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STUDENTS' VISUAL LITERACY DEVELOPMENT IN PRIMARY SCHOOL: THE INFLUENCE OF TEACHERS' ABILITY TO VISUALIZE EDUCATIONAL INFORMATION

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Abstract. *In modern digital society visual content is an integral part of human life. Developing visual literacy strongly which is connected with such soft skills as critical thinking, creative thinking, communicating and collaborating is an important aspect in school education. The research is aimed at demonstrating the dependence of primary school students' visual literacy on the primary school teachers' abilities to visualize effectively educational information in the process of teaching.*
The survey was conducted within the time period of 2019–2023. The team of researchers from Institute of Pedagogy of National Academy of Educational Sciences of Ukraine (Didactics Department) carried out an exploratory study within the primary school system in Ukraine. The total number of respondents consisted of 52 primary school teachers and 415 students.
The study finds out that nowadays the primary school teachers' visualizing educational information skills are not sufficiently developed. Boosting the development of visualizing educational information skills among primary school teachers will be resulted in primary school students' visual literacy development.
Having significant positive effect on primary school students' visual literacy development the mentioned primary school teachers' skills guarantee serious positive impact on learning results of primary school students in total.
Keywords: *primary school; primary school teachers; teachers' visualizing skills; visual literacy; visualizing educational information.*

Introduction

Primary school teachers work in a dynamic, information-saturated world and, according to the concept of Education 4.0, should actively involve ICT in the educational process to ensure its effectiveness. They teach modern students

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(children of the alpha generation) who are attuned to visual perception of information. Therefore, a primary school teacher should be able to find, analyze, critically evaluate, interpret, update and effectively use educational information in visual form; create educational visual content using modern ICTs and digital software; use visualization methods directly in active interaction with students during the educational process.

The significance ascribed to the visual literacy of primary school teachers and the development of their proficiency in visualizing educational information emanates from the pervasive integration of visual content within the contemporary information society and the educational system. Digital visualization is an integral component of the blended/remote educational process in primary schools. Visualization methods use in conventional classes aligns with the classical tenet of visibility (which is of paramount significance in primary education) with the provisions of competence-based, activity-based and personality-oriented approaches. Therefore, the research is aimed at demonstrating the dependence of primary school students' visual literacy on the primary school teachers' abilities to visualize effectively educational information in the process of teaching.

Literature Review

As noted in the document "What you need to know about literacy", "Literacy is a continuum of learning and proficiency in reading, writing and using numbers throughout life and is part of a larger set of skills, which include digital skills, media literacy, education for sustainable development and global citizenship as well as job-specific skills. Literacy skills themselves are expanding and evolving as people engage more and more with information and learning through digital technology" (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2024).

At its core, visual literacy, like any other (information, digital, financial, legal, etc.) is the fundamental basis necessary for effective communication with modern society.

The Association of College & Research Libraries (2022), European Network for Visual literature (Schönau, Kárpáti, Kirchner, & Letsiou, 2020) and International Visual Literature Association (2023) define visual literacy as "a set of abilities that enables an individual to effectively find, interpret, evaluate, use, and create images and visual media. Visual literacy skills equip a learner to understand and analyze the contextual, cultural, ethical, aesthetic, intellectual, and technical components involved in the production and use of visual materials. A visually literate individual is both a critical consumer of visual media and a competent contributor to a body of shared knowledge and culture" (ACRL, 2022).

The Media and Information Literacy Curriculum for Educators and Learners (UNESCO, 2021) and The Framework for Visual Literacy in Higher Education (ACRL, 2022) note that an important component of developing competence education is the formation of learners' visual literacy. The Common European Framework of Reference for Visual Literacy (Wagner & Schönau, 2016) states that visual literacy comprehensively covers all academic disciplines at all education levels.

Present-day studies allow us to conclude that visualizing methods, techniques and visualization tools occupy a significant place in modern educational process (Berradia, 2023; Yilmaz & Simsek, 2023; Leroux, 2023; Anderson, Chaparro, Smolkowski, & Cameron, 2023). As stated in the study by Lengler & Eppler (2007) more than 150 well-established methods are used in the practice of visualization.

The concept of "New Ukrainian School" in primary education recommends to use the next visualization methods (strategies):

- visual strategies for development of critical thinking: creation of conceptual tables, tables "analysis of concept features", Venn diagrams, cyclic diagrams, tree diagrams, Fishbone diagrams;
- a strategy for reviving the visual imagination during reading (the Visual Imagery Strategy), aimed at in-depth awareness of information, concretization of facts, the sequence of events, etc.;
- introduction of knowledge maps in the educational process for improving memory, recalling facts, words, images; ideas generating; concepts demonstrating; holistic educational material revising; results or events analysing, information structuring, promoting the solutions search;
- creation and use of visual materials for organizing class everyday activities: choice circles for resolving conflict situations, rules and routines visual definitions;
- visual techniques for accompanying reading with understanding: using the scheme-figure "I establish connections" to work out the text according to a four-stage model of understanding, schemes of "thin" (literal, which are aimed at remembering information) and "thick" (aimed at understanding, applying, analyzing, evaluating information and its creative processing) questions;
- visual support of the strategies "Daily 3" and "Daily 5", in particular, the creation of an "I-scheme" as a support in independent students learning activities, the introduction of "reading pictures (illustrations)" from the book at the initial stage of the reading competence formation;
- creating and using word walls in the learning process to visually support literacy, promote the learning of the alphabet and new vocabulary from

all educational fields;
- strategies for organizing classroom discussions (for example T-scheme);
- strategies for developing students' writing skills and critical thinking: a KWL table (I know – I want to learn – I learned) for expressing existing knowledge, forming a query for further learning and reflection, a RAFT table (role-audience-format-topic) – for creating your own texts on the selected topic;
- visualizing information on cubing strategies, brainstorming, associative bush, etc (Ministerstvo osviti i nauki Ukraïni, EdEra & Osvitorija, n. d.).

Research Methodology

A study was conducted in general education institutions (2020–2023). In the course of devising and executing research initiatives, the team of researchers from Institute of Pedagogy of National Academy of Educational Sciences of Ukraine (Didactics Department) took into account the experience of scientific and pedagogical activity amid the backdrop of unforeseeable global perturbations, including the Covid-19 pandemic and the imposition of martial law in Ukraine (Topuzov, Malykhin, & Aristova, 2022; Malykhin, Kaupuzs, Aristova, Orska, & Kalvans, 2023). The total number of teachers involved in the study was 52.

Interaction with primary school teachers was aimed at creating organizational and didactic conditions for the development of their visualizing educational information skills. It included a series of meetings with primary school teachers. Also teachers improved their visualizing skills using didactic and methodological materials for visualizing educational information, posted on the author's website "Visualization in primary education" (available: https://sites.google.com/view/vizualschool).

Primary school teachers (1) expanded their knowledge of modern visualization methods and appropriate visual forms of educational information representation; (2) deepened their knowledge of the psychological and pedagogical basis for educational information visualizing in primary school educational process (issues of children's cognitive psychological processes: visual perception, visual thinking and imagination were considered); (3) got acquainted with the basics of the visual educational materials design for primary schools and the possibilities of modern information and communication technologies, which are advisable to create educational visual content. Considerable attention was paid to the development of primary school teachers' skills to select and use appropriate visualization methods and tools to solve specific educational tasks in educational process; abilities to create, find and

update the necessary educational visual content; abilities to adhere to moral, ethical and legal norms for using visual content from open sources.

Among classes that joined the study methods of visualizing educational information and modern visual tools were widely used in the students' educational and cognitive activities. Interactivity of the learning subjects was ensured during their processing. For example, teachers were offered to use author's online Ukrainian language reference books, which contribute to the formation of direct subject competence, as well as the visual literacy formation and development of primary school students' visualization skills (available: https://prezi.com/view/uUMvi8kLG6OcwbFu5o93/ (first grade), https://prezi.com/view/KaRSdjUa4pzeR7WKzL3G/ (second grade).

In order to ascertain the efficacy of initiatives undertaken, diagnostic dialogues were conducted with teaching teams at the initiation of collaboration and during the concluding phase. These discussions centered on elucidating the influence of visualizing educational information on the primary school educational process. To find out the dynamics of educational results of students involved in the study, knowledge cross-sections were conducted in the first and the fourth grades. The total number of students involved in the study was 415.

The testing of first grade students was aimed at identifying the level of formedness of their skills in (1) visual presentation of verbal information and (2) analysis, synthesis and interpretation of information presented visually. Testing tasks were developed on the basis of diagnostic tasks for determining children's readiness for school education and appropriate methodological recommendations.

Results and Discussion

The majority of students showed high (37%) and medium (54%) levels of formation of these skills, while 9% corresponded to a low level. The most difficult task for students was to draw a person based on a verbal description (an adapted version of the Kern-Jirasek school readiness test). In the task, students were asked to draw a person according to the description: "*Our English teacher Kateryna Petrivna is medium height, slender and young. She has light curly long hair. She has dark eyes, black eyebrows and black eyelashes. Today at the lesson Kateryna Petrivnawas is dressed very smartly: she has a long blue skirt and a white blouse. She is wearing a beautiful blue turquoise necklace."* This test was aimed both at diagnozing the skills of visual representation of verbal information and assessing the formation of graphic activity skills, topological and metric spatial representations. It identified the general level of student's mental and cognition development, the arbitrariness of mental activity. The results clearly demonstrate that about a quarter of first grade students (27%) showed a low level, 55% – an average level, and 18% – a high level of student's mental and cognition development.

Examples of students' works are shown in Fig. 1. The top row represents works by students who have both a high level of skills of visual representation of verbal information and mental and cognition development. The middle row shows works by students who have both an average level of skills of visual representation of verbal information and mental and cognition development. The bottom row shows works by students who have both an low level of skills of visual representation of verbal information and mental and cognition development.

Figure 1 ***Examples of work of first grade students*** *(adapted version of the Kern- Jirasek school readiness test) Source: own study*

Table 1 ***Results of the task "Draw a person according to the description"*** *(adapted version of the Kern-Jirasek school readiness test)*

Source	First grade students' skills in (1) visual presentation of verbal information and (2) analysis, synthesis and interpretation of information presented visually	Level	Respondents (%)
Testing of first grade students	Students' abilities to visually present information presented verbally and to analyze, synthesize and interpret information presented visually	high	37%
		average	54%
		low	9%
Osvitnii ombudsmen Ukrainy	Intellectual readiness for school education (children aged 5/6 years)	high	14%/73%
		average	72%/27%
		low	14%/0%
	Psychological readiness for school education (children aged 5/6 years)	high	5%/59%
		average	76%/41%
		low	19%/0%

Source: own study & Osvitnii ombudsmen Ukrainy (2020).

Upon juxtaposing the acquired outcomes with the mean indicators of preparedness exhibited by children aged 6(5) years for scholastic education in Ukraine (Osvitnii ombudsmen Ukrainy, 2020), the analysis reveals a marginally diminished level of results in the conducted study (Table 1). This can be explained by the narrow test focus and the specificity of tasks related to the students' visualization information skills. This confirms the need for the targeted attention to the formation/development of primary school students' visual literacy.

To determine the dynamics of children's development, this test was also performed when students reached the fourth grade. The obtained results are shown in Table 2.

Table 2 ***Results of the task "Draw a person according to the description"*** *(adapted version of the Kern-Jirasek school readiness test)*

Visualization Skill	Level	Grades (%)		Dynamics
		1st grade	4th grade	
Ability to visually present information submitted verbally	high	18	87	+69
	average	55	13	-42
	low	27	0	-27

Source: own study.
n=415

The examples of students' works are given in Fig. 2.

Figure 2. ***Examples of work of 4th grade students (adapted version of the Kern-Jirasek school readiness test)*** *Source: own study*

The results increased significantly. This can be explained by the complex pedagogical influence, in particular due to experimental activities, and intensive mental development of children in the period from 6(7) to 9(10) years.

In the fourth grades students' tests were conducted to specify the significance of the pedagogical impact caused by experimental activities. They were based on the relevant test materials of the all-Ukrainian external monitoring of the primary education quality of 2021 (Lisova et al., 2022) "State of primary school graduates' reading and mathematical competences formation"). Tasks that were directly

related to the visualization of educational information were selected. The obtained data, as well as the results of the all-Ukrainian external monitoring of the primary education quality of 2021 (Lisova et al., 2022) are shown in Table 3.

Table 3 ***Results of students' ability to perform tasks directly related to the visualization of educational information (reading and mathematical competences)*** *Source: own study & Lisova et al. (2022)*

Ability to perform tasks directly related to the visualization of educational information	Level	4th grades (%)		Dynamics
		Own study	All-Ukrainian external monitoring*	
Reading competence	high	25.5	21.1	+4.4
	average	44.0	40.9	+3.1
	basic	25.0	27.7	-2.7
	low	5.5	10.3	-4.8
Mathematical competence	high	24	22.4	+1.6
	average	40.6	39.6	+1
	basic	31	27.8	+3.2
	low	4.4	10.2	-5.8

** – the given percentage ratios characterize the overall level of development of reading and mathematical competencies, respectively*

It should be noted that according to the all-Ukrainian external monitoring of the primary education quality of 2021 (Lisova et al., 2022), test tasks related to the visualization of educational information (reading tasks that include texts of interrupted and mixed type; as well as tasks in mathematics of the content category "Working with data") are defined as complex. So, the increase by several percent in students' ability to perform these tasks in comparison with the overall results aimed at forming students' reading and mathematical competences should be considered as a confirmation of the positive impact of the teachers' visualizing educational information skills development on the success of primary school students.

According to the results of conversations with primary school teachers at the beginning of the study, we state that they use pre-selected or hand-created digital visual materials in the educational process and have some experience in using modern information and communication tools for creating visual content (Padlet, Kahoot, Miro, Google Forms etc.). At the same time, teachers are not sufficiently aware of visualization as a teaching method. They do not have enough knowledge

concerning the design of didactic visual materials, tools for creating digital visualization. The results of the final conversations show an increase in teachers' design and instrumental skills in visualizing educational information, as well as their ability to plan, organize, control, evaluate, correct and improve the activity of visualizing educational information in the educational process.

At the end of the study, teachers show a positive effect of visualization on students' motivation for (1) learning (cognitive) activities, (2) the development of their critical thinking, creativity, communication and collaboration skills. They admit that there is a tendency of improving students' academic performance. Teachers show a great interest and high motivation in the use of forms, methods, techniques and tools for visualizing educational information in the educational process of primary schools. During the discussion of the topic on visualization of educational information as a component of modern education, they note the relevance and expediency of its including in the content of advanced training courses.

Conclusions and Prospects for Further Research

So, the results of conversations with primary school teachers who joined the study indicate a significant positive trend in the development of their skills in visualizing educational information. Teachers' knowledge of the theory and practice of visualization in primary education has been deepened; the frequency of using methods of visualization of educational information and didactic visual tools in the lessons of Linguistic and Literary, Mathematical, Natural, Civil and Historical, Social and Health-saving educational fields has been increased; the range of digital visualization tools that teachers use in their professional and pedagogical activities has been expanded; the creative component in the activities of teachers and classes in visualizing educational information has been improved.

The development of teachers has affected the level of academic achievement of their students. This is evidenced by both the results of conversations with teachers and the assessment of their students' educational achievements. Based on the results of the study, we note the improvement in the students' performance indicators. Cross-sections of students' knowledge and skills in visualizing information and processing visual content within the language, literary and mathematical fields indicate their significant positive dynamics.

Thus, we can draw a general conclusion that the level of skills to visualize educational information among primary school teachers in Ukraine plays a crucial role in overall learning outcomes of primary school students. Therefore, enhancing the development of these skills among primary school teachers will contribute to the improvement of visual literacy in primary school students.

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