DEFINITION OF SUBJECT-PRACTICAL AND TECHNOLOGICAL COMPETENCIES OF A PRESCHOOLER IN THE WORKS OF UKRAINIAN SCIENTISTS

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Summury

This article provides a theoretical analysis of research on the development of subject-practical and technological competencies in preschool children. The author argues that these competencies are intrinsically linked to education for sustainable development, emphasizing the role of environmentally responsible behavior in early childhood education as a foundation for human capital development. The study employs a theoretical analysis of scientific literature and a statistical analysis of the Google Scholar database from 2017 to 2024. The terminological field surrounding "subject-practical and technological competence of preschool children" is explored, with objectivity ensured through criteria such as concept definition, activity types, implementation methods, results, and study dates. Contradictions within the concepts across different researchers are identified. The article concludes by summarizing the current state of research and outlining future research directions in this area.

Key words: sustainable development, human capital, environmental behavior, literature review, terminological field.

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1. Introduction

The current state of development of society puts forward its own requirements for the development of education. Because it is that education, in our opinion, that acts as the main formative means of the human capital of the future. As the head of the Ministry of Education and Science, Oksen Lisovyi, noted in his recent publication, "…The key request is the person in the center of attention. All changes are for people and about people. The focus is on technology and innovation so that Ukrainians have the best opportunities, and so that the state has powerful human capital" (*Strategy for the Development…, 2023).* Based on the project "Strategy of Sustainable Development in Ukraine by 2030" and the Decree of the President of Ukraine "On the Sustainable Development Goals of Ukraine by 2030" (*On the Sustainable Developmen…, 2019),* ukrainian scientists have developed a number of methodological, scientific, practical, and theoretical materials on the implementation of this concept.

When implementing the concept of sustainable development, we must pay attention to the implementation of its ideas in all levels and areas of education. This ensures a holistic and comprehensive solution to the tasks of sustainable development, namely: acquiring knowledge

and skills that will ensure an attitude of value towards the environment and responsible behavior for the preservation and implementation of a full life for each member of society. The principles of sustainable development should be included in all educational programs and should be considered as an element of constant and continuous learning and upbringing, that is, they should form a special educational direction – education in the interests of sustainable development.

Of course, the first link that is responsible for laying the foundations of a sustainable worldview is preschool education. After all, already by 2040, those who are currently recipients of level zero education, or even those who have not yet entered kindergarten, will enter the labor market. Young citizens are able to perceive any influence of an adult. Therefore, the task of educators is to provide appropriate conditions for the full realization of this influence in accordance with the goals of sustainable development in Ukraine *(Gavrish, 2016).* Such conditions within preschool education are, first of all, the creation of a favorable educational environment, the development and implementation of relevant partial programs and taking into account the development of individual aspects of a sustainable worldview in the basic educational programs that preschool education institutions operate under, and, most importantly, the implementation of sustainable development ideas in the main document that preschool educators work on. We are talking about the Basic Component of Preschool Education. In 2021, its new edition was adopted, the second name of which is the State Standard of Preschool Education or BCPE-2021 (*On approval of the Basic component…, 2021).*

It is pleasing that the authors of the Standard took into account the ideas of sustainable development in this purposeful document of preschool education, changing and supplementing its content. This was accordingly reflected in the structure of some of its components. The educational direction "Child in the Natural Environment" became a logical reflection of the concept of sustainable development in the Basic Component of Preschool Education. The authors-developers quite appropriately included in this direction the maximum content regarding the "greening" of preschool education. However, it is appropriate to mention such changes also in view of the topic of our study. After all, for example, the subject-practical competence of a preschool child in the previous version of the BCPE (2012) was attributed by the authors to the educational direction "Child in the World of Culture" *(Bogush, 2012).* Currently, it structurally belongs to the educational direction "Child in the Sensory-Cognitive Space". Hence the difference in the content of this competence. In the new edition, it is considered alongside technological competence and involves considering the artistic and productive activities of a preschooler not only in terms of acquiring labor skills and skills for interacting with adults, but also mastering the world of environmental objects to study their qualities and the possibilities of transforming them into a socially useful product.

It is such change in the content focus on the acquisition of knowledge and skills in accordance with the specified competencies that prompts us to express the hypothesis of our research. Our goal is to conduct a theoretical analysis of existing scientific, theoretical and practical information, literary sources, in order to understand the state of development of the terminological and content field of concepts that were introduced by the authors of the new edition of the Basic Component of Preschool Education, namely "subject-practical, technological competence of a preschool child". And also to draw a conclusion about their relationship and mutual influence in accordance with the main principles of the concept of sustainable development.

2. Research Methods and Procedures

Our research is purely theoretical in nature. When conducting it, methods of scientific analysis and synthesis, as well as comparison, were used. A search for scientific articles was conducted in accordance with the topic of our research. For this, the resources of the scientometric databases ResearchGate and Google Scholar, library resources of the Dnipro Academy of Continuing Education were used. As well as other sources that are in the open access. An appropriate analysis of the information received was also carried out with its further processing and synthesis of new thoughts and conclusions. To formulate the final conclusions, the method of comparing scientific presentations of different researchers regarding their understanding of the concepts of "subject-practical, technological competence" (definition and content) was used. To ensure the objectivity of the results obtained, we determined the following research criteria: definition of concepts, types of activities, ways of implementation, result, date (term) of the study. To ensure the clarity of the research results, a superficial analysis of the frequency of use of the phrase "subject-practical and technological competence of a preschool child" in the metadata of the Google Scholar database was performed by year in the period from 2017 to 2024 and presented in the form of a histogram. To analyze the dynamics of the frequency, the period was divided in half: 2017–2020 and 2021–2024, and the results of this study were graphically presented using a bar chart.

3. Periodization of the Study: Legislative and Analytical Considerations

We began our research in this direction with analytical work, using the built-in Google Scholar tools in the "Articles" tab. We chose 2017 as the beginning of the research period. It was decisive in the development of education in Ukraine and preschool education in particular. This is the year of the adoption and entry into force of the law "On Education", which changed and introduced a number of key concepts and terms. The division of the period was also not accidental: 2021 was the year of approval and the beginning of the implementation of the new edition of the Basic Component of Preschool Education, which for the first time (relative to previous editions) was declared as the State Standard of Preschool Education. The document also reformulated and introduced a list of concepts that changed the terminological field of the regulatory and legislative framework of modern preschool education. It is significant that such a content logic for choosing research periods coincided with the elementary mathematical and statistical logic of research, which is usually chosen for data analysis (see Fig. 1 and Fig. 2).

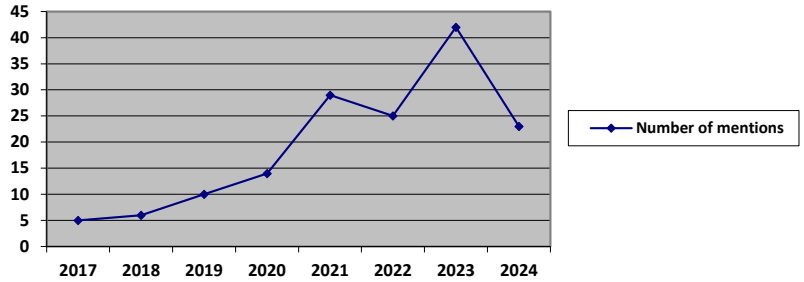

Fig. 1. Dynamics of the frequency of mentions of the phrase "subject-practical and technological competence of a preschool child" by year (2017–2024)

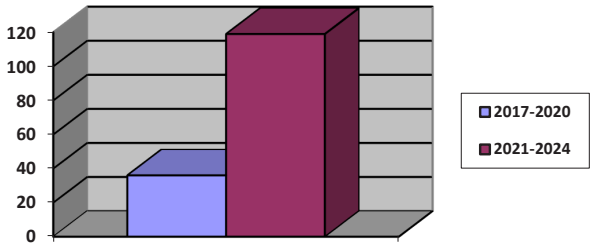

Fig. 2. Dynamics of the frequency of mentions of the phrases "subject-practical competence, technological competence of a preschool child" by half-periods: 2017–2020 and 2021–2024

We began the theoretical analysis of literary sources with the basic document of preschool education – the State Standard of Preschool Education, the logical continuation of which is the educational and methodological manual "State Standard of Preschool Education: Features of Implementation" *(Kosenchuk, Novik, Venglovska, Kuzemko, 2021)* developed by the same team of authors. The sections dedicated to the educational direction "Child in Sensory-Cognitive Space" were developed in both sources by the team of authors: O. Brezhneva, M. Mashovets, O. Bessonova.

The authors of the standard understand subject-practical, technological competence as "the ability of a child to realize creative ideas for transforming environmental objects using various materials, based on knowledge of means and subject-practical actions, with the help of an adult or independently in the process of performing constructive technical and creative tasks, modeling tasks. The result of the formed subject-practical, technological competence is creative self-expression through the formed subject-practical and technological actions in independent and joint activities with peers" (*Educational direction…, 2021).*

One of the authors further popularized this direction in her articles, further detailing and explaining the content of the competencies that interest us as researchers. This work was carried out during 2021.

Some authors consider the development of subject-practical and technological competence in the context of STEM (STEAM, STREAM) education, seeing the implementation of the concept of sustainable development only through the educational direction "Child in the natural environment". Some researchers combine competences into groups (subject-practical, technological, natural-ecological) with a corresponding consideration of their implementation through both educational directions – "Child in the sensory-cognitive space" and "Child in the natural environment". There are authors who even reveal the possibilities of implementing the idea of sustainable development through the direction "Child in the world of art" with consideration of the corresponding artistic and creative competence.

We should point out the works of authors who emphasize research not through the prism of competencies, but through types of activity (artistic-productive, subject-based, design, etc.). The works of these authors trace the most complex vision, which is reflected in the specification of precisely those actions of the child, thanks to which this or that activity is implemented. Also, there are studies devoted to the development of subject-based, practical, technological competence of children with special educational needs.

While working on the research, we got acquainted with a number of publications that can be attributed to general information on education for sustainable development. The author of

these publications, O. Vysotska, revealed the theoretical and practical aspects of implementing the educational component of the concept of sustainable development. Among the statements and conclusions of the researcher, we find theses stating that in conditions of increasing competition in global markets, the formation of an innovatively-oriented personality, capable of constant self-education and creative thinking, becomes increasingly important. This coincides with a more extensive description of the concept of "European dimension in education", according to which each individual must realize themselves as an active participant in society, understand their rights and responsibilities; possess critical thinking and independence, which are manifested in the ability to analyze information and form their own opinion, which is the key to success both in education and in professional life, as these allow them to make informed decisions and work effectively with information; constantly develop, expanding their knowledge and skills, thus ensuring competitive advantages in the labor market; be able to adapt quickly to changes and make effective decisions; share European values, such as tolerance and solidarity, moving towards democratic ideals *(Vysotska, 2011).*

This description of the "people of the future", which corresponds to the ideals declared in 1993 by the EU Maastricht Treaty, has direct correlations with the recommendations of another influential event of the global community – the World Economic Forum, which in 2020 formulated a list of 10 key skills that a person should possess in 2025. Among them: analytical thinking and innovation, active learning and learning strategies, solving complex problems, critical thinking and analysis, creativity, originality and initiative, leadership and social impact, use of technology and programming, endurance, stress resistance and flexibility, logical reasoning, problem solving and idea generation (*These are the top…*). These are the so-called soft skills, which really play an important role in the formation of environmentally sound behavior *(Volik & Chomich, 2024).*

4. Definitions and Interpretations of Subject-Practical and Technological Competencies

Let us now turn to the definitions formulated by various researchers of preschool education that relate to the competencies we are investigating. We have formed the results of our theoretical searches into a table (Table 1).

Bessonova O. offers the following algorithm for solving practical problems by a child: setting a goal, planning the sequence of actions, forming simple conclusions about the methods of action, distributing responsibilities, selecting the necessary materials and tools, monitoring the implementation of actions, analyzing and evaluating the result obtained *(Bessonova, 2021).*

The following are considered as priority activities in which subject-practical and technological competences are most effectively developed: subject-practical, design, labor, artistic-productive. Each of these activities develops certain skills and leads to the acquisition of relevant knowledge within the framework of the specified competencies.

Subject-practical activity acquaints preschoolers with the properties of objects and their origin, as well as the possibilities of their use. Since this activity involves actions not only with real objects, but also with their substitutes, *subject-game* activity is also distinguished within the scope of subject-practical activity. Design activity, according to Bessonova O., teaches children not only specific skills, but also general ones, developing the ability to reflect and generalize.

Successful *work activity* is impossible without a developed ability to define a goal and plan the process, analyze the results obtained, appropriate work skills, and motivation.

Artistic and productive activity, which includes design, needlework and technical modeling, is understood as a transformative activity in which it is impossible to do without knowing

Table 1

Review of research on the terminological field of the concept of "subject-practical, technological competence of preschool child"

Researcher	Competency	Types of activity	Implementation paths	Result	Date (term) of research, year
Bessonova O.	Subject-specific, practical, technological competence	Subject-practical (subject-game); design; Labor; Artistic and productive (design, needlework, technical modeling)	Solving specific practical tasks, active activities; Strengthening motivation; reflective analysis and self-analysis	Creative self-expression through formed subject-practical and technological actions in independent and joint activities with peers	2021
Boryn G.	–	Artistic and constructive	Providing older preschool children with opportunities to experiment with paints, art materials, and combine different types of fine art, even in one work	Intensive development of students' artistic abilities and emotional receptivity; development of the ability to set creative goals and achieve desired results, which contributes to the comprehensive development of the child.	2021–2024
Kotelyanets N.	–	Designing	Organization of a system of classes to form children's creativity by means of integrating speech and constructive activity; organization of children's play activities; organization of a subject-developmental environment of the preschool educational institution; organization of methodological and educational work with the teaching staff and parents.	Activating the creative potential of preschoolers	2021–2024

Pisatska L.	–	Subject-practical	In the perspective of further research	Increasing the level of organization of older preschoolers	2023
Litichenko O.	Subject-practical	Artistically productive; subject-oriented; artistically creative	Collective interaction during the activity. Activation of children's activities by giving the sphere of artistic work a cognitive character (using various new materials); ensuring the child's sustained interest in artistic work by creating prerequisites for improving their creative abilities (introduction of new technologies). Creation of a developmental environment and selection of the optimal pedagogical education strategy	Development of social skills. Creative self-realization of the individual. Development of independence	2019–2024
Legky O. and Kondratenko S.	–	Subject-practical	Specially organized correctional and developmental classes are held for preschoolers to solve cognitive tasks in various types of subject-based practical activities.	Formation of cognitive activity	2021
Dovbnya S. and Shelepko H.	Artistic and creative	Artistically productive	Implementation of a system for forming components of the foundations of artistic and design skills according to quality criteria	The emergence of artistic and design skills	2022

Franchuk T. and Pukas I.	Subject-practical and technological	–	Training of specialists	Continuity between levels of education	2021
Polovina O.	Artistic and creative	Artistically productive	Formation of a value attitude towards works of art, development of the need for artistic activity	Development of creative thinking, formation of aesthetic values and development of practical skills	2021–2024
Guzhanova T. and Panchenko Y.	Subject-practical, technological	Labor	Creating a safe space for experimentation, using game methods and an individual approach, as well as engaging in various types of work activities	Ability to use technology effectively, think logically in technical situations, and respond quickly to changes.	2023

the properties of objects, which encourages the production of one's own ideas and ways of implementing them. According to the researcher, it is in technical modeling that the development of engineering thinking in preschoolers takes place.

Continuing the ideas of Bessonova O., researcher Boryn G. *(Boryn, 2021)* combined two types of children's activities, introducing the name artistic and constructive activity, and formulated the following idea: by engaging in artistic and constructive activity, the child develops their ability to set creative tasks and achieve desired results, which contributes to their comprehensive development. The researcher directed her further scientific research to the theoretical and practical aspects of training future teachers to lead the artistic and constructive activities of older preschoolers.

Considering the constructive activity of a preschooler, researcher Kotelyanets N. claims that "…design is a type of activity of preschool children aimed at forming actions of visual spatial modeling. Important in such activity is the connection with the artistic and constructive-technical activities of adults; in the process of design, all the necessary conditions for the formation of technological skills are created". In her research, the researcher also paid much attention to the training of specialists (educators and primary school teachers) to realize the creative abilities of preschool and primary school children. Kotelyanets N.'s contribution is the author's pedagogical technology as a way of designing the pedagogical process for the formation of creative activity of children of senior preschool age *(Kotelyanets, 2021; Kotelyanets & Kotelyanets, 2022).*

The author Pisotska L. focused on the consideration of subject-practical activity as one that positively affects the level of organization of a preschooler. This skill is an ambiguous condition for the child's general readiness for schooling. Although the researcher has been dealing with the issues of the visual activity of a preschooler for many years, in the terms of the new edition of the Basic Component of Preschool Education, this is the only article *(Pisotska, 2023).*

Researcher Litichenko O. *(Litichenko & Nuradinova, 2022)* directs her gaze to artistic and productive activity as a means of developing social skills through collective interaction of preschoolers. She also explores the features of perception and use of color in artistic

and productive activity. The researcher considers artistic work as a means of forming the subject-practical competence of a preschooler. Moreover, the relevant achievements were highlighted before the new edition of the basic component of preschool education was published. Here, subject-practical activity has another expansion: artistic creative activity. Another aspect of studying artistic and productive activity and its impact on the development of the personality of a preschooler is in studying the issues of forming independence through such activity *(Litichenko, 2021; Litichenko & Masteruk, 2022).*

Researchers of the subject-practical activities of children with visual impairments, Legkyi O. and Kondratenko S., speak about the need for a comprehensive approach to organizing such activities for preschoolers and the possibilities and necessity of continuing relevant work in elementary school *(Legkyi & Kondratenko, 2021).*

Having considered such a special type of artistic and productive activity of senior preschoolers as landscape design, researchers Dovbnya S. and Shelepko G. drew attention to their ability to realistically imagine, the ability to see the whole before the parts, and the originality of creative ideas *(Dovbnya & Shelepko, 2022a).* The researchers consider the creation of landscape design to be an excellent example of how a preschool child can act as a designer, plan and implement their creative ideas. These authors in another study examined the development of artistic and design skills through artistic and productive activity. But it is attributed to the artistic and creative competence of a preschooler *(Dovbnya & Shelepko, 2022b).*

Franchuk T. and Pukas I. conducted a theoretical analysis of the formation of subject-practical and technological competence of preschoolers, technological competence of primary school students in the context of STEM education, emphasizing that to ensure the quality of such education, it is necessary to organize the training of specialists – preschool educators and primary school teachers *(Franchuk & Pukas, 2021).*

During theoretical explorations, we discovered an interesting contradiction. One of the authors of the State Standard of Preschool Education, Bessonova O. *(Bessonova, 2021),* considers *design* as a type of artistic and productive activity, which in turn belongs to *subject-practical, technological* competence (educational direction "Child in sensory-cognitive space"). Another author of the State Standard of Preschool Education, Polovina O., attributes artistic and productive activity, and along with it the type of activity "design", to a type of art, which accordingly ensures the formation of *artistic and creative* competence (educational direction "Child in the world of art") *(Polovina, 2024).* The researcher proves in her further works that the formation of elementary design skills is a complex process that includes the development of creative thinking, the formation of aesthetic values, and the development of practical skills *(Polovina, 2021).* We will leave the contradiction we have identified to the discretion of the scientific community, and will only note that in our opinion, regardless of the theoretical basis, the practical result has an impact on the development of a preschool child and, without a doubt, affects their environmentally appropriate behavior (using secondary resources to create something new) and, of course, creates positive consequences in the context of sustainable development.

Researcher Guzhanova T. paid attention to the development of the competencies we have identified in the research topic in normotypical children and children with developmental disabilities. They argue that during the design and creation of products, children not only develop their imagination, but also learn about the properties of materials, learn to plan their work and cooperate with other children. This process helps them develop such important skills as creativity, logical thinking and the ability to work in a team. Moreover, this thesis applies equally to both groups of students *(Guzhanova, 2024).*

5. Conclusions

The article provides a theoretical analysis of existing scientific, theoretical and practical information, literary sources in accordance with the research topic. The state of development of the terminological and content field of the concepts "subject-practical, technological competence of a preschool child" helped the author to understand the comparative analysis. If we look at the dynamics of the frequency of mention of the competencies under study, it is obvious that the number of publications has increased over the years. However, the greatest "spike" in the use of the concepts of the terminological field of the study can be traced after the approval and implementation of the new edition of the Basic Component of Preschool Education – BCPE-2021.

However, we can safely conclude that there is no unity among the authors-researchers of subject-practical and technological competence. The author of this publication associates this state of affairs with the fact that even the authors of the State Standard of Preschool Education – a document that examined in detail the competences of a preschool child and actually gave the "green light" to the use of the concepts we have defined for the general public – did not agree on the unambiguous interpretation and content of the relevant concepts. For example, artistic and productive activity occurs in the document twice. Once – as a priority activity in the formation of subject-practical competence (educational direction "Child in sensory-cognitive space"), the second time – as one that forms the artistic and creative competence of a preschool child (educational direction "Child in the world of art"). Because of this, all subsequent studies also diverged in different directions. This fact can be interpreted from different sides. Such discrepancies, on the one hand, confuse researchers, on the other hand, once again prove the integrative nature of the document as a reflection of a new paradigm of education. Let us recall that *integration* is one of the key definision of the concept of sustainable development. Thanks to this feature, we see that the aspirations for change declared for many years are being realized in modern education. The transition to sustainable development has already become a reality in preschool education. Children actively explore the world around them, learn to care for nature and understand the relationships in it. Thanks to the integration of the principles of sustainable development into the curriculum, preschoolers form a responsible attitude towards the environment. We see that the areas of educational activity are also being integrated.

Summing up the results of the research, we should say about the prospects for further scientific developments. We see them in the study of the state of development of other competencies that form the sensory-cognitive development of a preschooler: sensory-cognitive, logical-mathematical, research. Also interesting is the analysis of scientific achievements of foreign researchers of preschool education on issues of sustainable development.

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