METHODOLOGY FOR DEVELOPING SAMPLE TEXTBOOK PAGES BASED ON IMPROVED GRAPHIC MATERIALS

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Abstract. *This article presents a methodological approach to developing sample textbook pages based on improved graphic materials in drawing education. It examines the didactic functions of graphic images, their relationship with verbal information, visual clarity, and effective page layout. Based on the analysis of existing textbook materials, key problems are identified and a sequence for improving graphic materials and integrating them into textbook pages is proposed. The study emphasizes the role of graphic images as purposeful didactic tools that support learners’ understanding and practical graphic activities.*

Keywords: *graphic education; drawing education; graphic materials; textbook design; didactic functions; visual information; text–image coherence; instructional design; educational graphics.*

Effective delivery of knowledge to students in the educational process depends not only on the content of the learning material but also directly on the way it is presented. In graphic education subjects such as technical drawing, descriptive geometry, engineering graphics, and computer graphics, visual information plays a particularly important role in the acquisition of theoretical concepts, geometric shapes, spatial relationships, and graphical operations. Therefore, the content accuracy, visual clarity, precision, comprehensibility, and age appropriateness of graphic materials used in textbooks and educational literature for these subjects are among the important factors contributing to the effectiveness of education.

A graphic image should not be regarded merely as a decorative or supplementary element accompanying the text in a textbook, but rather as a didactic tool that facilitates the presentation and understanding of the educational content. A properly selected and pedagogically well-designed graphic image

helps concretize educational information, visualize complex concepts, develop spatial thinking, and facilitate the understanding of graphic procedures. Conversely, images that are insufficiently related to the content, graphically unclear, or compositionally ineffective may make it more difficult for students to perceive and understand the learning material.

An analysis of certain graphic materials found in school technical drawing textbooks indicates the need to further improve the alignment between the complexity of the educational content and the instructional potential of graphic images. In particular, insufficient attention is sometimes given to the simplicity or complexity of an image, the use of color and line types, the representation of the spatial position of an object, the placement of the image on the page, and the relationship between the graphic image and the corresponding text. Such circumstances may limit students' ability to perceive graphic information and use it effectively for educational purposes.

From this perspective, reviewing graphic materials in existing textbook pages in accordance with contemporary pedagogical and visual requirements, enhancing their content-related and didactic potential, and developing sample textbook pages based on improved graphic materials constitute important methodological tasks. In this process, it is important not to limit the improvement to the graphic image itself, but also to consider its functional relationship with the text, tasks, explanations, labels, and other elements on the textbook page.

This study analyzes the main requirements for improving graphic materials in textbooks and examines the development of sample textbook pages based on their alignment with the educational content, enhancement of the accuracy and visual clarity of graphic information, establishment of coherence between text and images, and consideration of students' age and cognitive characteristics. The study demonstrates the possibilities of pedagogically appropriate placement of improved graphic materials on textbook pages and their use as a means of developing students' graphic knowledge and skills as well as their spatial thinking.

Pedagogical and Didactic Approaches. Effective acquisition of educational material in graphic education literature depends not only on the scientifically accurate and coherent presentation of the content but also on the way in which this content is presented to learners. In subjects such as technical drawing, descriptive geometry, and engineering graphics, a significant part of educational information is conveyed through graphic images. Therefore, graphic materials should not be regarded merely as supplementary elements of textbook

content, but rather as important didactic tools that serve to explain and concretize educational content and guide learners toward practical activities.

In the process of acquiring educational material, it is important for learners to engage in active thinking, establish connections between existing knowledge and new information, and relate theoretical knowledge to practical activities. J. Bruner emphasizes the importance of connecting educational content with learners' active cognitive processes and facilitating the gradual acquisition of knowledge through different forms of representation [1].

This approach is particularly important in graphic education. In technical drawing, learners often understand the shape of an object, its spatial position, the relationships among its geometric elements, or the sequence of constructing an image not directly through textual information, but through graphic representations. Therefore, graphic materials in textbooks should not merely reproduce the content presented in the text; rather, they should visually reveal aspects that are difficult to express adequately through verbal explanations alone.

Furthermore, studies on multimedia and visual presentation indicate that the coherent organization of text and graphic images can support learners in selecting and processing information and in establishing meaningful relationships among different elements of the content [2]. From this perspective, the design of graphic materials on a textbook page should not be limited to the technical accuracy of the images; it should also take into account how these images are related to the accompanying text, explanations, and learning tasks.

Didactic Functions of Graphic Materials. To determine the educational value of graphic materials, it is important to identify the didactic functions they perform in the learning process. Graphic images in technical drawing textbooks can primarily perform such functions as providing information, explaining, concretizing, developing spatial understanding, and guiding practical graphic activities.

First, a graphic image presents information about an object or phenomenon in a visual form. *Second*, it facilitates the understanding of complex theoretical concepts by concretizing their content. *Third*, a graphic image makes it possible to represent the spatial structure of an object, its geometric elements, and the relationships among them. *Fourth*, a systematically sequenced image can guide learners in performing practical graphic activities.

Therefore, when selecting graphic materials for a textbook, it is not sufficient to consider merely whether an image is present or absent. The key issue

is to determine what specific educational function the image performs and how effectively it fulfills that function.

The didactic function of a graphic material is manifested through its content, type of representation, composition, size, system of symbols, use of color or line conventions, and relationship with the accompanying text. From this perspective, the process of designing an educational graphic image can be organized according to the following sequence:

→ *defining the educational objective*
→ *determining the content*
→ *selecting an appropriate type of graphic representation*
→ *developing the image structurally*
→ *establishing connections with the text and explanations*
→ *integrating the image with the learning task.*

Such an approach makes it possible to transform a graphic image from a simple decorative element of a textbook into a functional didactic tool.

Considering Learners' Age and Individual Characteristics. Taking learners' age and individual characteristics into account is also an important methodological requirement when developing graphic materials. The same graphic representation may be perceived differently by learners of different ages.

J. Piaget's views on cognitive development indicate that learners' ability to acquire knowledge is closely related to their level of cognitive development [3]. Therefore, the complexity of a graphic material, the number of elements it contains, its system of symbols, and the operations required to interpret the image should correspond to the learners' level of preparedness.

For example, at the initial stage, priority may be given to clear and simple representations of the general appearance of geometric shapes, while at subsequent stages, more complex representations showing their projections, dimensions, sections, or spatial transformations can be introduced. In this context, the principle of progression from simple to complex represents one of the key methodological criteria.

In addition, taking individual differences among learners into account can contribute to improving the effectiveness of graphic materials. The differentiated approach to instruction emphasizes the need to provide learning materials at different levels according to learners' levels of preparedness and individual needs [4].

From this perspective, in addition to the main graphic representation, improved graphic materials should include supplementary images, symbols, and

brief explanations that provide step-by-step clarification. This can expand learners' opportunities for independent learning and practical work.

Integration of Graphic and Verbal Information. In a technical drawing textbook, text and graphic images should not be organized as independent elements but rather as components of a unified instructional information system. The text should explain the aspects presented in the graphic image, while the graphic image should concretize and clarify the content described in the text.

Studies on multimodal learning indicate that the coordinated organization of different information channels can support the processing of educational content [5].

Therefore, the placement of graphic images on a textbook page is also important from a didactic perspective. If an explanation related to an image is placed too far from it, or if several graphic elements are presented within a common frame without clearly indicating which element corresponds to a particular statement in the text, learners may experience difficulty in establishing connections between the different pieces of information.

Thus, the logical relationship between "text → graphic image → explanation → practical task" should be regarded as one of the important conditions for designing an effective textbook page.

Didactic Problems in the Placement of Graphic Materials in Drawing Textbooks. The educational effectiveness of graphic materials depends not only on their content and technical quality, but also on how they are positioned on the page, how they are compositionally related to other elements, and how they are connected with the text.

Certain problems related to the placement of graphic elements can be observed in the analyzed pages of drawing textbooks. In particular, placing a graphic image far from the text that explains it, combining several images within a single common frame, and limiting the possibility of clearly distinguishing captions and labels beneath the images may make it more difficult for learners to quickly identify the required graphic information.

As an example, Figures 3.3 and 3.4 presented on page 19 of the 8th-grade Drawing textbook can be considered. On this page, the placement of graphic materials within a common frame causes several small images to form a single visual block. In such a composition, if the boundaries between individual images and their connections with the corresponding explanations in the text are not sufficiently clear, learners may need additional time to determine which graphic element they should refer to.

The problem is not only related to the number of images, but also becomes apparent when their hierarchy and functional roles within the educational material are not sufficiently differentiated. If the main image, supplementary image, sequential image, and explanatory graphic elements are not visually distinguished from one another, the page may be perceived by learners as a unified but complex graphic block.

Therefore, when placing graphic materials on a textbook page, it is advisable to consider the following requirements:

- the graphic image should be placed as close as possible to the text explaining it;
- the main and supplementary graphic elements should be visually differentiated;
- each drawing or group of drawings should be provided with a clear explanation;
- the sequence among graphic elements should be indicated by numbers, letters, arrows, or other symbols;
- excessive graphic density on the page should be avoided;
- the size of the image should be selected in accordance with its instructional purpose;
- a unified compositional and logical system should be established among the text, image, explanation, and learning task.

Thus, the content-related and compositional organization of graphic materials on existing textbook pages is one of the factors that influences learners' perception of graphic information. The identified problems indicate the need not only to improve individual graphic images, but also to redesign them in an integrated manner with the text, explanations, and learning tasks on the textbook page. Therefore, at the next stage, it is appropriate to establish a methodological sequence for improving existing graphic materials and developing sample textbook pages based on them.

Methodology for Developing Sample Textbook Pages Based on Improved Graphic Materials. To address the problems identified in existing graphic materials, the process of redesigning a textbook page should not be limited to redrawing the graphic image. The main task is to strengthen the didactic function of the graphic image and integrate it into a coherent system with the content of the entire page.

The development of an improved sample textbook page can be carried out through the following stages:

Stage 1 — Selecting an existing page. A specific textbook page whose graphic materials require improvement from a content-related, methodological, or compositional perspective is selected for the study.

Stage 2 — Graphic-didactic analysis. The graphic materials on the selected page are analyzed according to the following criteria: content relevance, graphic accuracy, visual clarity, adequacy of spatial information, text–image coherence, sequencing, age appropriateness, and practical orientation.

Stage 3 — Identifying problems. For each identified shortcoming, its potential consequence in the learning process and the method for addressing it are determined. For example, if a graphic image is found to be excessively complex, it can be divided into stages; if its connection with the text is weak, the image can be placed next to the corresponding text; if the main element is not sufficiently distinguishable, it can be visually emphasized.

Stage 4 — Pedagogical improvement of the graphic material. While maintaining the geometric accuracy of the image, its composition, size, system of symbols, sequence of stages, and explanatory elements are redesigned.

Stage 5 — Integrating the graphic material into the textbook content. The improved image is integrated with the text, explanations, questions, and practical tasks as a unified instructional system.

Stage 6 — Designing the sample textbook page. On the new page, the topic title, brief theoretical information, main graphic image, sequential images where necessary, explanations, and practical task are arranged in a logical sequence.

Stage 7 — Methodological evaluation. The developed sample page is comparatively analyzed against the existing page based on the established criteria. If an expert evaluation is conducted, the didactic potential of the page is determined based on the opinions of specialists in technical drawing and graphic education.

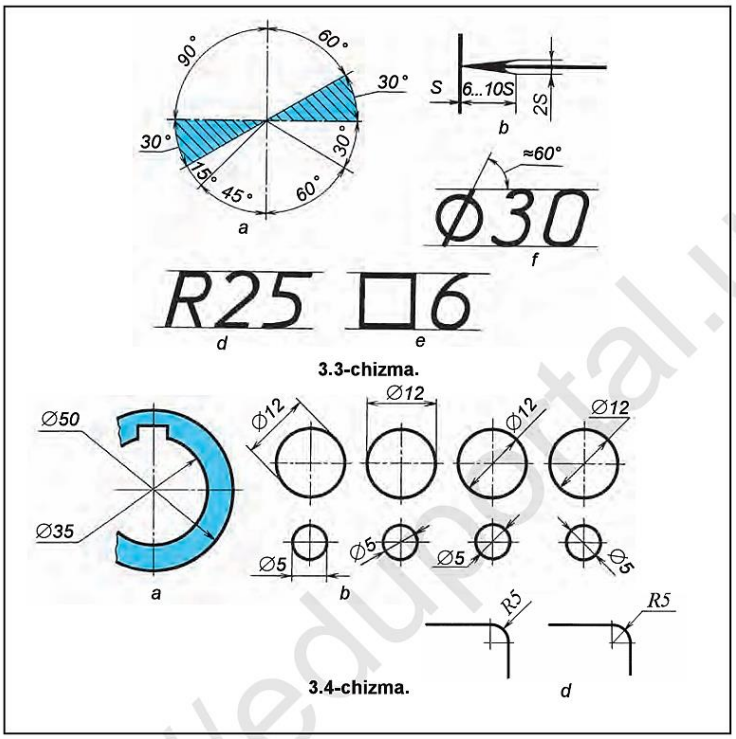

Figure 1. Figures 3.3 and 3.4 on page 19 of the 8th-grade Drawing textbook

To demonstrate the scientific and practical value of the methodology proposed in the article, it is important to present its application using a concrete textbook material as an example. Therefore, at the next stage, it is appropriate to select a specific graphic material, such as **Figures 3.3 and 3.4 on page 19 of the 8th-grade Drawing textbook**, analyze its existing form, and develop an improved version.

In this case, the difference between the "existing form" and the "improved form" should be demonstrated not only in terms of the external appearance of the drawing, but also through the following aspects:

Table 1

Criteria for the Comparative Analysis of Graphic Materials Before and After Improvement

Evaluation criterion	Existing form	Improved form
Graphic accuracy	Existing shortcomings	Clarified representation
Content relevance	Connection with the topic content	Directly reveals the content
Text–image coherence	Degree of connection	Clear and proximate placement

Visual clarity	Complex or insufficiently clear	Important elements are emphasized
Sequencing	The process is not fully revealed	Sequential stages are presented
Age appropriateness	Difficult to perceive	Appropriate to the learner's level
Practical orientation	Limited support for independent performance	Connected with a practical task

Such a comparative analysis makes it possible to provide practical support for the theoretical ideas presented in the article. Most importantly, the central idea of the article—redesigning a textbook page based on improved graphic materials—is demonstrated clearly through a concrete real-world example.

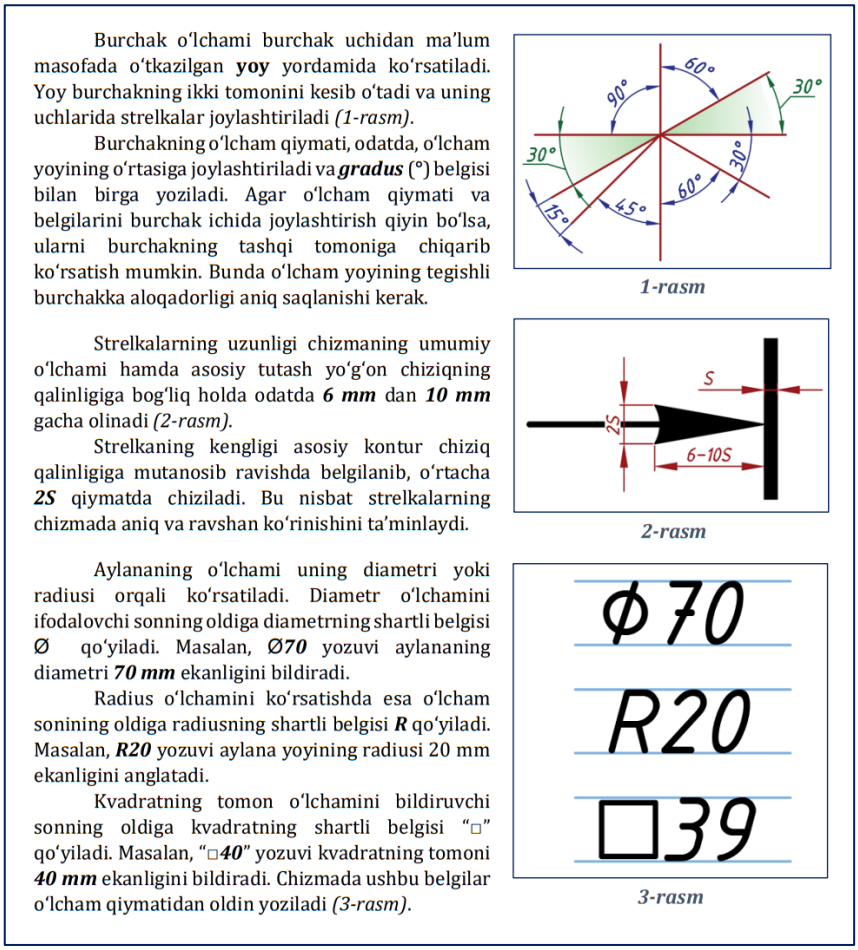

Figure 2. Sample textbook layout

Conclusion

To effectively utilize the educational potential of graphic materials in graphic education literature, they should be designed not merely as illustrative or decorative elements, but as instructional tools that perform specific didactic

functions. Within the framework of this study, the content of graphic materials, their didactic functions, their appropriateness to learners' age characteristics, their relationship with the text, and their compositional placement on the textbook page are considered as interrelated criteria.

The analysis of the examined textbook materials indicates that, in addition to the quality of a graphic image itself, its placement on the page and its relationship with the text and explanations may also influence the perception of educational material. On this basis, the following sequence for developing improved graphic materials and designing sample textbook pages was proposed: "analysis — problem identification — defining the pedagogical objective — improving the graphic material — integration — page design — evaluation."

The proposed methodology represents a broader approach than improving graphic materials individually, namely, designing the graphic image, verbal information, and learning task as a unified didactic system. In this respect, it can serve as a practical methodological basis for developing sample textbook pages for technical drawing education.

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