

ANALYSIS OF PICTORIAL MATERIAL IN TEXTBOOKS FOR ENVIRONMENTAL STUDIES AND SOCIAL STUDIES

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Abstract A textbook is a learning tool designed for students throughout the learning process. Pictorial material can significantly affect the quality of a textbook and is of great importance in textbooks. The purpose of the study was to examine the quality of pictorial material in textbooks for the subject of environmental studies in the first three grades of primary school and social studies in the fourth and fifth grades of primary school. The pictorial material in the textbooks was analysed according to the set criteria. It was established that the ratio between text and pictorial material in the textbooks was not appropriate in all publishers. The quality of the pictorial material also varied depending on the grade. In all analysed textbooks, photographs presented the largest part of the pictorial material. The pictorial material contributed the most to improving the understanding of the content in the textbooks for the third grade.

Keywords:

textbooks,
pictorial material,
learning,
primary school,
quality assessment

1 Introduction

Blažič et al. (2003) cite the demonstration method as one of the basic teaching methods. Demonstration methods include graphic displays, i.e., the use of images, sketches, diagrams, photographs, maps and other tools, visual stimuli, which predominate in the educational process, and auditory stimuli, which are particularly important when displaying the images found in textbooks. “Visual representation is very widespread, and relies on a theoretically broader complex, on visualization, that is on pictorial (graphic) demonstration” (Blažič et al. 2003, p. 53). The pictorial material in textbooks falls under the category of static demonstration, wherein objects and phenomena are not dynamic and do not have the properties of motion. In static observation, the object stands still, and students are given as much time as necessary for observation (ibid.). Images and photographs in textbooks influence the learning process. Students often see pictorial material even before reading the text (Kasmaiezhadfar et al., 2015). Since pictorial material affects the quality of textbooks, an analysis of pictorial material in textbooks was performed in 2020 for environmental science in the first three grades of primary school and for social science in the fourth and fifth grades of primary school. The results are presented according to individual criteria and the publisher.

1.1 Textbooks in Class

Textbooks still play an extremely important role in schools (Ivanuš Grmek et al., 2021a; 2021b). In Slovenia, a textbook is defined in Article 2 of the Rules on the Approval of Textbooks (2015) as the basic teaching material for achieving educational goals and standards of knowledge defined in the curriculum or knowledge catalogue. It supports teaching and learning with a didactic and methodical organization of contents and adapted art and graphic equipment. The content and structure of the textbook enable participants to learn independently, and they enable the acquisition of different levels and types of knowledge. A textbook is linked to a school subject or module and a certain level of education. A textbook is also read as a collection of texts selected in accordance with the objectives of the curriculum. It can be printed or electronic, or both (Rules on the Approval of Textbooks, Art. 2). The textbook acts as a content provider and facilitator that includes several ideas, information, and activities essential to achieve

the expected results (Khutorskoi, 2006). A textbook is not meant for teachers – it is meant for students.

In this role, a textbook is intended for learning or providing students learning activities (Štefanc, 2005). Several textbooks are available for each individual subject, so the teacher must choose the one that is most suitable for them and the characteristics of their students (Mithans & Ivanuš Grmek, 2020). Ivanuš Grmek (2003) defines a textbook as a special learning book in which science becomes accessible to all students who use the textbook. Marentič Požarnik (2019) finds that a textbook can only be used successfully if it is adapted to students and vice versa, because only in this way do students learn to use effective learning strategies. Writers of textbooks must pay attention to the developmental stage or the level of understanding of the students for whom the textbook is intended. Using a textbook is an economical way of preparing learning materials for students (Lukianenko, 2007). Therefore, most teachers consider textbooks to be the most important resource in the classroom. In addition, textbooks affect what and how students learn and what and how teachers teach (Mahmood, 2011). Textbooks can help students perceive their experiences. If they contain relevant questions and assignments, they can motivate students to think (Iqbal, 2009; Mahmood, 2011; Saeed, 2009). Textbooks are designed according to certain standards. It is necessary to consider the standards for the content organization of the text, page design, printing of pictorial material, font, readability of the content, etc. (Swanepoel, 2010).

In Slovenia, textbooks approved by the responsible scientific council may be used. In accordance with Art. 3 of the Rules on the Approval of Textbooks, it approves textbooks that:

- are in line with the goals of the education system in the Republic of Slovenia;
- are in accordance with the valid curricula or knowledge catalogues, according to the goals, standards of knowledge and contents;
- are in line with modern professional knowledge of the experts in the field,
- are methodologically and didactically appropriate;
- contribute to reducing the weight of school bags;
- are appropriate for the developmental stage and age of the participants; and

- are linguistically correct and appropriate, technically appropriate, and aesthetically and visually appropriately designed.

For textbooks used in the first educational period, developmental and psychological adequacy assessment is also obligatory (Rules on the Approval of Textbooks, Art. 3).

1.2 Pictorial Material in Textbooks

A textbook is a secondary source that cannot replace objective reality but can present it in several ways (original text, sketches, diagrams, etc.), and it must present it carefully and as clearly and unambiguously as possible (Poljak, 1983). The visual design and arrangement of textbooks can give importance and emphasis to some elements in the textbook. Students first visualize and understand the words between the illustrations in their textbooks (Hibbing & Rankin-Erickson, 2003). Peeck (1993) emphasizes the importance of pictorial material in textbooks, which can motivate students to study the attached text and encourage them to process the textual data included in the illustrations in greater detail. Pictorial material can explain and clarify content that is not easy to understand, or it can help create verbal and non-verbal codes, thus increasing the potential for the content of the pictorial material. Many authors agree that including pictorial material in learning material is important for improving the process of learning (Agrawal et al., 2011). Pictorial material can significantly affect the quality of a textbook. Illustrations and words together are an important factor in encouraging children and students.

Nevertheless, students must be motivated to learn. Motivation is considered the basis of creative success, so in the classroom, external motivation usually comes from teachers and learning materials. Accordingly, it is recommended that in the textbook making process, the designer and illustrators pay attention to the effect of images on student motivation (Kasmaienezhadfar et al., 2015). Authors must be very careful when choosing illustrations or pictorial material, as illustrations have a great cognitive and educational effect. If the author chooses an inappropriate illustration, it can act as an inhibitor (Justin et al., 2003). It is important to determine which pictures and photographs students are in constant contact with when learning about the environment and whether children learn from good and quality pictorial material (Lukša et al., 2014).

2 Methodology

The purpose of the study was to determine the quality of pictorial material found in textbooks for the subject of environmental science and the subject of social science.

Descriptive – non-experimental methods of pedagogical research were used. Textbooks from the four largest publishers in Slovenia were selected for the research sample.

The research sample included the following textbook publishers:

- Mladinska knjiga (Hergan et al. (2014), Hergan (2015), Kozel et al. (2016), Raztresen et al. (2016)).
- DZS (Skribe Dimec et al. (2012), Skribe Dimec et al. (2013), Umek et al. (2014), Komac & Zorn (2015), Zorn & Komac (2016)).
- Rokus Klett (Šefer & Kumše (2015), Grošelj & Ribič (2016), Grošelj & Ribič (2018), Verdev & Žlender (2018), Verdev & Razpotnik (2019)).
- Modrijan (Krncl et al. (2013), Umek & Janša Zorn (2014), Krncl et al. (2015), Antić et al. (2016), Umek & Janša Zorn (2016), Krncl et al. (2017)).

The publishing houses were labelled with the letters A, B, C and D. The pictorial material was analysed with the help of pre-prepared instruments. The instruments consisted of the criteria used to analyse the pictorial material in the textbooks. The data obtained from the analysis of the pictorial material were presented by indicating the absolute (f) and percentage frequencies (f%).

2.1 Criteria for the Analysis of Pictorial Material in Textbooks

For the analysis of pictorial material, criteria were first prepared, the composition of which was based on scientific statements by various authors. The following ten criteria for determining the quality of pictorial material in the textbooks were formulated:

1. The ratio between text and pictorial material in the textbook.

2. The representation of pictures, photographs, sketches, graphs, tables and schemes in the textbook (how much of which type of pictorial material is in the textbook and which type of pictorial material is most or least represented).
3. Pictorial material's contribution to the improvement of the understanding of textbook content (how much the pictorial material leads/does not lead to the improvement of the understanding of the content or how much the pictorial material is/is not related to the topic).
4. The up-to-datedness of the pictorial material in the textbook (do outdated objects still appear in the textbook?).
5. Authenticity of the pictorial material in the textbook (does pictorial material that does not show an authentic (real) situation appear in the textbook?).
6. Additions to the pictorial material (is all pictorial material accompanied by a description or comment?).
7. Appropriate size of pictorial material in the textbook (does the pictorial material show appropriate ratios between animals, objects and people?).
8. Unnecessary details in the pictorial material in the textbook (do many displayed objects appear in the pictorial material and are there added objects outside the context of the text?).
9. Supporting verbal information with pictorial material (does the pictorial material support verbal information written next to, below, or in front of the pictorial material?).
10. The emergence of a gender stereotype in the pictorial material in the textbook (does the textbook contain pictorial material in which a gender stereotype can be confirmed and pictorial material in which a gender stereotype can be refuted?).

All pictorial material in the analysed textbooks was evaluated according to the stated criteria. The results were compared based on the grade and the publisher.

3 Results

The results by individual criteria are presented in the following section.

3.1 Ratio Between Text and Pictorial Material in Textbooks

The combination of illustrations and words is an important factor in encouraging children and students. In literature, the material is most effective if it is properly presented. In textbooks, the appropriate ratio between the pictorial material and the text is chosen according to the students' level of development.

In environmental science, textbooks for the first and second grades by all four publishers were found to have the same ratio between pictorial material and text; namely, pictorial material represented 70% and text 30%. For the third grade, publishers A, B and D had the same ratio between pictorial material (60%) and text (40%). Only publisher C differed and had 50% pictorial material and 50% text.

For social science, the textbooks for the fourth and fifth grades had quite different ratios between pictorial material and text. For the fourth grade, the textbook from publisher A had 30% pictorial material and 70% text, and from publisher B it had as much as 60% pictorial material and 40% text. In contrast, the textbooks from C and D had the same ratio between text and pictorial material. For the fifth grade, the textbook from publisher A had 70% pictorial material and 30% text, and while the share of pictorial material (50%) and text (50%) from publisher B were the same, the textbook from publisher C had 40% pictorial material and 60% text, and the textbook from publisher D had the least pictorial material, namely 30%, and as much as 70% text.

3.2 Representation of Pictures, Photographs, Sketches, Graphs, Tables and Diagrams in the Textbook

The study examined the representation of various pictorial materials in textbooks.

For the subject of environmental science, photographs had the highest representation (65.5% of all pictorial material), followed by pictures (30% of all pictorial material), and schemes (1.8% of all pictorial material), sketches (1.4% of all pictorial material), tables (1.0% of all pictorial material) were much less represented, while the least represented were graphs (0.2% of all pictorial material).

Table 1: Numbers (f) and structural percentages (f%) of types of pictorial material for social and environmental science

Types of pictorial material	Environmental science		Social science	
	f	f%	f	f%
Pictures	121	30.0	341	20.2
Photographs	265	65.6	1.119	66.2
Sketches	56	1.4	16	0.9
Graphs	9	0.2	1	0.1
Tables	41	1.0	8	0.5
Diagrams	71	1.8	206	12.2

Source: Own

For the subject of social science, photographs also had the highest representation (66.2% of all pictorial material), followed by pictures (20.3% of all pictorial material), schemes (12.2% of all pictorial material), sketches (0.9% of all pictorial material), tables (0.5% of all pictorial material), while graphs (0.1% of all pictorial material) were also the least represented.

3.3 Pictorial Material's Contribution to the Improvement of the Understanding of Textbook Content

Pictures allow students to use their imagination to identify events in a book, which encourages students to come up with ideas based on their imagination and creativity. Diamond (2008) believes that pictures in textbooks are important, as their use causes students to learn better and with greater ease. Children often associate pictures with their life experiences, thus finding the meaning of the picture.

The results show that pictorial material contributed the most improvement in the understanding of textbook content in the third grade (100%), a little less in textbooks for the first grade (99.6%), and the least in textbooks for the second grade (99.4%).

Publisher A stood out because all pictorial material (100%) was related to the presented topic, publishers B and C were equal (99.8%), and the smallest connection between pictorial material with the presented topic was found in publisher D (99.3%).

The social science textbooks were almost entirely (99.9%) related to the topic for the fourth grade and slightly less (99.7%) for the fifth grade.

3.4 Up-to-Datedness of the Pictorial Material in the Textbook

Jurman (1999) says that a textbook is intended for mass use, so it must be designed according to certain principles. The language in the textbook must be appropriate to the developmental stage of the students who will use it; the difficulty must be adapted to the average student at a certain stage of development. The personal component is also important, as it creates an attitude towards the book among students. There are various types of content in textbooks that need to be up-to-date. It is important to choose content that will be the same for at least five years, as textbooks are approved for five years (Turk Škraba, 2006).

The study utilised only pictorial material the up-to-datedness of which could be clearly understood. Any topic related to the past was omitted in the analysis. The results show that, concerning the pictorial material, the textbooks for the third grade (30.0%) contained the least obsolete items. The textbooks for the second grade (36.4%) contained a few more, and the textbooks for the first grade (42.2%) contained the most. The textbooks from publisher A contained the most up-to-date pictorial material (78.6%), followed by publishers D (69.6%), C (54.8%) and B (54.3%). There was more obsolete pictorial material (20.0%) in textbooks for the fifth grade than in the fourth grade (15.7%). The publishers A and D had fully updated pictorial material in their textbooks (100%), B had a little less (90.0%), and the publisher C had significantly less (44.4%).

3.5 Authenticity of the Pictorial Material in the Textbook

The visual design and arrangement of textbooks can give importance and emphasis to some elements in the textbook. Students first visualize and understand the words between the illustrations in their textbooks (Hibbing & Rankin-Erickson, 2003). Authors must be very careful when choosing illustrations or pictorial material, since illustrations have a great cognitive and educational effect (Justin et al., 2003). Students at the primary level in particular internalize pictorial text, so it must be authentic, which means that it depicts the true reality of the children's world. For the subject of environmental science, most pictorial material depicted authentic situations (98.1%). However, there were also cases where the pictorial material did not represent an authentic situation (1.9%). Also, for the subject of social science,

there were some examples of pictorial material that does not represent an authentic situation (1.2%).

3.6 Additions to the Pictorial Material

In addition to subjective influences, the objective conditions or methodological determinants of the textbook are important in the design of the textbook. Jurman (1999) defines them as follows:

- Substantive
- Design
- Cognitive
- Technical

In the technical determinants of textbook design, the general form of letters and illustrations must be adapted to the developmental stage of students, readability must be maximal, illustrations must be correctly arranged in the text, and the textbook format for lower grade students must be A4 (*ibid.*). In the study, the additions to the pictorial material were delineated as either description or commentary.

Pictorial material had adequate additions in textbooks for the second grade (98.2%), slightly less in textbooks for the third grade (96.9%), and least in textbooks for the first grade (96.1%). The textbooks from publisher C had the most proper additions to the pictorial material (98.6%), followed by publishers D (96.8%), A (96.6%) and B (96.6%).

In textbooks for social science, pictorial material had adequate additions more often in the fifth grade (99.0%) than in the fourth grade (96.3%). Publisher C stood out, as all pictorial material (100%) had adequate additions, followed by D (98.7%), A (97.7%) and B (94.7%) with the smallest share.

3.7 Appropriate Size of the Pictorial Material in the Textbook

The study also observed the appropriate size of the pictorial material, as well as the size ratios between animals, objects and people.

The results show that the size of the pictorial material in the textbooks was most often appropriate in the first grade (99.7%), followed by the third grade (99.3%), and it was least appropriate in the second grade (99.0%). In terms of the appropriate size of the pictorial material in the different publishers, publisher C stood out the most (99.5%), followed by A (99.1%), D (99.4%) and B (98.9%). The pictorial material was more often adequately sized in textbooks for the fifth grade (98.8%) and less often in textbooks for the fourth grade (97.4%). Among the publishers, all pictorial materials were adequately sized in the textbooks by publisher C (100%), followed by A (99.1%), D (98.7%) and B (94.7%).

3.8 Unnecessary Details in the Pictorial Material in the Textbook

In learning literature, the materials are most effective if they are properly presented. Therefore, in textbooks, only a small number of pictures is selected that best helps to understand the text in different parts of the same chapter.

In the textbooks for environmental science, most of the pictorial material was without unnecessary details (99.7%), but some examples contained unnecessary details (0.3%).

In the textbooks for social science, all examples contained necessary details (100%).

3.9 Supporting Verbal Information with Pictorial Material

The language used in the textbook should be close to the student. It must be interesting to encourage the student to participate. Language includes not only text but also pictorial material. In the first three years of primary school, pictorial material already carries independent messages and can completely replace the text. Art and graphic equipment are also important for the effectiveness of the textbook. Therefore, the role and position of pictorial material, font, font size, textbook format, text structuring, titles and subtitles, and transparency of information are important (Blažič et al., 2003).

The study also focused on whether the pictorial material was related to the discussed topic. There were some cases in the textbooks for environmental science where the pictorial material did not support the verbal information (0.2%). In the case of the

textbooks for social science, all pictorial material was supported by verbal information (100%).

3.10 The Emergence of Gender Stereotypes in the Pictorial Material in the Textbook

Visual images are often treated as ornaments in textbooks, although they are much more than that. Younger students learn from illustrations that help them shape their views of society. Books and textbooks are examples for students, based on which they can form certain stereotypes as soon as at the age of five. Children's books are an important source of gender stereotypes. Gender stereotypes were present in the pictorial material in the textbooks for environmental and social science.

The highest number of gender stereotypes in the pictorial material, where it could be understood, was present in the textbooks for the third grade (88.1%), slightly less in the second grade (77.6%) and the least in the first grade (65.6%). The least gender stereotypes were present in the pictorial material from publisher A (58.1%). In contrast, the percentages were higher in B (83.3%), D (85.0%) and C (85.4%).

The results showed that more gender stereotypes were present in the pictorial material in textbooks for the fifth grade (92.9%) than in textbooks for the fourth grade (80.0%). They were least present in publisher A (80.0%) and most in publisher C (91.7%).

4 Conclusion

It can be concluded that the choice of pictorial material in textbooks for environmental and social science is still given too little attention. Although the authors of the textbooks follow certain criteria when choosing pictorial material, the authors of this study believe they should follow the criteria presented in this paper.

The study found that there was a much higher proportion of pictorial material in lower grades than text. In contrast, it was the other way around in most textbooks for the fourth and fifth grades. The reason for that could be that the students in the lower grades are just learning to read, and the content is easier to remember with the help of pictorial material. The division of the ratio between pictorial material and

text was appropriate in most textbooks. However, there were also a few cases where, in our opinion, it would have been better for the ratio to be more appropriate to the developmental stage of the students.

Umek's and Cimeša's (2008) study showed that there was the most illustrative text in fourth grade textbooks for social science, while explanatory text was in second place. The same could be seen in publisher B in the current study, while publisher A had more text. Lukša et al. (2014) state that concepts in environmental science must be presented in textbooks in the form with which children have the most contact because this way children learn about nature and everything around them. Without authentic images or pictorial material, the student will not recognize certain concepts in everyday life. Therefore, it is important that the textbook contains as many instances of pictorial material as possible that give meaning to the real situation of the children's world. Photographs and pictures were the most represented in the textbooks. Here, the authors must point out that pictures were most represented in lower grades and photographs in higher grades.

Pictorial material can motivate students to study the attached text and encourage them to process the textual data included in the pictorial material in more detail. Pictorial material can also explain content that is not easy to understand (Peeck, 1993). The authors' criterion for supporting verbal information with pictorial material is also derived from this. In the study, some pictorial material that did not support the verbal information was also found in the textbooks. Such pictorial material confuses the student even more and distracts from the content.

A criterion that was determined, among other things for the analysis of pictorial material, was appropriate additions to the pictorial material, as Blažič et. al. (2003) emphasize that the role and position of pictorial material and titles and subtitles are important. Most of the pictorial material in the textbooks in this study was organised according to the authors' advice.

Poljak (1983) states that it is very important for students at the primary level to present facts and abstractions artistically. Reality should be presented as realistically, obviously, and unambiguously as possible, and the facts as close to the students as possible. Thus, it is important for the pictorial material in the textbook to be authentic and to show real situations in the children's world. The analysis of the

pictorial material showed that there are also cases in the textbooks where the pictorial material presents inauthentic situations that distance students from reality.

There were various topics in the textbooks that needed to be up to date. It is important to choose content that will be the same for at least five years, as textbooks are approved for five years (Turk Škraba, 2006). The same can be related to pictorial material, which must show current things and situations. The study showed that there were examples of pictorial material with obsolete objects, especially in the textbooks for environmental science – less so in the textbooks for social science.

The study also focused on the phenomenon of gender stereotypes in pictorial material. Gender stereotypes were still present in the pictorial material in the textbooks for environmental and social science. The analysis of three textbooks (*Playway to English 1*, *Magic Adventure 2*, *Cookie and Friends*) also showed that the textbooks contained a lot of gender stereotypes and that they would need some corrections, depending on the children's cognitive development and their visual perception and depending on the age of the children for whom the textbooks were intended. Men are more often represented in textbooks than women. Moreover, in all textbooks, men are presented as more active, and women are presented on the side in a silent social role (Sovič & Hus, 2014). In the pictorial material used in the current study, females were also often depicted as housewives.

It would have made sense to include all textbooks for the primary level in the sample and thus obtain more detailed data, which would certainly have provided a better picture of the situation in this area.

Finally, in the future it would make sense for textbooks to:

- contain a ratio between the pictorial material and the text appropriate for the level of development of the students;
- contain different types of pictorial material;
- contain pictorial material that would be fully related to the presented topic;
- present current objects and situations authentically; and
- contain properly equipped pictorial material.

Real situations must be presented in the pictorial material, without unnecessary details and with an appropriate ratio between the size of the objects in the pictorial material.

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