EEPG Science and Math Network Meeting in Bratislava,
12-13 June 2008

Participants
Linda Zemite (Zvaigzne ABC Publishers); e-mail: linda.zemite@zaigzne.lv
Maruta Kusina (Zvaigzne ABC Publishers); e-mail: maruta.kusina@zvaigzne.lv
Anita Teržić Sunjić (Profil International); e-mail: anita.terzic@profil.hr
Suzana Filipašić (Profil International); e-mail: suzana.filipasic@profil.hr
Janina Šulčienė (Alma littera/Šviesa); e-mail: j.sulciene@sviesa.lt
Regimantas Baltrusaitis (Alma littera/Šviesa); e-mail: r_baltrusaitis@sviesa.lt
Mart Kalamees (Koolibri Publishers); e-mail: martk@koolibri.ee
Svjetlana Petrović (Kreativni Centar); e-mail: svjetlana.petrovic@kreativnicentar.co.yu
Ljiljana Vuković (Kreativni Centar); e-mail: vukovic@phy.bg.ac.yu
Thor-Atle Refsdal (Gyldendal Undervsining); e-mail: Thor-Atle.Refsdal@gyldendal.no
Jaroslav Hervert (Fraus Publishing House); e-mail: hervert@fraus.cz
Pavol Tarábek (Didaktis Publishing House); e-mail: didaktis@t-zones.sk
Veronika Adamčiková (Didaktis Publishing House); e-mail: v.adamcikova@didaktis.sk
Jana Mirgová (Didaktis Publishing House); e-mail: jana.mirgova@didaktis.dk
Preben Spåth (EEPG); eepg@adr.dk

Agenda

Wednesday, 11 June

Welcome dinner in City Hotel Bratislava, hosted by Educational Publishing House Didaktis

Thursday, 12 June

Morning session:

First topic: Evaluation of the science textbooks, misconceptions, cognitive analysis
Definition and examples of misconceptions

Veronika Adamčikova (Didaktis) talked about the definitions of misconceptions and gave many examples. Many studies have been conducted to explore the misconceptions of pupils and students over the last two and a half decades. The various causes of the formation of these misconceptions were analysed. It was found out that the formation of misconceptions could be attributed to textbooks too, because of incorrect and incomplete formation of concepts and knowledge. To make all participants aware of this concept, Veronika handed out a list of questions from Physics, Maths and Biology with answers which had been given by
Slovak students, showing widespread misconceptions. It became clear that even some of the participants had several misconceptions! Anyhow it was a very interesting exercise to raise the awareness of misconceptions.

Pavol Tarábek (Didaktis) focussed on the Exploration of misconceptions, the influence of textbooks upon misconceptions, and the cognitive analysis of these misconceptions. He showed examples of the Aristotelian concept of force (incorrect from the light of Newtonian physics) and presented the Vygotskian pseudo concept of electricity, and furthermore presented a cognitive analysis of the concept „force“ in the textbooks. An important argument was that misconceptions stem from textbooks, e.g. the Bohr planetary model of atom which is in many textbooks still shown with the electrons moving around the nucleus, while they should rather use the quantum-mechanical model; this misconception is present in many models and movie clips for physics. Another example is the definition of a year (Julian, tropical/solar, and civil year). Often the problem is that students think that what they see is true, they often forget to do some thinking first before deciding on what they are actually seeing. This may be called the WYSIWRI: ‘What you see is what reality is’ (e.g. the misconception that if an object is at rest, no forces act on it). Pavol showed examples from several Physics textbooks from the participants’ publishing houses where the misconception ‘a force is needed to keep an object moving’ is presented in a lot of pictures and graphs. Then he introduced Vigotsky’s concept theory (the triangular model of concept structure). The basic components are core [C], meaning [M] and sense [S]. This model enables a construction of cognitive models. After this introduction Pavol presented a questionnaire which was further discussed.

The Suzana Filipašić (Profil International) started from the question: Misconceptions all around us - how to beat them in school? The described the
way how to create some knowledge objects in textbooks (both Chemistry and Physics) to prevent or disturb misconceptions. The comparison of knowledge ‘from school’ with knowledge ‘from street’ is important in this context. In addition Suzana presented different ways to beat these misconceptions in schools. She started with definitions of the concept. As a child you learn by experience, later mistakes are passed on from person to person, later from the school etc. Further she gave good illustrations of several common misconceptions with examples like Einstein, Edison, cartoons, 9/11 etc. Finally she explained how the new reform of education in Croatia may be able to prevent some of the misconceptions to be created.

Regimantas Baltrusaitis (Alma Littera/Sviesa) about a new series of textbooks and methods to prevent misconceptions: Qualified authors, illustrators qualified in the subject, qualified reviewers of the manuscripts etc. As the publishing house did not have special tests and studies of misconceptions, but on the other hand strongly felt the importance of this problem, they have started to publish new series of textbooks which are tightly related with integration links to prevent different presentment of the same learning subject in different lessons of different subjects. The series covers several subjects and is called ŠOK (Lithuanian for a) chock, b) jump). The subjects covered include Lithuanian language, History, Natural Science and Literature (Geography and IT are coming). Characteristic for this new approach is cooperation between the teams of authors, every two months workshops for all persons involved in the project, research differences in age groups as to how they accept visual and textual information.

Maruta Kusina (Zvaigzne ABC Publishers) talked about the flower lungwort (Pulmonaria) about which it was written in a book that it changes its colour whenever a bee has been visiting it. In reality she realized that these flowers never change their colours after bee’s visits. She was hereby confronted with a misconception in a book for the first time. Only many years later she got to know
the real reason of colour change (anthocianids during spring frosts change their colour from pink to blue. Another very widespread misconception is the belief that man breathes oxygen and plants breathe carbon dioxide in order to get energy, but this is not true. Finally she gave examples of misconceptions based on differences between the languages, i.e. words in one language sometime shave a totally other meaning in the other language which may lead to serious misconceptions in the students’ minds.

**Afternoon session:**

*Cognitive analysis – workshop*

Pavol Tarábek introduced the principles and basic method of the cognitive analysis of concepts and knowledge in the perspective of curricular theory and handed out a questionnaire concerning potential misconceptions regarding the concept „force“. Afterwards he presented a cognitive analysis of the concept „force“ in the textbooks that had been sent in advance from the participants.

**Second topic: Knowledge and Learning Objects**

Preben Späth gave a short presentation of the definitions of Learning Objects and showed examples form the Internet of freely accessible LO for Natural Sciences.

In addition Pavol Tarábek (Didaktis) explained the difference between knowledge objects and learning objects in the perspective of curricular theory.

Svjetlana Petrović (Kreativni centar) talked about how to adapt 5th grade Math textbooks to the pupils’ cognitive level. From the point of view of the cognitive context, there are two main issues: the student makes the transition from concrete to formal thinking; and the student also makes a transition to another educational cycle. In terms of the curriculum, the difficulties are that the teacher, and thus also the textbook, must cover all topics from the plan and program. However, the program is characterized by a high academic level and discontinuity: there is no horizontal or vertical connection between different contents and no good correlation to other subjects. In addition, there are no knowledge standards. Based on these difficulties, they have set their basic textbook goals. Some of the strategies we have developed include: Problem-orienting the curriculum using introductory problems and activities; new content and concepts introduced gradually, through questions, problems, and then conclusions; connecting horizontally and correlating with other subjects; adding introductory pages for every chapter. Svjetlana gave examples of these approaches from several textbooks.

Regimantas Baltrusaitis (Alma Litera/Sviesa Publishers) presented from the web site of their company a series of Learning Objects for Natural Sciences for grade 5 and 6. For Lithuanuan, History, Physics, Chemistry, Biology and Maths they have developed a lot of LOs.

**Friday, 13 June**

**Morning session:**
Third topic: Has the use of ICT and Internet and smart boards led to changes in the teaching methods practised in the classroom? If so, what is new in the methodology and what are the consequences for the teaching material required? Does this lead to changes in the teaching methods which are reflected in the textbooks and supplementary teaching material that we produce?

Thor-Atle Refsdal (Gyldendal Undervisning) showed an example from new series in Math for grade 1 to 7 (age 6 to 13) which comprises traditional books, an internet site for this series and an additional component for the Interactive White-Board. He presented the web portal MULTI (www.gyldendal.no/multi) on Gyldendal’s web site where teachers (and learners) can inspect lots of interactive materials for Maths at Primary level. All components are adapted to each of the grades 1 to 7, and the exercises can be worked out by the pupils themselves. Last year Natur och Kultur (Sweden) bought the rights to this portal, however, the Swedes have regretted this and have developed their own math web site called PIXEL (www.nok.se/pixel/smakprov), also for the Interactive Whiteboard. These interactive components for the Whiteboard will be bought back from the Swedes. The books are almost the same, so what is called Multi in Norway is called Pixel in Sweden.

Linda Zemite (Zvaigzne ABC Publishers) explained how ICT, Internet and Smart boards are being integrated in the teaching and learning process. The situation in Latvia is that most teachers are not motivated to use ICT in their job. Internet access is not available yet in all schools. Smart boards are increasing in numbers all over the country. Many textbooks are accompanied by CDs, and in the books are indications for links to Internet sites. In addition teachers’ books are accessible from the company web site. By and by it has become clear that ICT is the way of making the learning process more interesting, motivating, dynamic and attractive – probably Smart boards is the best way in an educational environment.
Mart Kalamees (Koolibri Publishers) asked the question 'Why choose YOUTUBE and DIVX?' He showed how Koolibri has used Youtube as a free server for more than 70 learning objects for Physics (go to ‘youtube’ and search for ‘Fyysika.ee’ and see for yourself). The DIVX platform has several advantages, one is the very high compression rate (important for video clips to be put onto a CD or DVD), another being that DIVX is free of charge.

Jaroslav Hervert (Fraus Publishing) talked about interactive materials and their influence on the educational process. First he gave a brief history of equipment support the educational process (OHP, beamers, VHS/DVD players, computer classrooms), the main disadvantages have been big costs and difficulties in use. Another problem has been that most teachers were simply afraid of and negative to ICT in general. Next step has been the development of interactive materials which can be worked with in at least three ways: learning objects, special interactive parts of the content (topic) and full interactive content (textbook). Fraus Publishing House has found the following solution regarding the development of materials for the Interactive Whiteboard: materials are made by teams of professionals, content of the subject is covered for the whole year, links are given to other textbooks/materials, and the products can be used in different ways (whiteboards, computer + beamer, computer classrooms). Finally Jaroslav listed some benefits from using their interactive materials: tailor made support of printed materials, user friendly, all in one, just in time, modification of lessons is possible, active work, work with many sources possible (e.g. links to the Internet, to dictionaries, encyclopaedias), students more actively engaged in the learning process etc. (more info can be found at www.fraus.cz). Finally he showed an interactive textbook for Physics for Upper Secondary. He presented all the numerous ways of working interactively with interactive textbooks for Maths, Physics and Chemistry (searching, going to pages, linking to the Internet, linking to other interactive textbooks, zooming in and out, play simulations, watch video clips, watch experiments etc.).

Regimantas Baltrusaitis (Alma Littera/Sviesa Publishers) presented the strategy for introducing ICT into Lithuanian education in 2008-2012, among other things were the introduction of interactive whiteboards. Evaluations of this approach show for example that students' motivation for Natural Sciences has increased with the introduction of ICT in the learning process.

**Afternoon session**

**Fourth topic: Discussion about possible common project of EEPG-members**

Pavol Tarábek (Didaktis) proposed a project which would carry out tests of misconceptions in several European countries organised by EEPG members. The misconceptions are a big problem in world education because of their bad impact on cognitive competences. Many misconception’s tests of small numbers of respondents have so far been published in scientific and educational magazines only. But the misconceptions were not tested in a big framework like mathematical and science literacy through PISA tests.
The idea is to try for a bigger common project of all members in area, which is a specific problem of the education connected with meaningful instruction and textbooks from the light of needs of knowledge society (key competences). If we can prepare the right project as co-operation of publishers and teacher’s associations it could be possible to apply for a grant from EU (possibly the Comenius programme). A discussion among the participants revealed a positive attitude to such a project. It would also mean that EEPG members could in the end use the outcomes to improve their textbooks and other educational materials for Natural Sciences and similar subjects.

The plan is now that Preben Späth will present the idea to the EEPG Management Board. Later he will describe such a project together with Pavol Tarábek and initiate a debate of the idea at the EEPG General Assembly in Frankfurt.

Finally the following two topics were suggested for coming meetings (more topics are welcome!!):

- The use of Interactive Whiteboards in Maths, Science, Biology and similar subjects.
- How textbooks and other educational materials can support the teachers of Science, Math, Biology and Chemistry in differentiation/individualisation of the learning process for both weaker and stronger learners

Preben Späth