WEB GRAPHIC ORGANIZERS AS AN ADVANCED STRATEGY FOR TEACHING SCIENCE TEXTBOOK READING COMPREHENSION

Marija Ropič, Metka Kordigel Aberšek
University of Maribor, Maribor, Slovenia
E-mail: marija.ropic@uni-mb.si; Metka.kordigel@uni-mb.si

Abstract

This paper presents the results of the 5 months experiment in which the influence of using a web graphic organizer in the science literacy curriculum was observed. The interest of the study was focused on the quality and quantity of learning/understanding the explicatory text description from the science textbook. The experiment included students at the age of 8-9 years. Science and L1 class were integrated for this purpose: teachers were instructed to use web graphic organizer as a tool for visualizing the text structure on the level of concrete cognitive operations. The results show the effect of using the web graphic organizer on students' competence to find out what in the science textbook text is important, on the level of text comprehension and on the competence of comparing new information with the previous knowledge.
Key words: *Web graphic organizer, pre knowledge, categorization of concepts, reading comprehension, description, science textbooks.*

Introduction

Reading comprehension is a multifaceted process. It is not enough, students develop decoding skills, they also need metacognitive skills, so they can monitor their understanding and reflect on what has been read (Kordigel Aberšek, 2008). Some teachers may assume that reading comprehension will develop naturally without any direct teaching of comprehension. But it will not. Each reading skill must be taught through formal education. An endless number of experiments have proven that learning basic reading strategies leads to better understanding of written communication created by others (Buehl, 2009, Gregory, Cahil 2010). Although the crucial role of comprehension instruction has been recognized, struggling readers typically receive even heavier doses of decoding instruction while failing further behind in their academic courses because their inability to deal with challenging academic texts (Kintsch, Hampton, 2009). Buehl (2000) points out, how the instructional activities can help students sort key ideas and concepts from background details focus attention on questions as such. He underlines the fact that students often miss the point the author may be sharing in the written text and instead find themselves lost in a maze of factual details. One must not forget that comprehension depends on reader's making reflective decisions. Classroom strategies can help students perceive the structure of the text – the relationship between ideas and information –are the prerequisite for determining the importance.

In other words, reading lessons do not end, when students are able to decode the words. Students need the instruction that will support their understanding of what they are reading about and of that what is more or less important. Students in primary grades are particularly challenged by the use of science textbooks (Bryce, 2011). Not only that they have to make meaning from textbooks that are hard to read and understand, they often still have difficulties at the decoding process and vocabulary (Moss, 2005). The consequence of this circumstance is the fact; they cannot use enough of their reading energy for "understanding" and "learning" the text.

Due to the proliferation of nonfiction texts in upper elementary grades and beyond, there is a push to integrate more content area instructions and use of nonfiction texts in younger grades (Duke & Bennett – Armistead, 2003; Frey & Fisher 2007). Textbook publishers are often criticized for producing textbooks that are quite challenging for young readers. Textbooks use difficult vocabulary, condense information about presented topics, present superficial information and use language that is uninteresting. (Brice, 2011)

Therefore teachers must find ways to make the textbook reading more meaningful for young readers. One of the ways is to teach them to recognize the text structure and to predict which information in the text they can expect and which of them will be more important than the others. On this point we reach the central problem: for recognizing text structure the mental processes of generalization and abstract thinking is necessary. But the children in first grades, which need our help in text understanding, are on the level of concrete cognitive development. And on the concrete cognitive level they do not have the ability of abstract thinking and generalization. Our main idea was, to substitute the lack of such cognitive ability with the visualization of text structure. This procedure makes possible "to see"/and understand the text structure with the mental process on the concrete cognitive level. In our paper we will show how we successfully solved this problem with the use of graphic organizers. In our experiment science and L1 class were integrated for this purpose: teachers were instructed to use web graphic organizer as a tool for visualizing the text structure on the level of concrete cognitive operations. The results show the effect of using the web graphic organizer on students' competence to find out what in the science textbook text is important, on the quality of text comprehension and on the ability of comparing new information with the previous knowledge.

Recognizing Text Structure: a Way of Learning from Science Textbooks

Science literacy incorporates an understanding of the nature of science, investigations of the natural world, the ability to use reading, writing, listening, and speaking to learn about science, interpretation of data and communication of scientific findings, prominent features, etc. According to aims in science literacy curricula students should train reading and listening strategies how to get knowledge about science topics and how to get the information from the field of science. (Yerrick, Ross, 2008) The **science reading curricula** teach reading expository texts for acquiring knowledge from them and teach how to get a single information or set of information from the same kind of text. (Yetton, Alexander, 2008).

The process of acquiring science literacy cannot be started early enough. Teachers should begin in the first grades, since "students of primary grades are particularly challenged by the use of science textbooks. Not only they have to make meaning from the textbooks that are hard to read and understand, but they are often not provided with opportunities to read nonfiction texts of their own, rendering this genre unfamiliar and more challenging" (Bryce, 2011: 474). Vocabulary in textbooks for young students is too difficult, information about many topics is condensed, textbooks present a superficial view of information, their language is uninteresting (Brice, 2011). To support content area of learning science, teachers must find ways to make the textbook reading more meaningful for young readers. One of the ways is to teach them to recognize the text structure and to predict which information in the text they can expect and which of them will be more important than the others.

Explicatory texts in science textbook have a specific text structure - similar as literature texts. It is very traditional to educate students about the structure of sonnet or antique tragedy or classical fairy tale and far less traditional to teach students about the **structure of explicatory texts** in their science textbooks. Informational texts are commonly organized into different form as compare/contrast, problem/solution, cause/effect, chronological/sequence, and descriptive form (Fischer, Frey, Lapp, 2009). Text structures are used by writers to illustrate relationships among concepts. Often these are accompanied by signal words that serve as guideposts, alerting the reader to a conceptual relationship. It is very helpful for students to recognize the text pattern (Vacca & Vacca, 2008), since **recognizing text structures and signal words helps them to make sense of the text.** Text structures provide students with frameworks for understanding the text content (Montelongo et. al., 2010). The recognition of an organizational pattern facilitates the learning of textbook information because it enables the reader to see the logical relationships advanced by the author (Ogle & Blachowicz, 2002).

In short, even students of first grades must recognize the interrelationships among the topics, main ideas, and supporting details of paragraphs in their textbook, if they want to comprehend and remember the important points. They have to be aware of the different types of text structures and signal words to guide their comprehension. Furthermore, students must be able to generate mental representations of the different structures to learn, remember and write about the information from text. Lessons focused on text structures can help students to find out, what is important and what not. On the elementary level teacher can/must focus the attention of his students on the text structure. On the first place among the five text structures Thomson suggests to work, on the elementary level, with the description text structure (Tompkins, 2001).

Graphic Organizers Based on the Text Structure

How to help young students to recognize text structures in science textbooks? One way to teach them to recognize the different text structures is to provide them with practice deconstructing and reconstructing paragraphs with graphic organizers, which are visual representations of text structures that capture the relationships between main ideas and supporting details (Montelongo et al., 2010). Graphic organizers can also help teaching students to conceptualize the relationships among the new knowledge, existing knowledge and their misconceptions (Buehl, 2000; Fisher et. al. 2008; Kose, 2007). Once students have learned the expository text structures, they can use them to generate their own texts. The graphic organizers can also be used to scaffold their writing as well. Some examples are shown at the Figure 1.

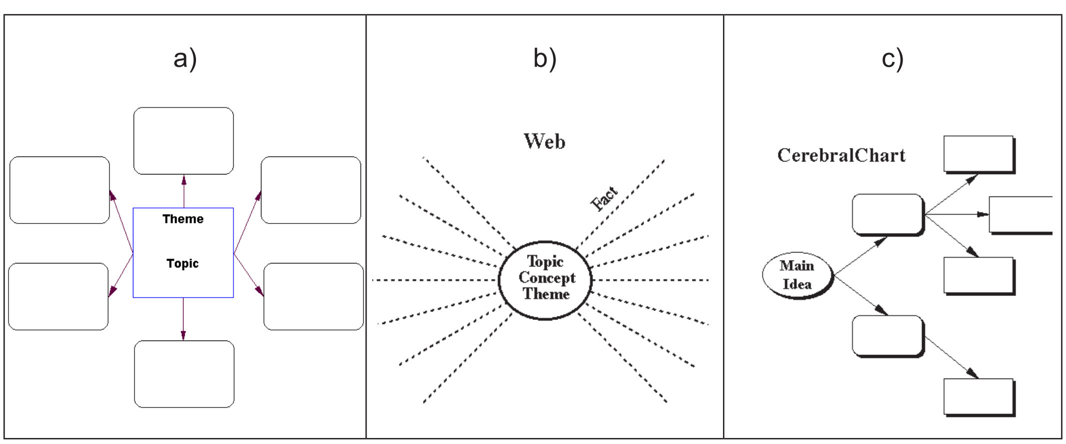


Figure 1: Some examples of Graphic organizers.

Aim of the Study

On a behalf of all this we started a 5 month experiment in which we analyzed the influence of using a web graphic organizer on the quality and quantity of learning/understanding the explicatory text from the science textbook by the students at the age of 8-9.

Methodology of Research

The study was conducted in the third grade of the compulsory school in Slovenia. The aim of the research was to establish the effect of using web graphic organizers, based on the text structure, on quality of understanding the explicatory text.

For our research we used the adopted version of one form of the graphic organizer, namely web graphic organizer (see figure 1b). Graphic organizers help students visually organize information to support their comprehension. They are useful because they highlight the important ideas in the text and show how these are related to each other. They are visual representations of a student's knowledge and are structured to show relationship through labels. Graphic organizers present information in concise ways to show key parts of the whole concept, theme or topics and are highly effective for all students. (Fischer, Frey, Lapp, 2009). When students are actively engaged in processing the text, they are using skills such as analyzing, synthesizing, evaluating and summarizing. Graphic organizers help students with these skills by organizing information to show, how it is related. According to information theory process (Broadbert, 1958) as briefly shown figure 2, graphic organizer is a tool that helps students to reduce the demand on their working memory and facilitate information transfer into long-term memory (Fisher&Frey, 2008).

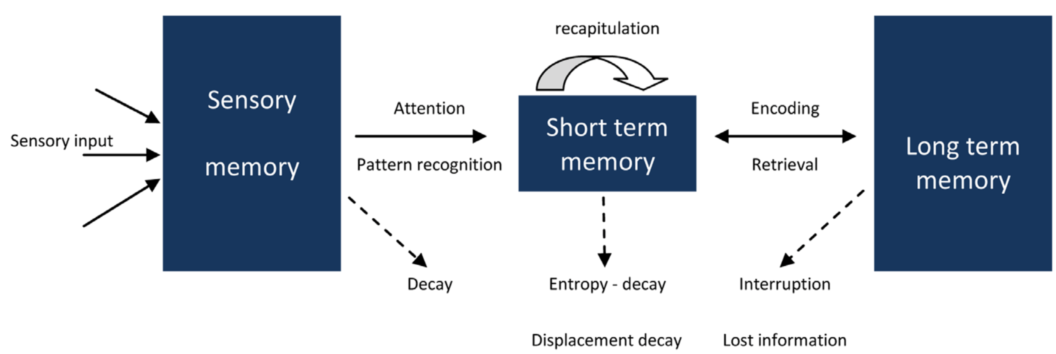


Figure 2: Model of information process.

Graphic organizers should be used for individual work or in small groups. Working in small groups the students should get the instruction to identify the specific text pattern and locate and highlight key words that would aid them in the identification and comprehension of particular text. On the primary level the learning process can proceed only if it happens on the level of concrete operations, so the meta(re)cognition of the text structure is possible only if the child can see it (on the concrete level!). To achieve this, it is useful to ask children to complete a graphic organizer, which **makes the text structure visible**.

The research was organized in two groups of students:

- the first (experimental) group, where the experiment as described was conducted,
- the second (control) group, where teachers worked as they had worked in the previous years.

Experimental group (ES):

In the experimental group it is performed an integrated approach of mother tongue (L1) and science class: learning the ability to read/understand and to write the text structure: description (mother tongue curriculum) and learning about different animals from the textbook (science class curriculum). We decided for such integration because we knew that reading and understanding of explicatory text is the aim of the mother tongue curriculum already at the beginning of the compulsory school (from the first grade on) and that students in science class have to learn *how to learn* from their science textbooks, where explicatory texts are used. Integrating this curriculum aims gave us enough time to perform the experiment in the frame of regular school time and promises better results in science class and in reading understanding. In the period of 5 months science class and mother tongue class were integrated always when "animal" and "description" were taught. Teachers from the experimental group were instructed to use web graphic organizer as a tool for visual presentation of the text structure *description.*

Recent reading research points out the importance of connecting the new information in the text with readers' previous knowledge (Bass, Gee Woo, 2008). It has shown teachers how to help students comprehend and has identified strategies that good comprehenders use. Reading teachers and content area teachers should design lessons that help students comprehend (i.e., learn from) specific texts and need to develop comprehension strategies that readers can use on many different types of texts (Grill, 2008). So the students in our experimental group were encouraged in the framework of science class to recall their previous knowledge (existing mental scheme) about the animal they shall learn about and to draw the web graphic organizer. In the first science lessons web graphic organizer was introduced by the teacher. He used graphic organizer for recording of the lesson about the animal: he recorded the central word (topic) in the center of the picture, the key words (subtopics) around it and the supporting information in the form of arrows coming from keywords. After repeating this several times, children were encouraged to use graphic organizers for recording the previous knowledge about the animal they shall learn about in the science class by themselves. The work was organized in small groups or in pairs. Each group had to draw its own graphic organizer. After science classes, where teachers were free to select the didactic approach of "teaching" about the animal (lecture, didactic conversation, school in nature, visit of the near farm or aquarium…) students individually read the related chapter in their textbook, where the text structure *description* was used. After reading the groups gathered in the previous form, took the web graphic organizer, they had made before reading and added or changed it according to new information, they had learned from their textbook.

Control group (CG)

As already mentioned, in control group teachers worked as they had worked in the previous years. This means:

1. they didn't integrate mother tongue class and science class, when they taught *description* or *animal*. They didn't teach *description* on the text from the science textbook. Instead of that they used one of the special textbook for nonfiction texts, which are recently awaible on the marker to teach functional literacy in Slovene schools;
2. teachers used web graphic organizers here and then (as they are commonly used in Slovene schools), but they didn't used them systematically for making the text structure description I science textbook visible;
3. Children were not encourages to use web graphic organizers by themselves.

Sample

For monitoring and proving the influence of using web graphic organizers based on the text structure on the understanding of the explicatory text in science textbook we decided to compare the results of two groups of students:

- the first (experimental) group (EG), where the experiment as described was conducted,
- the second (control) group (CG), where teachers worked as they had worked in the previous years.

The whole sample contained 144 third grade compulsory school students (in Slovenia: the age from 8 to 9 years). There were 84 students in the first, experimental group (in four classes) and 60 students in the second, control group (in four classes). Sample choosing of students was random and connected with the choosing of teachers. There was only one criteria we took into account: we chose for the experiment classes, where the literacy process has reached such level of decoding skill, that students could spend enough reading energy for reading comprehension, which is the level, they should reach when we decide to promote reading instruction for learning from the textbooks.

Of course it would be ideal for our experiment, if all the children would be taught form the same teacher (since different teaching styles could be considered as a second variable). But this was unfortunately not possible. In Slovenia primary teacher teaches all the school subjects (22 hours a week) and the number of classes, included in our experiment was 8. So we accepted some limitations in selecting teachers for the experiment. To exclude the influence of different teaching style on the results of the experiment to a possible minimum we selected teachers according to some criteria:

- We excluded teachers (classes) where teacher tend to integrate all school subjects, which still happens in the first triennium in our county as a consequence of such didactic recommendation some years ago. As source of information about using the general integration strategy we chequed teachers written preparation for three weeks of school work.
- All the teachers, included in the experiment used the monographic analytic –synthetic literacy method combined with the global literacy method. They performed the literacy program, while using the same literacy textbook and supporting didactic material. The timing and the implementation of mentioned methods was guided by the instructions in teachers' handbook, which was designed for teachers which are using the selected teaching material.
- All the teachers taught science according to the same curriculum and according to the same didactic recommendations in the curriculum.
- All the teachers had university level of teachers education and all of them were almost of the same age (between 35 and 40 years old).

Data Collection

We collected data twice: before the five month experiment and immediately after finishing experiment. For data collection we used the same form of web graphic organizer, shown at the figure 3, that was introduced to students during the experiment with the only difference that this time, they had to work individually.

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Volume 41, 2012

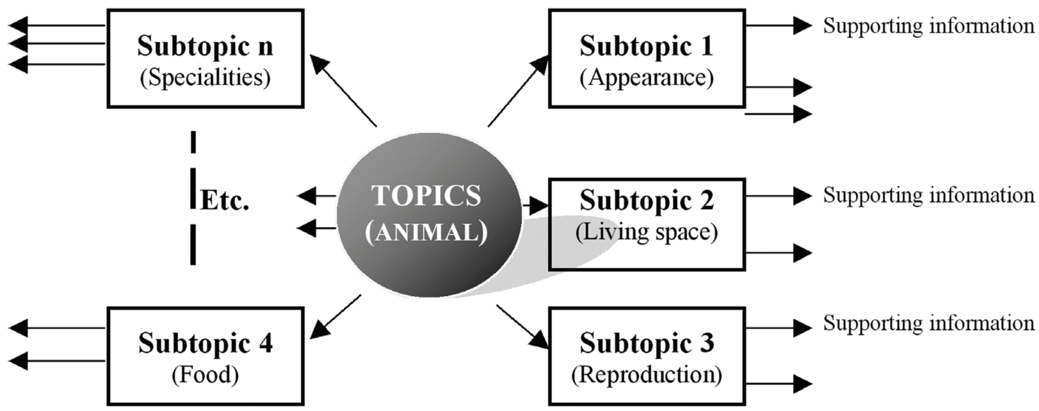


Figure 3: Web graphic organizer.

To reach the objectivity of results, we decided to use for data collection *before* and *after* the experiment the same topic and the same textbook text: the topic *cat*. In the textbook the animal was presented with the text structure *description.* The textbook offered students also 7 photographs of the cat, which visualized the key data ("key words") the verbal part of the text was talking about. The text was structured into paragraphs. Each paragraph gave information about one of the "key words". The textbook text also offered visual cues (bold, bullets, colored print…) as help for better understanding.

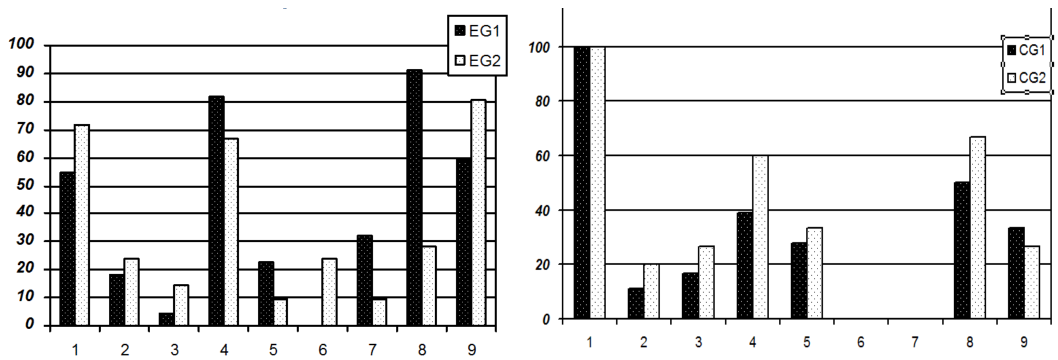
Before reading the text about the cat, students in experimental and control group had to draw the web graphic organizer of their mental scheme cat on the A3 paper sheet. They were instructed to write the data with the green pencil.

After that students read the textbook twice. After second reading the teacher returned web graphic organizers, students draw before reading. This time they had to add the new learned data or to correct the previous marked wrong data and substitute them with the new ones with a blue pencil.

Results of Research

Presenting Pre Knowledge

Before and after the five month experimental period in which teachers of the experimental group systematically introduced web graphic organizer for visualization of mental scheme/*text structure,* we chequed the students ability of using web graphic organizer as a tool for presenting pre knowledge (existing mental scheme). Every student of the experimental and control group was asked to draw a web graphic organizer CAT. We labeled recorded information and formed 9 groups of subthemes. Results are presented in figure 4.

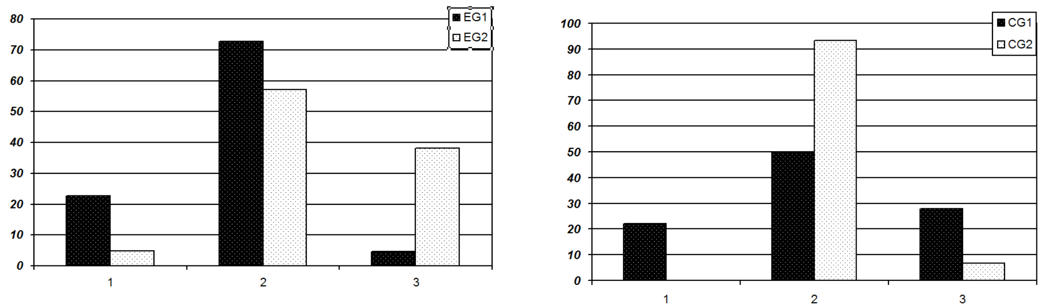


Subtopics: 1- appearance; 2 - living space; 3 - use; 4 - food; 5 - reproduction; 6 - moving; 7 - animies; 8 - behavior; 9 - specialties

Figure 4: Quantitative results of the experimental (EG) and control (CG) group: pre knowledge before and after the experiment.

Comparison of web graphic organizers according to figure 4, that present the pre knowledge of students in experimental and control group (Figure 4a) shows, that all students were primarily focused on data about appearance (1), food (4), behavior (8) and specialties (9) and that they more or less neglected data about moving (6) and enemies (7). Comparing results of both groups after the 5 month experiment (Figure 4b) on the other hand shows the progress of the experimental group. Working with web graphic organizers, students could visualize the text structure of *animal description* and after 5 months they knew on which groups of information they have to focus their attention: experimental group's pre knowledge graphic organizer after experiment shows data from all 9 subthemes, even about moving (6), which was before the experiment for them unimportant information.

The quality of web graphic organizers of students in both groups (EG and CG) used for recording their pre knowledge also was compared. Students' records were divided into three categories: *linear record*, *simple graphic record* and *structured graphic record*. We put into the category *linear record* all those records in which we could observe the absence of any web pattern and in which students instead of web records used linear sentences or parts of sentences. As a category *simple graphic record* we counted those records in which students used a compilation of web pattern and linear sentences. As a category *structured graphic record* we counted all those students' records which had a form of web graphic organizer, which means central word (topic), key words (subtopics) around it and supporting information connected with arrows, which are origining from the correct subtopic. Figure 5 presents the results of both groups before and after the experiment. It is obvious that almost the same number of students (22, 7% in experimental group and 22% of the control group) before experiment used the form of simple linear record for presenting their pre knowledge. On the other hand we can observe the remarkable progress of the experimental group after the experiment concerning the use of structured graphic record and concerning decrease of such record in the control group.

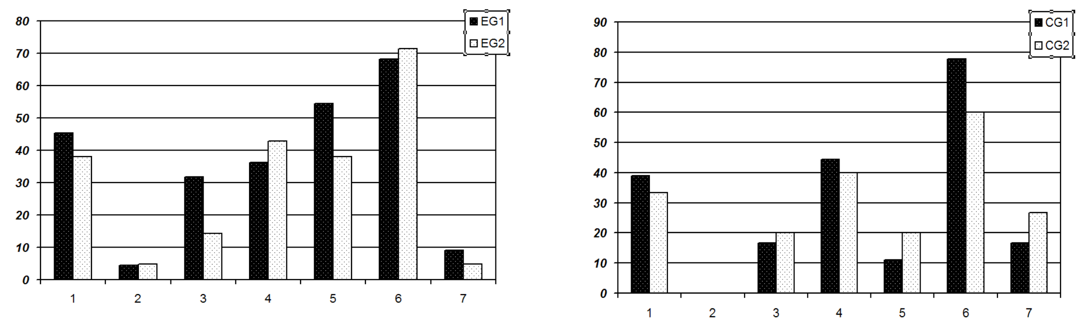


Quality of written record: 1 - linear record; 2 - simple graphic record; 3 - structured graphic record.

Figure 5: How students wrote down their pre knowledge before and after the experiment.

Presenting New Knowledge

After reading the text in their science textbook we checked the number of information students of EG and CG have noticed and recognized as important. The explicatory description text Cat in the science textbook was structured in 7 subthemes that we labeled with key words: *appearance, living space, use, food, reproduction, behavior* and *specialties*. Figure 6 shows the quantitative results.

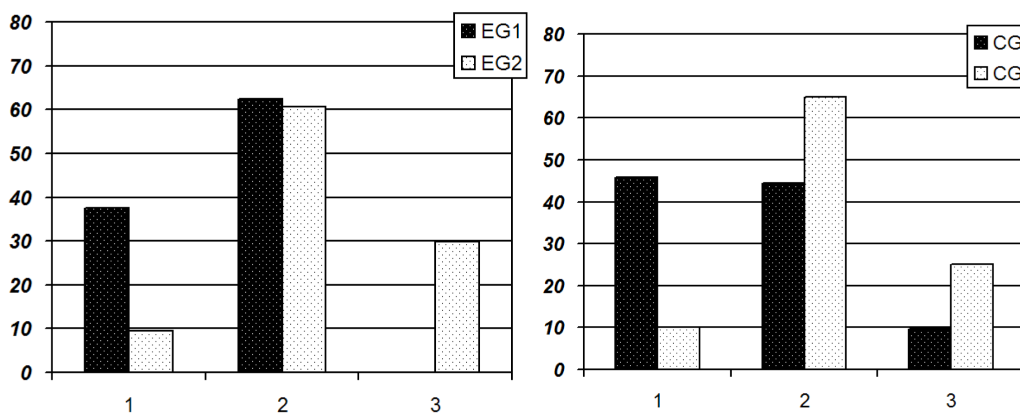


Subtopics: 1 - appearance; 2 - living space; 3 - use; 4 - food; 5 - reproduction; 6 - behavior; 7 - specialties

Figure 6: Quantitative results of the experimental (EG) and control (CG) group: knowledge record after reading explicatory text before and after the experiment.

Comparing the number of information students have noticed in the explicatory text shows that students in the experimental group recorded a bigger number of information and that those information derived from all 7 subthemes, the textbook description had mentioned. On the other hand students of the control group didn't notice information from the subtheme living space or didn't think it would be important.

The quality of web graphic organizers from students of both groups (EG and CG) used for recording their knowledge **after reading their science textbooks** also was compared. As the current research points out the importance of connecting the new knowledge with readers' previous knowledge/mental scheme, we compared our students' ability of comparison the new mental scheme with their previous mental scheme (pre knowledge). We categorized their records in to three categories: *linear record without connection with pre knowledge*, *graphic record without connection with pre knowledge* and *structured graphic record - connection with* *pre knowledge*. We put into the category linear *graphic record without connection with pre knowledge* all those students' records in which students used a pre knowledge records and simply in linear form added sentences in which they described, what they had read about it in the textbook. We put into the category *structured graphic record without connection with pre knowledge* all those students records in which web graphic organizers were used - and in which students recorded new information in a additive form. This means students' treated new information as a new subtopic (key word) and draw the arrow for it directly form the central word (topic) of the web graphic organizer. And we put in to the category *structured graphic record with connection with pre knowledge* all those students' records in which students web graphic structure shows that a student compared in the text mentioned information with the web, he had drawn before reading the text and added this new information on the place where this information belongs – he draw the arrow from the correctly related subtopic in his web.



Quality of written record: 1 - linear record without connection with pre knowledge; 2 - graphic record without connection with pre knowledge; 3 - structured graphic record - connection with pre knowledge.

Figure 7: How students wrote their knowledge after reading the textbook before and after the experiment.

It is obvious that **before** the experiment the results of the control and experimental group do not differ from each other. A similar part of students recorded their knowledge in the form of linear record and a similar part of students used a simple graphic record. The only important difference was the circumstance that in the experimental group before the experiment (before the intervention) no student used a structured graphic record and the quality of recording knowledge with web graphic organizer was in the control group remarkably better. **After** the experiment the competence of recognizing and presenting the text structure and important text information visually with web graphic organizer in the experimental group improved remarkably. Observing the results after the experiment, we can see that almost 30% of students from the experimental group developed the competence of presenting their knowledge in the form of structured graphic record. The progress in the experimental group seem to be even more important if we underline that the competence of comparing new knowledge with the previous mental scheme developed in the five month of the experiment for 29, 8% of students, who used to build a parallel mental scheme before the experiment.

Discussion

With expansion and accessibility of multiple sources of science information, students are constantly surrounded with choices of informational texts. As a key to accessing knowledge,

ISSN 1822-7864

student success in science classroom today depends of his science/explicatory text reading strategy skill. In this context the findings of described experiment highlight some promising results. They prove the effectiveness of integration of science and L1 class, to reach higher level of student's literacy for reading/understanding texts in their science textbooks for learning science and gathering information about science. Knowing that explicatory texts in science textbook have a specific text structure and knowing that using the knowledge about this text structure can improve understanding, our experiment introduced web graphic organizers in the third grade class. Using web graphic organizers, when learning science integrated with literacy in five month period equipped students with a remarkable skill of using web organizer to make their pre knowledge visible (on the concrete level) and to integrate new knowledge (described in the text) into the preexisting mental scheme. Students of experimental group improved their skill of recording their pre knowledge mental scheme about the chosen animal remarkably. They were able to visualize the text structure of animal description and they knew on which group of information they have to focus their attention. Consequently after reading they recorded a bigger number of information and this information derived from all subthemes, the textbook description has mentioned. The most important result, we have achieved with the five month introduction of web graphic organizer into the science class, is the proof that about the third of the students in the experimental class developed the skill for recording the pre knowledge and the new knowledge in the graphic form of structure *"graphic connection with pre knowledge",* which means that they now are equipped with the tool for visualization of the process in which their knowledge is constructed. In short, we can point out our experiment supports the findings of previous reading research: it is very helpful for students to recognize the text pattern (Vacca & Vacca, 2008), since **recognizing text structures and signal words helps them to make sense of the text.** Text structures provide students with frameworks for understanding the text content (Montelongo et. al., 2010). The recognition of an organizational pattern facilitates the learning of textbook information because it enables the reader to see the logical relationships advanced by the author (Ogle & Blachowicz, 2002). And we can usefully use web graphic organizer for to encourage this process.

Conclusion

Despite that fact, teachers of primary grades have to teach students to use science textbooks in their science class, they also have to teach their students to read and understand explicatory text and to decide, what is necessary to learn and what to remember.

In our research we decided to reach that goal through integrated literacy and science class. We integrated the teaching L1 curriculum goal: *reading and understanding description* with the science curriculum goal: *animals,* since textbook chapters about animals use text structure description. Although relevant literature reminds, we cannot expect quick effect in reading comprehension after reading instruction, but we reached remarkable results after 5 months of systematic introduction of graphic organizer for visualizing pre knowledge and to record the new gained knowledge. One third of the students in experimental group developed the strategy for recording their mental scheme with graphic organizer to the level of structured graphic record, which means, they were able to decide, which words in the text are important and which are less important. After five months this students developed the awareness of text structure, are able to recognize it and to use it as a personal reading/learning strategy. The progress in the experimental group seems to be even more important if we underline that the competence of comparing new knowledge with the previous mental scheme developed at 29, 8% of students, who used to build a parallel mental scheme before the experiment. As experienced teachers we can foresee that this knowledge, after being integrated in to the existing relevant scheme, will become the part of the long term memory, while not integrated information will be sooner forgotten.

References

Bass, M. L. in Gee Woo, D. (2008). Comprehension Windows Strategy: A Comprehension Strategy and Prop for Reading and Writing Informational Text. *The Reading Teacher*, 61 (7), 571-575.

Brice, N. (2011). Meeting Reading Chalanges of Science Textbooks in the Primary grades. *The Reading Teacher,* 64 (7), 474-485.

Buehl, D. (2000). *Classroom Strategies for Interactive Learning*. Newark, DE: International Reading Association.

Duke, N. K., Bennet-Armistead, V. S. (2003*). Reading and writing informational texts in the primary grades: Researcg based practeces.* New York: Scholastic.

Fisher, D., Frey, N (2008). *Improving adolescent literacy: Content area strategies at work* (2nd ed.). Upper Saddle River, NJ: Pearson.

Fisher, D., Frey, N., Lapp, D. (2009). *In a Reading State of Mind*. Newark, DE: International Reading Association.

Frey, N., Fisher, D. (2007). *Reading for information in elementary school: Content literacy strategies to build comprehension*. Upper Sadle River, NJ: Pearson.

Gregory, A. E., Cahill, M. A. (2010). Kindergartners Can Do It, Too! Comprehension Strategies for Early Readers. *The Reading Teacher*, 63 (6), 515-520.

Gill, S. R. (2008). *The Comprehension Matrix: A Tool for Designing Comprehension Instruction*. The Reading Teacher, 62 (2), 106-113.

Kelley, M. J., Clausen-Grace, N. (2007). *Comprehension Shouldn't be Silent*. Newark, DE: International Reading Association.

Kintsch, E., Hampton, S. (2009). *Supporting Cumulative Knowledge Building Through Reading*. In S. R. Parris, D. Fisher & K. Headley (Eds.), Adolescent Literacy, Field Tested (47-57). Newark, DE: International Reading Association.

Kordigel Aberšek, M. (2008). Science literacy: How to teach? *Problems of Education in the 21st Century*, 9, 9-16.

Kose, S. (2007). The Effects of Concept Mapping Instruction on Overcoming 9th Grade Students' Misconceptions obout Diffusion and Osmosis. *Journal of Baltic Science Education,* 6 (2), 16-25.

Lapp, D., Fisher, D. (2009). *Essential readingson Comprehension*. Newark, DE: International Reading Association.

Lapp, D., Fisher, D., Johnson, K. (2010). Text Mapping Plus: Improving Comprehension Through Supported Retellings. *Journal of Adolescent & Adult Literacy,* 53 (5), 423-426.

Montelongo, J., Herter, R. J., Ansaldo, R., Hatter, N. (2010). A Lesson Cycle for Teaching Expository Reading and Writing. *Yournal of Adolescent & Adult Literacy*, 53(8), 656-660.

Moss, B. (2005). Making a case and a place for effective content area literacy instruction n the elementary grades. *The Reading Teacher*, 59(1), 46-55.

Ogle, D., Blachowicz, C. L. Z. (2002). Beyond literature circles: Helping students comprehend informational texts. In C. C.Block, & M. Pressley (Eds.), *Comprehension instruction: Research based best practices* (p.p. 259-274). New York: Guilford.

Vacca. R. T., Vacca, J. A. L. (2008). *Content area reading: Literacy and learning across the curriculum* (9th ed.). Boston: Allyn & Bacon.

ISSN 1822-7864

PROBLEMS
OF EDUCATION
IN THE 21st CENTURY
Volume 41, 2012

Advised by Saleh A. Alabdulkareem, King Saud University, Kingdom of Saudi Arabia

Received: *January 05, 2012*   Accepted: *January 20, 2012*

Marija Ropič	PhD., University of Maribor, Koroška cesta 160, 2000 Maribor, Slovenia. E-mail: marija.ropic@uni-mb.si
Metka Kordigel Aberšek	PhD., University of Maribor, Koroška cesta 160, 2000 Maribor, Slovenia. Phone: 02-229-3900. E-mail: metka.kordigel@uni-mb.si Website: http://www.uni-mb.si/

ISSN 1822-7864