

The Principles of the New Mathematics Textbooks in Hungary

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Abstract

In the following I give a short summary about the planning process and development of the new mathematics textbooks in Hungary. I am going to show that the basic theoretical principles are applied in the new textbooks. I bring examples of good practices for theoretical problems such as for problem solving tests. The first feedbacks from teachers confirm that we are on a good path however we have to meet their need for a lot of ready to use easy tasks for the everyday teaching practice. They were really enthusiastic about the games and put them well into practice but we need to work on the literacy competency skill of the students and teachers.

Keywords: Textbooks, mathematics, teaching.

Classification: U23

Introduction

The development of new curriculum and textbooks meeting the 21st century requirements are high priority in Hungary. We started to develop new textbooks and other learning tools for the age group 6-18 with the support of Social Renewal Operational Programme in 2014. In the first year the mathematics, literature and grammar, history and common natural science pilot books were developed for the grade 1, 2, 5, 6, and 9, 10 students. This offer will expand with the number of books available for grade 3, 7 and 11. The physics, chemistry, geography and biology textbooks are currently in the publishing process in 2015. The series will be completed with the set for grade 4, 8 and 12 in the autumn of 2016.

In the following I describe the curriculum development process which takes three years. In the first year the authors and the creative editor write the pilot version of the textbooks. In the second year the books are tested in practice by thousands of students and at least fifty teachers. We collect systematically the teacher feedbacks week by week. These feedbacks are then handled by independent educational experts who compile an analysis and an assessment. In the third year we utilize their results to reconstruct and rewrite the respective parts of the pilot textbooks. The volumes will get their final form only in the third year.

In spite of the former published textbooks every pilot textbooks are available and downloadable from the internet without any restriction.
(see <http://etananyag.ofi.hu/tantargyak/matematika>)

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It was an essential aspect to rethink the possibility of the didactic rules of the digital media and build connections to the printed books as well. An unimpeachable and inevitable part of the project is the development of the national education portal, where in the future everybody can access the connected digital teaching tools.

In this article I focus on how we achieve our main goals in the 5-8 grade mathematics textbooks. I demonstrate several good examples from the textbooks and in the end I will cite some teacher opinions.

Theoretical background

The textbook is a specialized book which supports the learning and teaching of mathematics. The regular place of usage is in the schools and homes, that is why the most important users are the teachers and students. This is the origin of the didactical triangle (Rezat 2008a, p. 177, Schoenfeld, 2012).

Valverde (Valverde et al. 2012) completed it with the mathematical knowledge to the textbook–student–teacher didactical triangle as the fourth vertex and they got a three dimensional triangle, a tetrahedron. See figure 1.

We do believe that this three dimensional tetrahedron model describes the connections in the system more precisely.

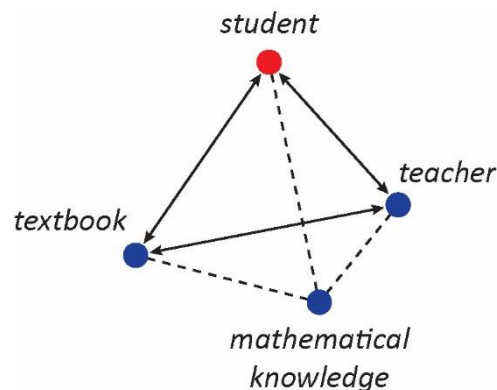


Figure 1: The didactical triangle or tetrahedron

Naturally there are several players besides teachers and students who would like to influence the textbook development according to their preferences. Let us take a look at them and their wishes.

- mathematician: Be precise and mathematically correct.
- teacher: Provide help for the everyday challenges.
- didactic expert: Let it be easy to understand for students and educate them to think.
- student: It shall be interesting and enjoyable.
- government: Suit the aim of the state.
- parents: It should be financially available and easy to handle.

Main principles

In the Hungarian and international practice the interest of the mathematicians and teachers are first priority in the textbook development process. Moreover we have to respect additional viewpoints of other stakeholders as well. Unfortunately in Hungary the student needs were at the end of the line. However when the Varga Tamás teaching method was

launched in the 1970's we were in the lead of the student focused mathematics teaching. Due to several reasons it was lately neglected.

In the beginning of the new textbook process one of our most important decision was to respect the Hungarian traditions and put the students into the focus of development. Parallely we directed our attention to meet the requirements of the teachers as well. This is the main reason why there are several games, research tasks, and problems that intend to improve literacy competency. We created several methodological recommendations for the teachers. For example if the students shall work on the problems in pairs or groups. These suggestions are of course not obligatory to follow but give a good direction how the tasks can be used in the most efficient way.

There is an international expectation that the students shall acquire an applicable set of knowledge by finishing the school years. To reflect this in the textbooks is only possible if the teachers can recognize and utilize these goals, consequently our main task is to provide inservice teacher training.

The socialization of children to student life starts approximately at the age of 6. If they are in the primary school confronted with mathematics only as summation, subtraction, multiplication and division we shall not expect that in the upper grades they will evolve and start to think beyond. We need to start to teach them thinking from the first class on!

Based on this the authors and the creative editor (me) are strongly committed that the mathematics textbooks need to serve problem solving, practice oriented and realistic mathematics teaching at the first sight. We need to build it in a frame which is liked by the students and acceptable by the teachers. At the same time we emphasize that based on the personality of the teacher and their class, it is the teacher's responsibility to find the most efficient way that the students like, understand and learn the curriculum.

The pilot textbooks

Each chapter starts with a whole page graphic as a storyboard connected to the main topic of the chapter to grab the attention of the students and build an emotional connection. These short stories build on each other and form a story of a fantastic class excursion. See figure 2.

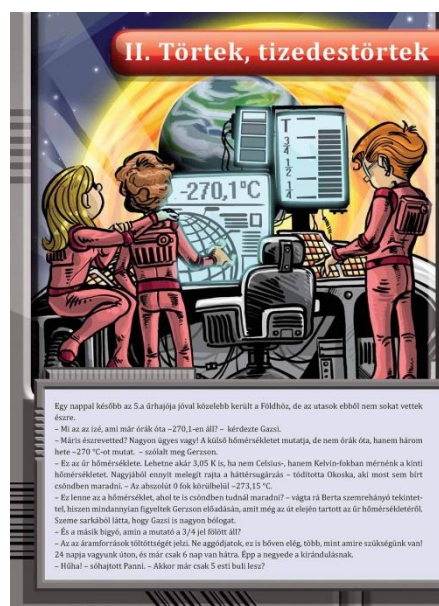


Figure 2: The open page of the chapter of fractions from the book grade 5 (page 43)

According to the first feedbacks this idea was liked by the students although some of them found them a little too long and caused confusion in the teachers in some cases.

Games and manipulating works

In each chapter we aimed to place games connected to the topic. Important to note that these are real games and not only tasks that are usually considered as games only by the mathematics teachers. For example Hangman, Shut the box, Word chain etc.

We usually start our lecture with experimental work. For example the lesson about congruent triangles starts with a groupwork see figure 3.

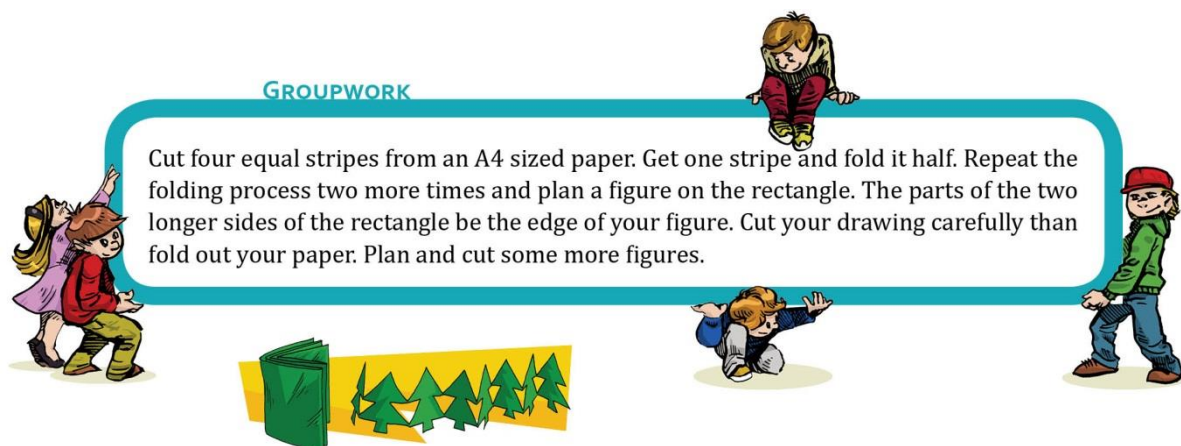


Figure 3: The group work task from the grade 6. textbook (page 54)

Media literacy

We applied plenty of different problems to develop the literacy skills of the students. These problems are really easy if somebody is able to process the information from the text and handle it in the appropriate way. See the figure 4. This type of literacy problems are really useful for students and teachers. First they have to read the whole story and only then they can answer the questions. Not only the PISA test but the Hungarian Competency Measure has a lot of similar problems and we have to note that the Hungarian results are unfortunately not on a high level (see Csüllög et al., 2014).

1. The Stonehenge monument is a remaining part of standing stones and earthworks. It was built approximately 2500 BC and finished the work around 2100 BC. Many people think that it is a cultic or astronomical building, erected by the ancient Celts in England. Galileo Galilei found the four big satellites around the Jupiter in 1610 AC and it confirmed his opinion that the Earth is not the centre of the universe.

- a) How many years did it take to build Stonehenge?
- b) How many years later did Galilei live than the builder of Stonehenge?
- c) How many big satellites does the Jupiter have?
- d) Look up the planets of the Solar System!



Stonehenge

Figure 4: Literacy problem from the workbook of grade 5. (page 21)

Some reactions from teachers feedback:

“There are too few easy tasks to practice, but a lot of word problems.”

“We really need more practicable task for the less talented students.”

We know that it is really useful to have full pages of numbers to sum or multiply them but we also know that practicing without understanding the algorithm behind and the necessity of it is almost useless. We have to find the points which we can remodel and rewrite in order to achieve senseful changes. (When was the last time you had to calculate two ugly fractions without a calculator or a mobile phone?)

Conclusion

We can conclude very useful advices, wishes and comments from the not yet final feedbacks. The teachers on the first hand examined the book from their own viewpoint and only on the second hand hand from the students.

The literacy issues popping up among the teachers confirms that according to the European trends it is crucial to provide high level teacher training and inservice teacher training. The development of high quality textbooks have to go hand in hand with the continuing professional development of teachers.

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