

# System-Activity Approach in Increasing the Level of Information and Communication Competence of Teachers of Preschool Educational Organizations\*

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**Abstract.** The paper highlights the experience of working on implementing the system-activity approach in training teachers for the development of a digital educational environment in a preschool educational organization. The study aims to analyze the system-activity approach as a methodological basis for preparing a teacher to develop a digital educational environment in a preschool organization. The basic principles and conditions for advanced training in a preschool educational organization are presented based on an analysis of the scientific literature on preparing teachers to develop and use information and communication technologies in their professional activities within the system-activity approach. We presented an analysis of research activities on implementing information and communication technologies in a preschool educational organization. Besides, we carried out an analysis of primary and secondary complex diagnostics, in which 40 preschool teachers took part. The paper describes the character, intensity, functions, and reasons for teachers' current difficulties in implementing innovative educational technologies in professional activities. Teachers filled out questionnaires aimed at introspection of their knowledge, skills, and abilities to use information and communication technologies in their professional activities. We proposed to direct the obtained results to the development of models and programs for increasing the level of information and communication competence. The paper can be in demand by methodologists, teachers, students, and teachers of pedagogical and non-pedagogical universities.

**Keywords:** System-activity approach · Information and communicative competence · Preschool education · Digital educational environment · Advanced training

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## **1 Introduction**

New requirements for teachers began to form with the transition of preschool educational organizations to new Federal State Educational Standards [FSES]. At the same time, the activities of teachers change significantly. The system-activity approach is the methodological basis of the FSES being introduced. It is necessary to solve many problems for a complete transition to a new level of development of modern education. The first problem is the updating of teaching materials. These materials will help teachers understand how to implement the theoretical part of the system-activity approach in increasing the level of information and communication competence (ICT competence). The second problem is the teacher's personal position, motivation, readiness to use, and the development of the digital educational environment in his professional activities. The system-activity approach in increasing the level of ICT competence will help solve these problems, motivating teachers for a systematic analysis, self-assessment of their activities and abilities, and building a program of professional self-development.

Higher education organizations are faced with creating training programs for increasing the level of ICT competence for all teachers, starting with preschool education specialists. Modern education actively uses innovative technologies that change the basic concept of the educational process. The majority of teachers encounter the actual problems of lack of knowledge, skills, and abilities to use information and communication technologies [ICT] in their professional work. The benefits and harms of ICT are still not thoroughly studied. The level of information and communication competence among teachers is formed within the system-activity approach. The approach, in its outline, encourages the teacher to analyze their professional activities using ICT systematically. Introspection is the starting point for professional development. The self-development program grows old based on introspection. The study aims to analyze the system-activity approach as a methodological basis for preparing a teacher to develop a digital educational environment in a preschool organization. The study object is the process of preparing a teacher for the introduction of ICT in preschool education.

## **2 Materials and Methods**

To analyze ICT implementation problems in preschool education, we used Russian scientists' works: S. L. Koksharova (2017), A. V. Kulaev, L. A. Khokhlova, and others (Kulaeva & Khokhlova, 2014). O. O. Balka, D. Sh. Matros, D. M. Poleva, N. N. Melnikova, A. I. Subetto, S. V. Uzhegova, L. N. Chipysheva, A. N. et al., and their works have formed effective and optimal approaches to improving the quality of knowledge, skills, and abilities of preschool education specialists when introducing ICT into the preschool educational process (Balka, 2014; Matros, Polev & Melnikova, 2001; Uzhegova, 2014; Chipysheva, 2015; Subetto, 2008). In their research, conceptual provisions for managing the quality of education are formed. Scientists note that the forms

and methods of professional development are constantly changing and the problem of increasing their efficiency remains unresolved.

Self-assessment is the primary method for identifying the difficulties of teachers in the implementation of ICT technologies. Difficulties when working with innovative technologies are a person's subjective-personal psychological state, which does not lend itself to outside observation and assessment. It determines the choice of the method. Self-assessment allows us to identify the characteristics of the respondent's activities. We note that self-esteem can be overestimated, underestimated, and adequate. Expert judgment and observation will compensate for inadequate self-esteem. We surveyed preschool education specialists, guaranteeing their anonymity for a comprehensive study of the development of a digital educational environment in preschool education. We interviewed in three municipal budgetary preschool educational Barnaul institutions (Altai Krai): No. 224, 231, 229. Forty pedagogical workers took part in the study at different stages. The material collected in this way allowed us to summarize information about the nature, intensity, functions, and causes of typical difficulties for teachers in implementing ICT technologies and designing a digital educational environment in a preschool educational organization.

We have created a set of questionnaires for analyzing preschool teachers' level of readiness to design a digital educational environment. The teachers were offered questionnaires, the questions of which had to be answered in a short time while guaranteeing anonymity. Observing this condition, one can hope to form a real picture of the state of affairs. The survey aims to identify difficulties that may arise when working with information and communication technologies in preschool teachers' professional activities. During the questionnaire survey, the main difficulties were identified, their nature, intensity, and reasons for their occurrence. It is possible to determine their readiness to develop a digital educational environment in preschool organizations when analyzing teachers' receptivity to innovative activities and their motivational readiness. Finally, we explained the results to the subjects individually and provided targeted assistance.

### **3 Results**

In the course of comprehensive diagnostics in three preschool educational institutions, the main features of developing the digital educational environment in preschool education were identified. We found out what precisely the teachers are in trouble and how severe these difficulties are. Difficulties were found for teachers in the use of ICT in the goal-setting of their activities. The teachers also indicated that they find it difficult to use ICT in their work with parents. We found out that it is difficult for a teacher to implement ICT in planning. They do not know how to document information in databases. Difficulties also manifested themselves in the use of various applications for editing and correcting information. It is difficult for educators to create their own digital portfolio. Difficulties are also caused by the development of electronic didactic materials and the use of ICT for reporting and monitoring activities.

We tried to identify the functions of teachers' difficulties in designing a digital educational environment. In pedagogy, difficulties reflect the conflicting forces of the development of the learning process. Therefore, they can play either a positive or negative role in the development of the teacher. Accordingly, difficulties have either a stimulating or a deterrent function. The results of the survey showed that the primary function of difficulties in our case is stimulating. There are grounds to assume that difficulties in ICT will activate and mobilize the preschool teacher. The emerging difficulties create a state of volitional composure and emotional uplift. Temporary difficulties ultimately lead to the improvement of pedagogical skills. According to the questionnaire results, it turned out that the difficulties encountered play an essential role in enhancing pedagogical activity, increasing the self-esteem of teachers.

Our next step was to analyze the main reasons for the difficulties. The lack of time and material incentives were most evident. The analysis of teachers' susceptibility to innovation showed that 95% have an acceptable level and feel comfortable in the digital educational environment, 5% of specialists actively participate in various competitions, open lessons, and create projects using innovative educational technologies in their professional activities. The results on the level of motivational readiness showed that 70% of teachers have an average activity level when using innovative technologies. At the same time, they are more comfortable with a stable rhythm of work, without changes and additional costs. The remaining 30% are teachers who have extensive experience in their professional work while not losing the incentive to work, interest, desire to improve, learn everything new, and exciting. Secondary diagnostics showed positive dynamics. Teachers have become more confident in using information and communication technologies in their professional activities. They were also able to help improve the level of ICT competence, not only for themselves but also for colleagues.

## **4 Discussion**

According to the new requirements of federal state educational standards for preschool education, teachers should competently and at a high level use all kinds of innovative educational information and communication technologies in their professional activities.

The high level of their ICT competence is the result of the advanced training of preschool teachers. We understand information and communication competence as the ability to use modern digital technologies, communication to receive, manage, integrate, evaluate, create, and transmit information in a modern information society. Today, teachers can improve their skills, abilities, and knowledge and maintain professional contacts through continuous self-education and advanced training in ICT use. These include webinars conducted by high-level specialists of various orientations; video conferencing where one can ask questions and get answers to them remotely.

The ICT competence level among teachers is formed within the system-activity approach. It stimulates the teacher for a systematic analysis of professional activity and uses information and communication technologies. Self-assessment is the starting point for professional development. Based on self-analysis, the self-development program is built. The system-activity approach is the methodological basis of teaching, in which a comprehensive development of the student's personality occurs by searching for the own solution in the process of educational and cognitive activity. The main task of the system-activity approach in preparing a teacher for the development of a digital educational environment is to organize terms that initiate the development and increase of the ICT competence level. The system-activity approach assumes that:

- Educational process must meet all the requirements of the modern information society;
- All-round development of the student's personality occurs based on mastering universal educational actions;
- It is essential to recognize the decisive role of the theoretical and practical content of education.

It is necessary to create a unified work system with teachers to improve the level of qualifications within the system-activity approach. At the first step, a comprehensive diagnosis of teachers' level of readiness with innovative activities is carried out. In the process of monitoring, the ICT competence level, the character, intensity, functions, and reasons for the main difficulties in using information and communication technologies in professional activities are revealed. Self-assessment is the primary method for identifying difficulties. The teacher should first use three essential questions to help build an effective plan of action to overcome difficulties. The question *For what? What for?* aims to clarify the goal of professional development. The question *What do I want to learn?* specifies the content and focus of training. The question *How?* defines methodological techniques, updated teaching aids, and implementing the system-activity approach. The data obtained as a result of self-assessment, expert assessment, conversation, observation, analysis of the results of teachers and students' activities, etc., are used.

The next step is to conduct collective and individual lessons aimed at solving the identified problems. The final stage is developing and implementing collective (group) project activities of teachers with children using innovative information and communication technologies. The methodologist conducts lessons. Alternatively, the teacher independently chooses a distance learning course. The main result of using the system-activity approach in professional development will be active participants in all subjects of the educational process interested in improving their potential. Teachers not only study themselves but can also transfer the experience gained in using new information and communication technologies in their professional activities to other teachers from different districts, regions, and other regions, remotely. The ICT competency model effectively teaches others in a lecture mode, working in a small group, and consulting individually. In the course, meta-subject and individual results are formed for all participants. The

result of such advanced training should be the appearance among teachers of the ability to use information and communication technologies not only in professional activities but also for other needs.

## 5 Conclusion

As a result of the analysis of the essence of the system-activity approach, we have identified the basic principles, adapted and taken from the principles of the educational process, ensuring the effective professional development of teachers in the field of ICT in preschool education:

- Principle of vigorous activity;
- Principle of continuity;
- Principles of minimalism and targeting;
- Principle of relevance;
- Principle of effectiveness;
- Principle of psychological and social comfort;
- Principle of variability;
- Principle of creativity.

For the system-activity approach, the main task is to create the necessary conditions that initiate the development and increase of ICT competence level. An essential condition for improving the qualifications of teachers is their desire to improve themselves. It is impossible to achieve high results without a clearly set goal, prospects without the support of qualified specialists. We use the results of a pilot study to create a model for training teachers to develop a digital educational environment in a preschool organization.

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