon character, pressed on the key or clicked, the webcam photographed, changed the position of the hero, shot a new frame, etc.). And also should be the ability to copy, move or delete each frame and several frames (children often leave their hands in the frame or the fantasy makes to change the plot in process). It is highly desirable to have a strip or column with frames so that you can easily see how to add, move or delete them, etc. There must also be a function of varying the playback speed of frames, as children, especially the middle preschool age, make frames quite slowly and can be disappointed that as a result of hard work they received a second video. But children will not be embarrassed if, for example, a plasticine worm will move on the screen slowly enough. The main thing is that the very fact of watching your own cartoon will take place.
Speech development of the child includes the possession of speech as a means of communication and culture; enrichment of the active vocabulary; development of coherent, grammatically correct dialogical and monologic speech; development of speech creativity; development of sound and intonational culture of speech, phonemic hearing; acquaintance with the book culture, children's literature. In connection with these, it is a fundamental importance to record the voices of children who voice the cartoon by viewing his project in real time. If this function is not available, the teacher must write down children's voices to the recorder, therefore, we are already talking about learning the replicas by heart and reducing the importance of such work in terms of the development of monologic and dialogical speech. It should be possible to download music and other audio recordings from the computer, determine the beginning and the end of the audio clip ("cut"), move the audio clip through the frames, and "stick" the fragments. It is also desirable to see in the line or column with the frames the attachment of the audio track, which will allow you to accurately link the beginning and the end of the corresponding audio passage to a specific frame. It is desirable to have a "library of sounds" or "audio library": background music, nature sounds, laughter, "picks", etc., which can be used in author cartoons, as well as various sound effects.
Taking into account the realities of the educational system, the author's children's cartoons can be used as competitive works, as a means of presenting innovative pedagogical experience and the like. In this regard, teachers in any case will face the need to add titles, including a library of fonts and effects. It should be possible to add inscriptions, drawings, icons to the frame. It is desirable to have a frame processing function (lightening, darkening, changing the contrast, retouching). It is desirable to work specifically with the image (selection of the object on the frame along the contour, changing its position, rotation, duplication, resizing, etc.). Peculiarities of preschool age also dictate the mandatory need for the possibility of intermediate preservation of the project, returning to changes, the cancellation of the done changes.

References

[1] Bezdukhov, V. P., Noskov, I. A. About the multi-level nature of pedagogical reflection. News of the Samara Scientific Center of the Russian Academy of Sciences. 2015, vol. 17, № 1-3, p. 552.
[2] Yakimanskaya, I. S. Age and individual characteristics of figurative thinking of students. Scientific Research Institute of General and Pedagogical Psychology of the Academy pedagogical sciences of the USSR. M.: Pedagogy. 1989, p. 224.
[3] Volosovets, T. V., Markova, V. A., Averin, S. A. STEM-education of preschool and primary school children. Partial modular program for the development of intellectual abilities in the process of cognitive activity and involvement in scientific and technical creativity: the curriculum. Moscow: BINOM. Laboratory of Knowledge, 2018, p. 112.
[4] Il'ichev, V. V., Il'icheva, E. V. The value of figurative thinking in teaching. Pedagogy and modernity. 2013, № 1, pp. 2-4.
[5] Murodhodjaeva, N. S., Madumarova, A. V. Use of information and communication technologies in the process of intellectual development of preschool children. Informatization of education: theory and practice: a collection of materials of the international scientific-practical conference. 2015, pp. 110-112.
[6] Kurakina, E. S., Alisov, E. A. Possibilities of using social services in conditions of information and communication educational environment. Bulletin of Tambov University. Series: The humanities. 2017, Vol. 22, no. 3 (167), pp. 33-38.
[7] Savenkov, A. I., Tsaplina, O. V., Ganicheva, A. N., Murodhodjaeva, N. S., Polkovnikova, N. B. Monitoring of the main educational programs of preschool education. Moscow Publishing House of SIC ART, 2017, p. 212.
[8] Osipenko, L. E. Scientifically-practical training: from the model to the technology of organization [Text].Moscow, IIU MGOU, 2015. p. 290.
[9] Poddyakov, N. N. Mental development and self-development of a preschool child. Near and far horizons. Moscow: Obruch, 2013, p. 192.
[10] Savenkov, A. I. Pedagogy. Research approach in 2 hours 2nd ed. Moscow Yurayt, 2016.
[11] Savenkov, A. I. Development of emotional intelligence and social competence in children [Text]. Moscow: National Book Center, 2015, p. 127.
[12] Smirnova, P. V. The game and the research behavior of a modern child of an early age (based on longitudinal material). Materials of the International Scientific and Practical Conference. Moscow: Moscow City Pedagogical University. 2017, p. 93-98.
[13] Sobkin, V. S., Skobeltsina, K. N. Representations of parents about the features of communication of their child with a computer. Modern preschool education. Theory and practice. 2012, № 3, p. 30-34.
[14] Utlik, E. P. On competencies and competence approach. Bulletin of the Moscow State Regional University. Series: Psychological sciences, 2015, № 1, p. 59-65.
[15] Tsaplina, O. V. Technologies of development of cognitive activity of the preschooler. Kindergarten from A to Z, 2016, № 1 (79), pp. 44-53.
[16] Blankenburg, J. S., Höffler, T. N., and Parchmann, I. Fostering Today What is Needed Tomorrow: Investigating Students' Interest in Science. Science Education, 2016, no. 100(6), pp. 364–391.
[17] Breiner, J. M., Harkness, S. S., Johnson, C. C., & Koehler, C. M. What is STEM? A discussion about conceptions of STEM in education and partnerships. School Science and Mathematics, 2012, no. 112(1), pp. 3–11.

[18] Maltese, A. V., Melki, C. S., & Wiebke, H. L. The nature of experiences responsible for the generation and maintenance of interest in STEM. Science Education, 2014, no. 98(6), pp. 937–962.
[19] Méhaut, P., & Winch, C. The European Qualification Framework: skills, competences or knowledge? European Educational Research Journal, 2012, no. 11(3), pp. 369-381.
[20] Mietzner, D., and Kamprath, M. A. Competence Portfolio for Professionals in the Creative Industries. Creativity and Innovation Management, 2013, no. 22(3), pp. 280–294.
[21] Santosh, A., Shinde, Rajeswari, R. Intelligent health risk prediction systems using machine learning: a review. International Journal of Engineering and Technology(UAE). 2018, vol 7, no 3, pp.
[22] Pikkarainen, E. Competence as a Key Concept of Educational Theory: A Semiotic Point of View. Journal of Philosophy of Education, 2014, no. 48(4), pp. 621–636.
[23] Schaap, H., de Bruijn, E., Van der Schaaf, M. F., and Kirschner, P. A. Students' personal Professional theories in competence-based vocational education: the construction of personal knowledge through internalisation and socialization. Journal of Vocational Education & Training, 2009, no. 61(4), pp. 481-494.
[24] So, W. W. M. Connecting mathematics in primary science inquiry projects. International Journal of Science and Mathematics Education, 2013, no. 11(2), pp.
[25] Wang, X. Why students choose STEM majors: Motivation, high school learning, and postsecondary context of support. American Educational Research Journal, 2013, no. 50(5), pp. 1081–1121.