

## Development of Soft Skills in Future Preschool Teachers using ICT in Their Professional Training

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**Abstract:** - The objective of this study is to determine the extent to which future preschool teachers develop soft skills through the use of information and communication technologies (ICT) in their professional training. The effectiveness of this approach was assessed using J. Phillips' model, along with efficiency, variation, effectiveness, and correlation coefficients. Additionally, peer observation was employed to evaluate training. Correlation analysis was performed using the Pearson correlation coefficient and the Mann–Whitney U test. The teaching method developed consisted of three stages, and the training program incorporated various digital tools, such as Mentimeter, Kahoot, VoiceThread, Pear Deck, and EdPuzzle. The study showed that the proposed pedagogical approach promoted the development of critical thinking (0.92), creativity (0.90), competitiveness (0.87), and social competence (0.84) among learners. The findings revealed that 74% of future preschool teachers displayed a high level of organizational skills, particularly in presenting original information. J. Phillips' model indicated high performance in preschoolers (Group 1) and students (Group 2). The practical significance of this work lies in its potential to enhance the educational process through the use of digital technologies. Further research could explore the effectiveness of modern digital technologies in cultivating soft skills in future teachers.

**Key-Words:** - interactive technologies, digitalization of education, interactive reality, digital applications, preschool, professional competence, critical thinking.

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## 1 Introduction

Preschool education institutions play an important role in the formation of a child's personality, emphasizing the development of cognitive, intellectual, and creative thinking. The need to create favorable conditions for children's education, which requires a high level of teachers' professional competence, is becoming especially urgent. Finding a solution to the problem implies continuous improvement of the educational process using modern information and communication technologies (ICT). There is a need not only to use additional technologies, such as multimedia projectors, video cameras, computers, etc. but also to use specialized software, [1]. Only comprehensive training of teachers can ensure effective sharing of teaching methods in preschool institutions, which makes the article particularly relevant.

The development of soft skills in future preschool teachers can be achieved through the improvement of the training system, which results from socio-economic changes. Studying educational programs with the help of ICT ensures a high level of training and enhances students to study the material, [2]. ICT are complex technologies that include accumulative, visual systems that contribute to the storage and exchange of educational information. Modern technologies contribute to the creation of different didactic materials, and facilitate work with text, and visual images, [3]. However, preschoolers only begin forming knowledge about the surrounding world, so the training of future preschool teachers should take into account the didactic principles. The ability to explain topics from simple to complex should also be considered. The preparation of preschool teachers to conduct classes in preschool education institutions should be based not only on the creation of the most favorable approaches to rendering information. It is also necessary to take into account the possibilities of developing children's emotional intelligence, [4]. Children's emotional intelligence helps ensure communication with others, and enables them to control their mood. The task of future preschool teachers is also to develop children's self-awareness, which requires additional skills, and intellectual and personal self-improvement, [5].

The future preschool teacher must also respond to the pupil's behavior in a timely manner, which contributes to the coordination of his actions and the resolution of controversial issues. It is also necessary to form an idea about the performance of correct or prudent actions, which contributes to the understanding of the inner world. The formation of

the spiritual world of an individual allows for the development of the values of justice, mutual respect, the education of a harmoniously developed personality, etc., [6]. The cultivation of soft skills during the training of prospective preschool educators facilitates the enhancement of pedagogical techniques for disseminating educational content. It also contributes to the formation of value orientations, and the development of communication skills, which is reflected in the general approach to education. The use of ICT will make it possible to develop flexible thinking, determine innovative approaches to rendering information, and contribute to solving complex tasks, [7]. The development of soft skills provides for the development of thinking, which is manifested in the possibility of logical reasoning, and the use of creative and constructive skills for presenting information. It also affects the assessment of risks related to learning the material, which enables solving the problems, [6].

This article is important for the study of interactive technologies, as it demonstrates how their use in the professional training of future educators increases the effectiveness of the educational process. The use of such tools as Mentimeter promotes the original presentation of information, and develops critical thinking, creativity, and social skills of students. The study also emphasizes that interactive technologies can significantly increase the level of satisfaction and assimilation of the material among both students and preschoolers, which makes them an integral part of modern education.

The aim of the work involves studying the features of the development of soft skills in future preschool teachers by using ICT in their professional training. The aim involved the fulfillment of the following research objectives:

- Create a teaching method that enables the developing soft skills in future preschool teachers through the use of ICT;
- Determine the level of soft skills and the possibility of ensuring the organization of the educational process by future preschool teachers;
- Determine the effectiveness of education among preschoolers and future preschool teachers using the J. Phillips model.

## 2 Literature Review

The implementation of a STEM approach can facilitate the delivery of effective training for prospective preschool educators. This is determined by the fact that they facilitate adaptation to the

requirements of the labor market and the development of transferable skills. A deliberate learning process encourages the exchange of ideas and communication between the various participants in the educational process, [8]. It is imperative that future preschool teachers receive training that will enable them to develop the digital skills of preschoolers. The educational approach should be based on developing students' independent skills, which facilitate studying interactive technologies' functions and identifying deficiencies in the educational process. This enhances literacy levels and facilitates the transfer of essential information, [9]. The use of robotics during the training of future preschool teachers promotes the implementation of integrated activities that further contribute to the children's development. This expands the educational opportunities in the presentation and perception of information. Interactive technologies also contribute to developing self-regulation skills and a positive perception of information. However, the learning process should be organized in such a way as to support preschoolers at different stages, [10].

The development of soft skills during the training of preschool teachers should be based on qualitative feedback and self-analysis. The use of ICT tools can contribute to quality learning, which promotes the development of cognitive and motivational skills. The choice of ICT should be based on the possibility of receiving feedback, which will ensure high-quality pedagogical reflection. During the education of pupils, this will enable the developing of physiological peculiarities, affect speech and thinking, and provide a playful approach to the perception of information, [11]. Information and communication technologies for training future preschool teachers contribute to the development of specific skills. When organizing the education of preschoolers, it is possible to provide information transfer through portable tablets, which is effective in the study of natural sciences. This makes it possible to ensure the discussion of the problems when teaching in preschool education institutions, [12]. A positive process results from the digital transformation of education. The intervention centre We Are Playing the Future allows solving existing problems in the form of a game and also promotes the creation of new games. Therefore, it is necessary to ensure an understanding of the child's psychology, and develop communication skills, creative thinking, etc. during the training of future preschool teachers, [13].

Understanding the specifics of a praxeological fairy tale should be based on an understanding of

the factors that are most favorable to the reproduction of the theme. They also promote the creation of thematic situations for the creation of rules and ways of solving the situations proposed to future students, [14]. The learning process can be implemented using specialized interactive applications, virtual and augmented reality. The introduction of augmented reality technologies fostered a culture of enhanced learning motivation among students. The utilization of these technologies in an educational setting for preschool-aged children facilitates the development of reading, language, and literature skills, [15].

The literature review provides evidence to suggest that contemporary interactive technologies facilitate the acquisition of multi-directional skills among prospective educators, thereby enhancing the organization of the educational process. Nevertheless, research gaps remain regarding establishing a relationship between the technologies employed and the development of specific soft skills.

### 3 Methods

#### 3.1 Research Design

The study covered the time period from 2022 to 2023. It was conducted in 3 stages. Figure 1 (Appendix) presents all stages and their contents.

#### 3.2 Sampling

The study involved 156 students who were studying to become future preschool teachers. The respondents studied at Khmelnytskyi Humanitarian-Pedagogical Academy, Rivne State Humanitarian University, Mukachevo State University, Berdyansk State Pedagogical University, and Zakarpattia Institute of Postgraduate Pedagogical Education. The selection criterion was their second-year studies, as students have basic professional knowledge. This makes it possible to monitor the level of development of soft skills compared to the previous year. The training took place in a mixed format, but most classes were held remotely. Group 2 was represented by preschoolers who studied in the cities of Khmelnytskyi, Rivne, and Mukachevo (98 children). The preschoolers were involved in the research as students conducted practical classes.

#### 3.3 Methods

The development of the training method for future preschool teachers provided for the selection of ICT. A general theoretical comparison was used for their

selection to determine the possibility of ensuring the effective training of students. For this purpose, interactive applications were selected, which help to study the information, and affect the possibility of developing educational games in the future. The presented technologies were Mentimeter, Kahoot, VoiceThread, Pear Deck, and EdPuzzle.

1. Development of the teaching method. Acquiring a sufficient level of knowledge for teaching in preschool education institutions requires thorough preparation, which implies learning the educational material. Soft skills should also be developed during training, contributing to the versatile fulfilment of the lesson plan, and dealing with pupils. Therefore, the first stage of the research was to develop a teaching method for preparing future preschool teachers using ICT (Figure 2 in Appendix).

The first stage of the teaching method was to ensure the study of the structure of work in a preschool education institution. This stage is aimed at understanding approaches to the formation of the structure of preschool institutions, understanding the psychology of children, and principles of integration of approaches to learning. The approaches to adapting future preschool teachers for conducting classes were studied to study the structure of work in preschool education institutions. The learning process was implemented using the Mentimeter application, which provides interactivity (Figure 3 in Appendix).

The technical capabilities of the application made it possible to present information in an easy-to-understand form. The learning process provided the possibility of using interactive slides, which ensured high technical accuracy of the presentation of the material. The cloud-based online capabilities of the application made it possible to provide surveys online using a QR code or online links.

The second stage of teaching methods involves forming methodical work methods with preschoolers. This is aimed at understanding approaches to conducting classes among pupils, as well as the development of original approaches to educating children. It was planned to provide children's physical, mental, moral, labor, and aesthetic education during learning. Using the adaptive Kahoot platform provided an insight into the principle of creating educational games for pupils. The Kahoot platform was used with the auxiliary technical tools (projector, screen, monitor, etc.). Automatic text translation was used for a better understanding of the provided information.

VoiceThread technology was also provided for training, which enables providing information using

video and audio elements. The VoiceThread application is based on the use of high-quality sound instruments, which provide a better perception of sound waves. The use of the application is possible due to the connection to the Internet. VoiceThread version 4.10.1 (Figure 4 in Appendix) was used for the research.

An important stage of teaching methods is developing the creative potential of future preschool teachers. Therefore, it was planned to provide collective and group work with preschoolers and develop approaches to independent study of the material. This creates an innovative perception of teaching in preschool education institutions. Using the Pear Deck program made it possible to create new approaches to studying information, and creating visual material for information perception. Pear Deck enabled the coordination of informational slides based on its technical functionality. The EdPuzzle program (Figure 5 in Appendix) was applied to develop various video fragments to motivate preschool children to perceive information.

The technical capabilities of EdPuzzle helped to visually perceive different information, providing individualization and influencing the flexibility of learning. The use of micro-lesson approaches contributed to a deeper understanding of the educational materials.

2. The Phillips model was used to ensure the effectiveness of using acquired knowledge by future preschool teachers. The J. Phillips model involves determining the level of students' satisfaction in conducting classes, their effectiveness, and their level of behavior. The used model is aimed at determining the respondents' attitude to conducting classes and determining specific effectiveness based on the gained knowledge.

3. The method of observation of the colleagues' training. Facilitating peer learning sessions where prospective preschool teachers observe and provide feedback on each other's use of ICT tools in teaching, facilitating collaborative learning, and sharing of best practices.

### 3.4 Data Analysis

The coefficient of variation was used to calculate the most developed soft skills among future preschool teachers, [16]. Comparing the effectiveness of students' perception of information before and after the study influenced the determination of the skills that were developed.

$$V = \frac{s}{x}. \quad (1)$$

$s$  – the standard deviation indicator, which is interrelated with the students' ability to perform original assignments;

$x$  – a sample value that indicates the level of soft skills of each student.

The efficiency coefficient developed by the authors was calculated to determine the development of organizational skills among students. This made it possible to determine a high level of organizational skills. It provided for the appropriateness of choosing material for learning, the approach to providing information, and the relevance of using ICT. A sufficient level is provided for making minor mistakes in the presentation of information. The medium level provided for making mistakes in the choice of ICT for providing information. A low level implied a lack of logical connection in the presentation of information.

$$y_{ef} = \frac{\sum(j_o + r_{c(i)})}{n_{gen}} \quad (2)$$

$j_o$  – effectiveness for using an original approach to learning;

$r_{c(i)}$  – effectiveness of classes held by students in the preschool education institution taking into account the relevance of the choice of ICT;

$n_{3ar}$  – total effectiveness that could be obtained for the organisation of classes.

The efficiency coefficients were calculated to confirm the indicators in accordance with the data from respondents ( $d_{e.r.}$ ) and actually acquired knowledge ( $d_{k.e.}$ ). To confirm the indicators, the efficiency coefficients were calculated in accordance with the data from respondents ( $d_{e.r.}$ ) and actually acquired knowledge ( $d_{k.e.}$ ).

$$d_{e.r.} = \frac{q \times 1/2f}{n}, \quad (3)$$

$q$  – an indicator that takes into account the level of satisfaction/the level of acquired knowledge according to data from respondents;

$n$  – the maximum level of satisfaction/level of acquired knowledge according to data from respondents.

$f$  – a coefficient that includes the general attitude of respondents to the learning process (3 – the highest value, 1 – the lowest value).

$$d_{k.e.} = \frac{x_{b/k} + j_c}{n_{b/k}} \quad (4)$$

$x_{b/k}$  – scored points for behaviour/level of acquired knowledge;

$n_{b/k}$  – general level of behaviour/acquired knowledge;

$j_c$  – scored points for the level of aspiration to perceive information.

A statistical calculation of the correlation coefficient was carried out to confirm the obtained numerical data, [17]. The coefficient was used to compare soft skills acquired by future preschool teachers. The J. Phillips model was also to determine the efficiency level.

$$p = 1 - \frac{6 \sum d^2}{n^3 - n} \quad (5)$$

$d$  – rank difference;

$n$  – the total number of indicators;

$\sum d^2$  – the sum of the squares of the rank difference.

It should be taken into account that if the calculated value equals 1, the indicators are correlated.

The **Pearson's chi-square test** ( $\chi^2$ ) was used To determine the reliability of the obtained data, which is determined by using the formula:

$$\chi^2 = \frac{1}{n_2 n_1} \sum_{i=1}^m \frac{(x_i n_2 - y_i n_1)^2}{x_i + y_i}; \quad (6)$$

where  $n_1$ ,  $n_2$  – the number of values in the first and second compared rows;

$m$  – the number of levels in the compared data series;

$x_i$ ,  $y_i$  – frequency value at the  $i^{\text{th}}$  level in the first and second data series;

$\chi^2_{\text{empirical}}$  – empirical value of the aggression level.

**The Mann–Whitney U test** is calculated by using the formula:

$$U = (n_1 \times n_2) + (n_x \times (n_x + 1) / 2) - T_x; \quad (7)$$

where  $n_1$  – the number in Group 1;

$n_2$  – the number in Group 2;

$T_x$  – the largest of the two rank sums;

$n_x$  – the number in the group with a bigger rank sum.

### 3.5 Data Collection

The Thurstone scale was used to ensure a comprehensive study regarding the determination of the effectiveness of the knowledge transfer by future preschool teachers to respondents from different groups, [18]. The Thurstone scale was used to assess the level of respondents' satisfaction with education and the level of acquired knowledge according to respondents. For this purpose, they assigned points

of 0 and 10, which corresponded to the selected indicator. This made it possible to obtain percentage data, which was reflected in the necessary calculations. Data from respondents were obtained using pre-approved electronic mailboxes.

### 3.6 Ethical Criteria

Ethical criteria made it possible to ensure the conduct of qualitative research in accordance with the norms put forward for academic publications. In accordance with the Guidelines for Research Ethics in Science and Technology, [19], the same conditions were observed for all respondents in the work. Ethical aspects also influenced the choice of research material. The authors confirm that all presented materials are unique and were not used in the already published studies.

## 4 Results

The training was followed by determining soft skills that the future preschool teachers have acquired. Soft skills have a direct relationship with the development of competence, which provides an original approach to the presentation of information and the manifestation of leadership qualities. The results were obtained using the coefficient of variation (Figure 6 in Appendix).

It was established that, first of all, critical thinking was developed among future educators during professional training. Critical thinking enables one to quickly fulfill original tasks using the acquired knowledge and skills. Critical thinking allows a person to quickly adapt to new situations that may arise during the upbringing of preschoolers. An example can be the occurrence of conflict situations between pupils, which requires finding approaches to fulfilling tasks and considering harmonious ways of adaptation. Critical thinking contributes to the correct evaluation and analysis of information, and influences the creation of new ideas.

Maintaining competitiveness through variation with various technologies enables forming different approaches to providing information. However, the presented soft skills are aimed at the possibility of using various digital technologies depending on their functions. The use of Mentimeter, Kahoot, VoiceThread, Pear Deck, EdPuzzle provided an insight into the principle of using various digital technologies, which contributes to educational activities. Modern technologies promote the development of methods of conducting classes, reproduction of information, involvement of

preschoolers in educational games, and perception of information.

The study determined the increase in the level of organization of classes by future teachers. These data are necessary for understanding the possibility of variation with learned information and, formation of mechanisms for the original presentation of material. The authors determined the level of professional competence based on the development of management skills as a result of the formation of the principles of critical thinking (Table 1 in Appendix).

During the performance of practical tasks, it was noticed that a significant part of future preschool teachers demonstrated a high level of organizational skills. The obtained results revealed the potential for a thorough presentation of information on specific topics and the use of ICT to disseminate information. Special attention was paid to alternative methods of presenting information that promote the development of critical thinking. The final stage of the study was to determine how students were able to ensure the conduct of classes among the two study groups. Group 1 was represented by preschoolers, and Group 2 — by students who were studying to be future preschool teachers. Results were determined using the J. Phillips model (Table 2 in Appendix).

The study showed a significant level of satisfaction of the participants with their educational experience. Both groups reported high satisfaction, mainly due to the interesting materials and varied teaching methods. As for the assimilation of knowledge, Group 1 demonstrated a high level, and Group 2 - even higher. The difference in satisfaction was related to the difference in the perception of the way information was presented. Feedback from future preschool teachers indicates a high level of knowledge in both groups, and the behavior of most preschoolers in Group 1 deserves praise. These results emphasize the importance of efficient information processing and methods of its presentation. In Appendix, Table 3 and Table 4 present the results of analyzing the effectiveness of the acquired knowledge according to the J. Phillips model using Pearson and Mann-Whitney tests.

The results of the correlation analysis indicate that the development of soft skills with the help of ICT in the training of future preschool teachers has a positive effect on their learning effectiveness. In particular, the development of critical thinking, social competence, creativity for teaching, and competitiveness (ICT) is associated with a higher level of satisfaction with learning, acquired knowledge, and behavior. This was followed by

determining the Soft Skills level among the future competencies using the method of observation of the colleagues' training. The results are presented in Appendix in Table 5.

Table 4 (Appendix) shows the dynamics of the use of ICT and the organization of colleagues' training during the three visits. From the first visit, the colleagues showed a high level of mastery of various ICT programs and tools. However, during subsequent visits, there was a decline in the use of ICT for creative explanation of material and its integration into all aspects of lessons.

Table 6 (Appendix) shows the correlation analysis between skills and indicators of learning effectiveness selected according to J. Phillips' model.

The correlation analysis in Table 6 (Appendix) shows strong positive relationships between the selected skills and learning effectiveness. Critical thinking has the highest correlations, especially with satisfaction (0.892\*\*) and knowledge acquisition (0.845\*\*). Social competence also correlates well, with the strongest link to satisfaction (0.781\*\*). Teaching creativity is strongly associated with satisfaction (0.853\*\*) and knowledge acquisition (0.802\*\*). Competitiveness in ICT shows solid correlations, with the highest being satisfaction (0.814\*\*). Overall, critical thinking is the most influential skill in learning effectiveness. The results of the analysis show that all skills and learning effectiveness indicators have a strong positive correlation. The strongest correlation is observed between critical thinking and the level of satisfaction with learning (correlation coefficient 0.892). Developing critical thinking, social competence, creativity for teaching, and competitiveness (ICT) are associated with a higher level of satisfaction with learning, acquired knowledge, and behavior.

## 5 Discussion

Augmented reality technologies help to organize a strong educational process by combining different teaching methods. Digital applications facilitate the analysis of research by authors from around the world, contributing to the dissemination of knowledge among preschoolers, [20]. Literary reading classes conducted with the help of these technologies promote artistic perception and creativity, develop creative thinking, and encourage a culture of reading. Competencies for the sustainable development of preschoolers and primary school students directly depend on the professionalism of teachers, in particular teachers of

preschool educational institutions, [21]. The soft skills of future preschool teachers, including creativity and communication, improve the educational process in preschool institutions. These skills contribute to creating scientific models with preschoolers, developing systemic thinking, and understanding the properties of the environment through the teacher-child interaction, [22]. As the mentioned authors indicated, the level of satisfaction with learning depends on the degree of ICT used in the educational process. A high level of ICT competence directly affects satisfaction with learning, which is a direct confirmation of the results of this study.

Digital competencies, as the results of the study show, contribute to the development of creativity, communication, and critical problem-solving skills. The results of this study confirm the results obtained in, [23]. As the authors note, future preschool teachers need to create educational games to actively engage children. Future preschool teachers should choose stories based on children's interests, which requires critical thinking to provide accurate information, expand prospects, and shape children's inner world, [24]. Previous studies emphasized understanding the psychological characteristics of preschoolers for teacher training. This study confirms that the developed approach to learning contributes to developing organizational skills, which are crucial for providing quality preschool education, [25].

The learning process contributes to developing skills that influence critical, autonomous, and flexible thinking, which is reflected in the professional practice. Cognitive skills should be built during training, which affects the further development of students' competence. It is also important to ensure the development of self-education, which provides a deeper understanding of a separate topic and affects the independent establishment of future teachers, [25]. The introduction of computer technologies for the development of preschoolers requires building soft skills in future preschool teachers. Soft skills contribute to the development of computational thinking and cognitive skills. Their development contributes to providing independence skills, which is related to understanding the delivered material, [26]. In addition, this study identified soft skills that influence the development of students' professional competence. In contrast to the data presented in the studies, [27], [28], this research establishes a correlation between acquired skills and the level of organizational skills associated with professional competence.

The analysis of academic articles revealed a lack of clear presentation of the varieties of technologies that affect the effectiveness of the educational process for future preschool teachers. This study established that various technologies can be used to form the professional competence of future preschool teachers. These are Mentimeter, Kahoot, VoiceThread, Pear Deck, and EdPuzzle. It was also found that these technologies contributed to the development of soft skills among students (critical thinking, social competence, creativity for learning, and maintaining competitiveness due to the variation of various technologies). This helped to determine the impact on learning perceptions of preschoolers and students studying to become preschool teachers using the Phillips model.

The novelty of the research lies in developing and applying a new method of training future preschool teachers using information and communication technologies (ICT) and developing their soft skills. This study examines in detail the role of various ICTs, such as Mentimeter, Kahoot, VoiceThread, Pear Deck, and EdPuzzle, in building the professional competence of future preschool teachers, as well as their impact on the development of soft skills such as critical thinking, social competence, and creativity. However, the study has some methodological limitations. First, the limited use of some specific ICT may affect the results' universality. For example, if students cannot access certain software or hardware, this can limit their capabilities and affect learning outcomes.

## 6 Conclusions

The aim of the work was achieved, as different soft skills acquired by future preschool teachers during their professional training were identified. Soft skills include the development of thinking, creativity, social competence, and maintaining competitiveness. The study of the structure of work in preschool education institutions provided an understanding of the approaches to adapting future preschool teachers to conduct classes in preschool education institutions. It also influenced the preschoolers' personality formation. The first teaching method was implemented using the Mentimeter digital application, facilitating original information presentation. The creation of methodical work methods with preschoolers was also provided for during training. The process included the formation of approaches to conducting classes among pupils and the development of understanding of the use of original approaches to educating children. After the training, it was

established that the students achieved a high level of organizational skills, which was reflected in the presentation of information. It was determined that preschool children (Group 1) were highly satisfied with learning, which affected the relevant behavior among 98% of students. The results are related to the preschoolers' interest in the presented approach to information perception. It also influenced the achievement of a high-performance level by 84% of respondents. A total of 85% of future preschool teachers (Group 2) achieved high efficiency in the assimilation of information. A high level of satisfaction in the perception of information is observed in 92% of respondents, sufficient — in 5%. Research prospects may be related to comparing the efficiency of assimilation and transfer of knowledge by future preschool teachers in different preschool education institutions.

The advantages of this study are that it has revealed various soft skills that future preschool teachers acquire during professional training, including developing critical thinking, creativity, social competence, and competitiveness. The use of digital technologies, such as Mentimeter, facilitated the original presentation of material and increased the level of students' organizational skills. The study also showed the high effectiveness of training for future teachers and preschoolers, ensuring quality training and satisfaction with the educational process.

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Each author has made an equal contribution.

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The authors have no conflicts of interest to declare.

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## APPENDIX

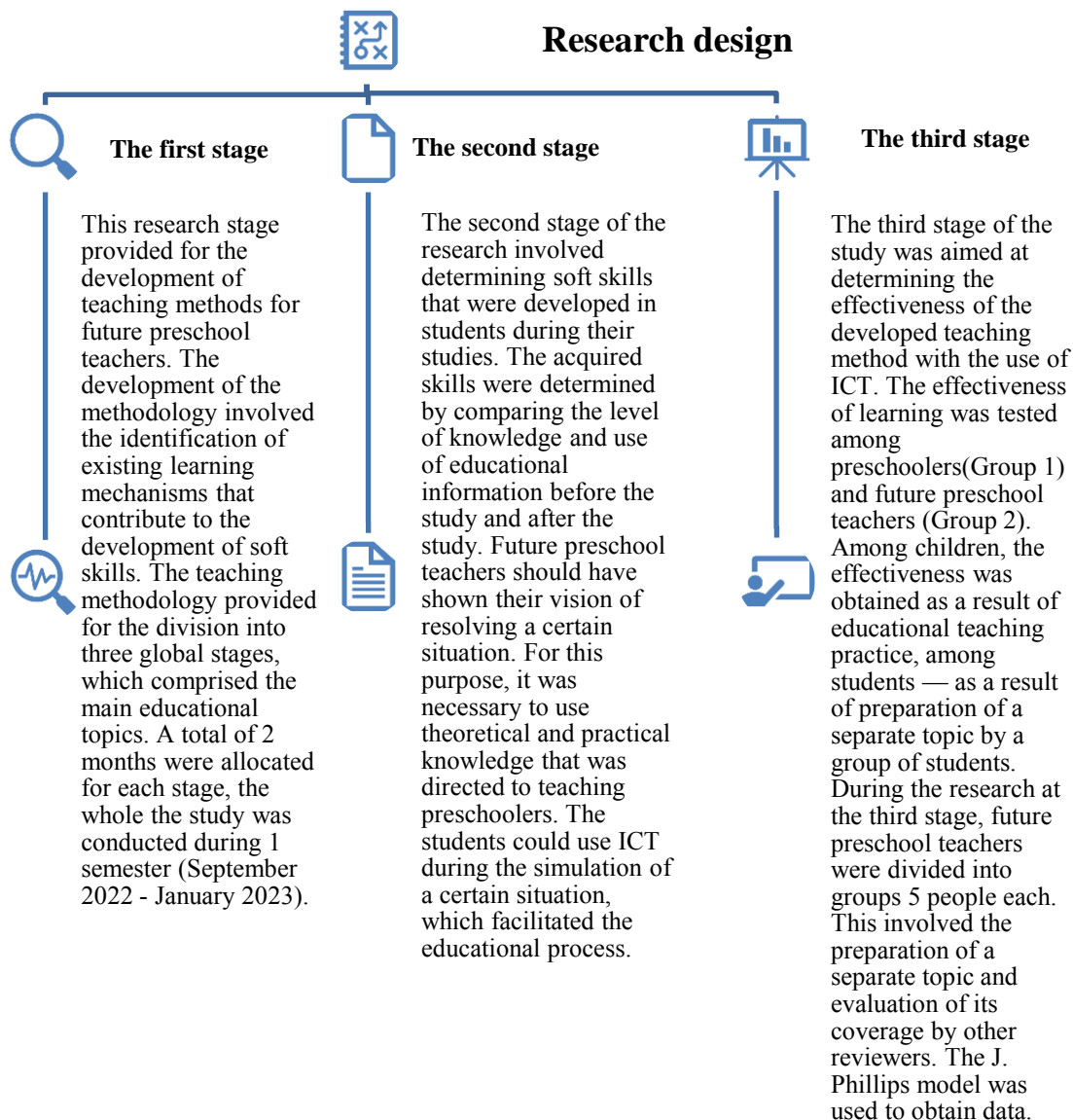


Fig. 1: Research stages and their content

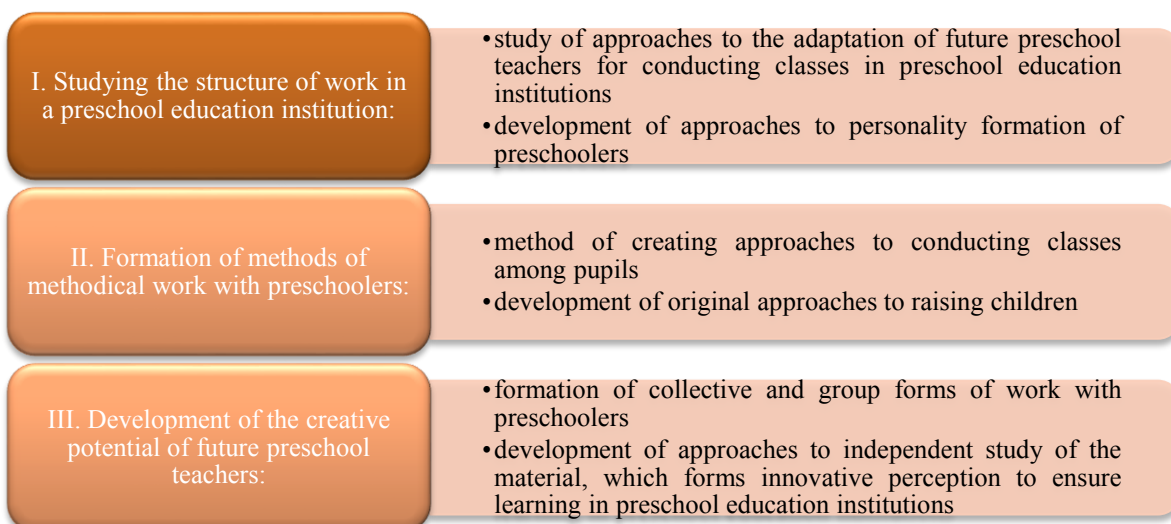


Fig. 2: The methodology for the development of soft skills of future preschool teachers

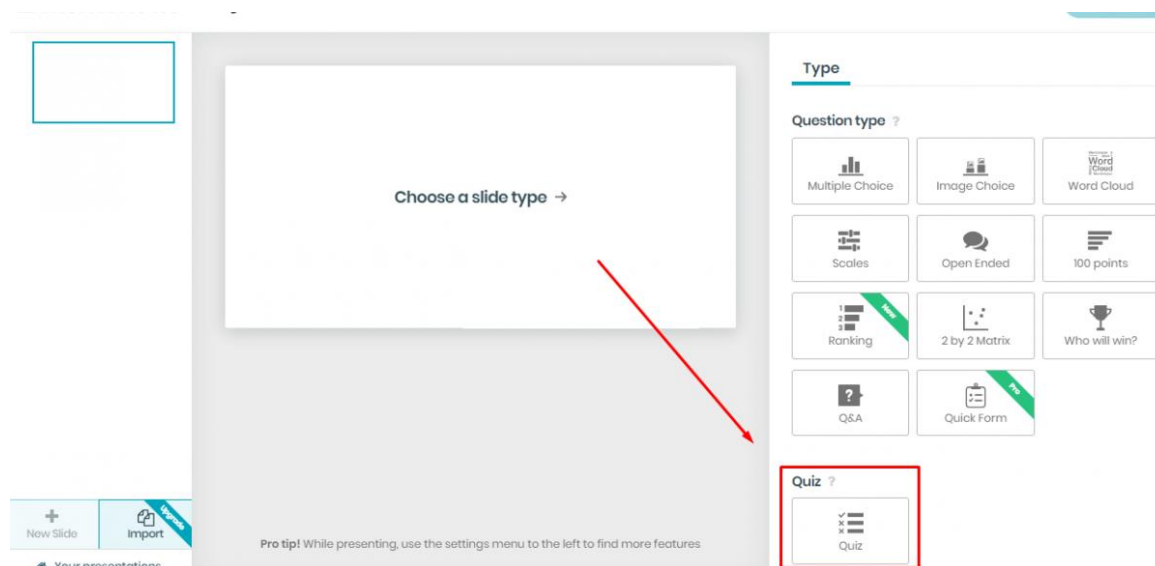


Fig. 3: Functions of the Mentimeter application that was used for training

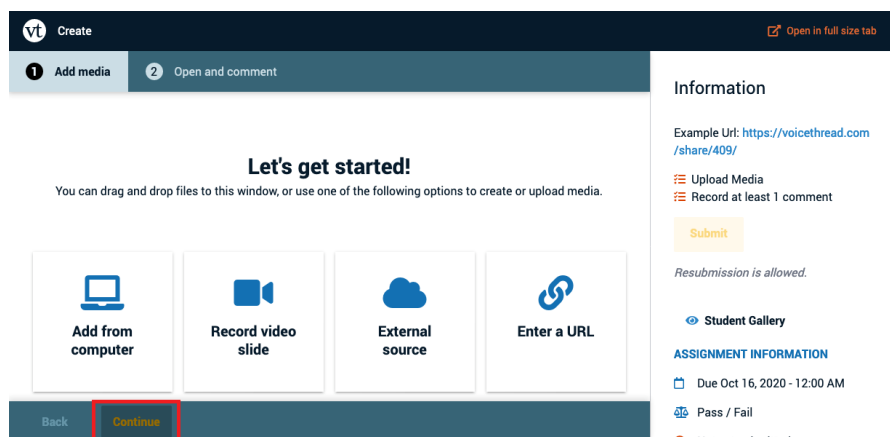


Fig. 4: Technical capabilities of the VoiceThread application

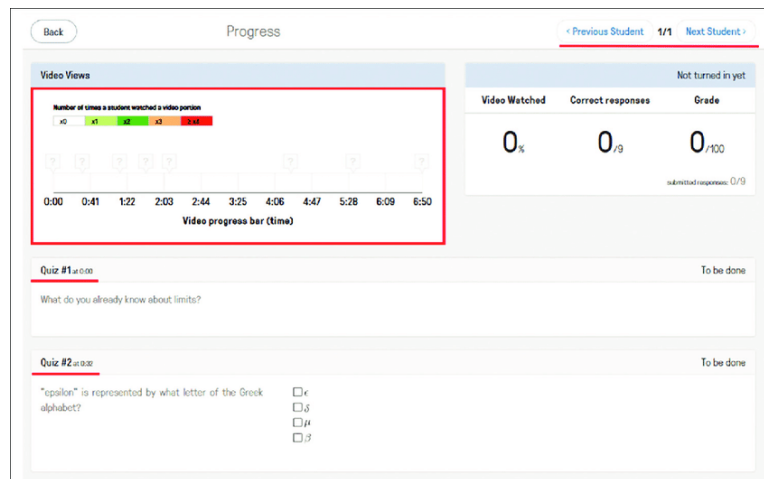


Fig. 5: Specific functions of the EdPuzzle application

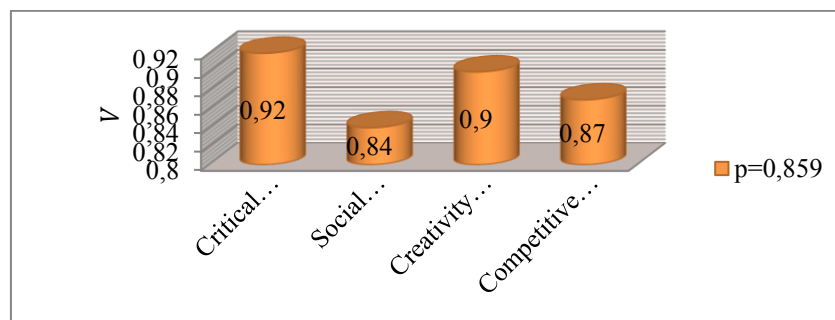


Fig. 6: A variety of soft skills acquired by students

Table 1. The level of organizational skills and professional competence of future preschool teachers for practical tasks

The level of the development of organizational skills	$j_o$	$r_{c(i)}$	$n_{tot}$	$y_{ef}$
High	7.6	7.7	8	1.913
Sufficient	5.2	5.4	8	1.325
Medium	3.8	3.5	8	0.91
Low	-	-	-	

Table 2. Effectiveness of acquired knowledge according to J. Phillips model

Indicator of the J. Phillips model	Group 1				Group 2				Comparison (high level)		
	High	Sufficient	Medium	Low	High	Sufficient	Medium	Low	The sum of squared deviations	Number of indicators	Correlation coefficient
The level of satisfaction with learning	0.58	0.45	0.32	-	0.59	0.42	0.36	-	205.31	3	0.983
Level of acquired knowledge (according to respondents)	0.53	0.43	0.34	-	0.57	0.44	-	-	202.64	3	0.954
Level of behavior	0.58	0.41	-	-	0.59	0.45			204.83	3	0.981
Overall learning effectiveness (as assessed by future preschool teachers)	0.54	0.43	0.37	-	0.56	0.41			206.41	3	0.973

Table 3. The results of analyzing the effectiveness of acquired knowledge according to the J. Phillips model using Pearson test

Variable	Critical thinking	Social competence	Teaching creativity	Competitiveness (ICT)
<b>Level of satisfaction with learning</b>	0.892** (0.001)	0.781** (0.003)	0.853** (0.001)	0.814** (0.002)
<b>Level of acquired knowledge (according to the respondents)</b>	0.845** (0.001)	0.723** (0.004)	0.802** (0.002)	0.751** (0.004)
<b>Level of behavior</b>	0.798** (0.002)	0.672** (0.006)	0.741** (0.004)	0.694** (0.005)
<b>Overall learning effectiveness (as assessed by future preschool teachers)</b>	0.825** (0.001)	0.701** (0.005)	0.773** (0.003)	0.722** (0.004)

*Note: Correlation values marked \*\* ( $p < 0.05$ ) are considered statistically significant.*

Table 4. The results of analyzing the effectiveness of acquired knowledge according to the J. Phillips model using Mann-Whitney U test

Variable	Group 1	Group 2	U test	p-value	Conclusion
<b>Level of satisfaction with learning</b>	0.58, 0.45, 0.32	0.59, 0.42, 0.36	12	0.541	There is no statistically significant difference.
<b>Level of acquired knowledge (according to the respondents)</b>	0.53, 0.43, 0.34	0.57, 0.44	10	0.243	
<b>Level of behavior</b>	0.58, 0.41	0.59, 0.45	11	0.417	
<b>Overall learning effectiveness (as assessed by future preschool teachers)</b>	0.54, 0.43, 0.37	0.56, 0.41	11	0.417	

Table 5. Analysis of colleagues' training

Criterion	Visit 1	Visit 2	Visit 3
Use of technologies	80%	70%	65%
- Confident command of various ICT programs and tools	✓	✓	✓
- Creative and effective use of ICT to explain educational material	✓	✓	–
- Integration of ICT in all aspects of lessons	–	✓	–
Students' engagement	90%	85%	75%
- Using interactive teaching methods that stimulate student participation	✓	✓	–
- Using ICT to create a conducive environment for collaboration and discussion	✓	✓	–
- Encouraging students to do independent research and critical thinking	✓	✓	–
Organization of lessons	95%	90%	85%
- Clear planning of lessons with clearly defined goals and tasks	✓	✓	✓
- Effective use of time during lessons	✓	✓	✓
- Structured and logical presentation of educational material	✓	✓	✓
Stimulation of active learning	90%	80%	70%
- Use of various interactive learning methods	✓	✓	–
- Encouraging students to actively participate in discussions and group work	✓	✓	–
- Creating an atmosphere where students feel comfortable expressing their thoughts and ideas	✓	✓	–
Evaluation of educational results	85%	80%	75%
- Using ICT to assess student's knowledge and skills	✓	✓	–
- Providing students with clear and meaningful feedback	✓	✓	–
- Monitoring student progress and making changes to the curriculum as needed	✓	✓	–

Table 6. Correlation analysis between skills and indicators of learning effectiveness selected according to the J. Phillips' model

<b>Variable</b>	<b>Critical thinking</b>	<b>Social competence</b>	<b>Teaching creativity</b>	<b>Competitiveness (ICT)</b>
<b>Level of satisfaction with learning</b>	0.892**	0.781**	0.853**	0.814**
<b>Level of acquired knowledge (according to the respondents)</b>	0.845**	0.723**	0.802**	0.751**
<b>Level of behavior</b>	0.798**	0.672**	0.741**	0.694**
<b>Overall learning effectiveness (as assessed by future preschool teachers)</b>	0.825**	0.701**	0.773**	0.722**