EEPJG Science & Maths network meeting in Vienna, 7-8 May 2009

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Thursday 7 May:

Topic 1:

The situation in general for Mathematics and Science in education (short presentations by the participants and in depth discussion to follow up):

a) What is the general attitude towards Mathematics and Science? Is it stable? Is it changing?
b) Where are Math and Science standing in the range of subjects?
c) Have there been substantial curricular changes? Are there some to be expected? In what direction will they point?
d) Have the methods of teaching Math and Science been changing? What are they? Are they expected to change? How?
e) What about Math teachers and Science teachers - are they all sufficiently qualified? Is there a shortage or not?
f) How important are qualifications in Math and Science (from school) for the future careers of the students?

Jan-Holger Gründler talked about the German situation after the PISA chock, and stressed the importance of Maths acknowledged by the authorities. The state
approval system means that in some federal states only 5 books are approved for any subject which can be rather difficult for publishers. Science does not have so much attention as Maths. Many teachers are unwilling to work with very innovative materials; they feel more confident with the traditional schoolbooks.

Vasja Kozuh described the situation in Slovenia where the big debate now is about how to integrate the Science subjects in the school year. The Science curriculum is being changed these days. As for methods the conceptual approach is normal in Science, but teachers need support for this and that is why new types of textbooks are being made. There is clearly a lack of scientists and engineers in society. As for differentiation in primary school he told that in the subjects, Slovene language and Math and English, the pupils are divided into ability groups, in other subjects they are together all the time.

Mart Kalamees talked about Estonia where the curriculum is now being changed for the third time in 15 years. PISA tests show that Estonia is rather good in Maths and Science. However, pupil surveys tell that they find Maths difficult. There is a clear lack of Maths teachers in Estonia; this year only 6 new Maths teachers finished university! Most young scientists go abroad and that is a problem for schools. That means that most Math teachers are old and often from the Soviet times – they do not want to change their teaching methods. Science starts in grade 1 and stays until grade 7 for all. In the first years the subjects are of course integrated, and later they learn pure Physics and pure Chemistry.
One problem is that the teachers of the grades 4 and 5 often have not studied Physics or Chemistry at all, so there is a structural problem as well. In some Math textbooks there are offered subtopics that are not compulsory but allow differentiation and individualisation – and these books from Koolibri have been a big success.

Sabine Eckert first explained the Austrian school system and the new educational standards (after the PISA tests), e.g. new aims for Math lessons like understanding Math in stead of pure calculations. There are also plans for differentiation and individualisation including support also for highly talented pupils. In Austria Biology, Physics and Chemistry are taught but not linked at all which is bad. Interdisciplinary Science lessons are still only an exception. There is debate about expanding the education of teachers.

Svjetlana Petrovic told that Math is compulsory in all 8 years of primary school in Serbia. Science subjects are taught in the first 4 years as integrated, and later the Science subjects are split up. The Math teaching is rather formal with only few links between theory and practice. The learning takes place in stages and at the end of each stage there is a test. Later the knowledge learned is not reactivated at other stages. Serbia did not so well in the PISA tests. The curriculum clearly defines the content but gives no hints for teaching methods which is problematic. In the textbooks approved by the Ministry the content plays the most important role, not innovative pedagogical approaches, learning strategies etc. The authorities are against changes in general. As for society and future careers of the pupils, the motivation for and interest in Math and Science is probably the biggest problem.

Tamar Mezga described the situation in Croatia. Maths and Science have more lessons than even mother tongue in the schools. There have been experiments for some time with the new curriculum: Exercises and special tasks are used a lot so that pure reproduction of rules and knowledge is not enough. Now it is becoming normal in Croatia now. Linking Maths and Science to everyday life is important and required, but teachers often have problems with this. The textbooks from Profil often integrate such an approach – but the teachers often question this – so this is a practical problem in elementary school. The curriculum is fine but the teachers are the problem.

Katalin Tóth told that the curriculum has changed with every new government in Hungary which is confusing and problematic. The teacher education has not been changed. Every week the population hears in the media that the textbooks are bad, and although the publishers try hard to make good books they have no consequence/impact on the teaching process. The teaching in Hungary is still very theoretical, but the approach of textbooks that apply more practical issues is not welcomed by teachers. In Math the textbooks are relatively good and actually being used. Science is a bigger problem, the pupils simply do not like the subject
(up until grade 5 they sometimes enjoy it, but in higher grades where the approach is more theoretical the pupils simply do not like the subject). The teaching of Science has only to very small degree any links to everyday life. The number of teachers in Math and Science has dropped dramatically. The Math engineers and scientists after university get jobs with high salaries and therefore do not become teachers.

Thor-Atle Refsdal talked about the situation in Norway and dealt with all the questions asked on this topic.

For the following general discussion Martina Griessner summarised these topics:

*Integrated Science vs. separate subject matters*
*Impact of tests (nationally and internationally)*
*New Mathematics teaching (problem solving, real life situations)*
*‘Teachers are the main problem’*

It was agreed to focus on the last topic while the other topics were recommended for coming meetings of this network. Some points from the general discussion are indicated here:

Teachers keep the traditions and do not want to use the new methods – this probably goes for all teachers; if it requires extra work they discard the proposal. On the other hand publishers have a problem if they make books that the teachers do not want.

Another point indicated that the government is also to blame because of the permanent changes and reforms.

It can be a good idea to leave the older books in the catalogue and then try and sell the innovative books at the same time.

What is the real problem? Is it that the teachers do not buy our innovative books or that they do not buy books at all?

The communication between publishers and teachers is also important (e.g. special courses promoting new books). Another idea is practiced in Germany where Cornelsen Verlag have more than 1,000 Math teachers in a network that receives newsletters and discusses pedagogical issues – these ideas are then often brought onboard when preparing new textbooks.

The whiteboards are to be seen as a gift to the teachers; they do not have to change their teaching methods; and for the children it can be motivating to see multimedia and interactivity being integrated into the learning process. Thor-Atle Refsdal spoke about the numerous e-mails from children who are using the internet access to Gyldendal’s Math books. Tamara Mezga, on the other hand, mentioned a survey from the UK which did not prove that the children actually learn better using interactive whiteboards.
Afternoon session:

Topic 2:  
*The use of Interactive Whiteboards in Maths, Science, Biology and similar subjects: exchange of experience and discussion of pedagogical perspectives (problems and advantages)*

Thor-Atle Refsdal showed a Math application ‘MULTI’ for primary Mathematics integrated into an interactive whiteboard environment. Not only the teacher but also the children have the possibility to interact directly with the content and the many exercises in Math for beginners. There is a wide variety of tools available to the teacher when working at the whiteboard in front of the class, and on the other hand the children can easily click and move around objects with their hands/fingers on the whiteboard.

Márton Bozsó presented MozaBook, an application showing numerous textbooks for primary. The pages are apparently identical to the book pages, but here you can always zoom in on any part of the page. The application is compatible with all types of whiteboards. In addition a lot of tools are available to the teacher when working with MozaBook. Also numerous extra tasks and exercises are integrated into the application. Drawings and written input may be saved with the book for the class in question.

Afterwards he showed MozaWeb for children. This site gives access to all the company’s schoolbooks with lessons, tasks, additional multimedia etc.

The final activity of the day was an in depth debate on the future of interactive whiteboards. A general conclusion was that there certainly is a growing market out there, and that it is a fact that authorities (government, European Commission etc.) have already started to give financial support – directly or indirectly – to the development of interactive whiteboard and other ICT applications for education.
Friday 8 May:

Morning session:

Topic 3:

How can textbooks and other educational materials support the teachers of Science, Math, Biology and Chemistry in planning and implementing differentiation/individualisation of the learning process for both weaker and stronger learners?

Thor-Atle Refsdal mentioned that Gyldendal have no textbooks with markings for weaker or stronger learners, but that they always indicate procedures for differentiation in the teachers’ books. He also presented a teacher’s manual for ‘Multi Math’ with in depth descriptions of how to teach with each double spread of the textbook including advice on how to involve both weaker and stronger learners.
Jan-Holger Gründler indicated that Cornelsen Verlag have markers for
differentiation in all textbooks for Math and languages. The teachers insist on
having such markers. He showed a software application with 20,000 Math tasks
for grades 5 to 9 with tasks classified by difficulty level, competencies (arguing,
problem solving, presenting, modelling and communicating). All tasks can be
selected and printed out (as a file or on paper) for groups or individual learners.

Vasja Kozuh claimed that in Slovenia they do not support differentiation with
specific marks. They have three different ability groups in the last 3 years of
elementary; in their books they indicate with colouring the three levels. These
approaches to differentiation are valid for Math and English in general. He
presented a Math textbook series for grades 1-5 and another one for grades 6-9.
In grades 1-5 differentiation is done internally in the class with separate groups;
in grades 6-7 differentiation is carried out 25% of the time, and in grades 8-9
the differentiation is 100%, i.e. the pupils work in separate rooms/groups
according to their ability level. This type of differentiation is foreseen in the
curriculum and is done for Slovene language, English and Maths. In the Math
exercise book the tasks are indicated for A, B and C difficulty level.

Mart Kalamees described the Estonian situation in this field. In Maths they have
marks and labels for difficulty levels. In Chemistry there are also difficulty levels of
the tasks and experiments, and the answers are shown in the teacher’s manual.
He also presented some pages from a Physics book (for upper secondary level)
which can be used along with any traditional textbook. The important aspect of
this book is that it contains a lot of text explaining the background for each task,
describing in detail how to proceed to solve the problems, and of course showing
the solutions with detailed comments.

Svjetlana Petrovic told that in teacher’s manuals (from Kreativni Centar) it is
always indicated which exercises and tasks are more difficult than others (in the
subjects, Math and native language); this is done for the first 4 grades. She
presented a Math textbook with content presentations, tasks etc. at three
levels, inspired by PISA and national test results. They have had several national
tests and also international tests (TIMS and PISA). Using the experience from
those empirical findings and also the ideas about levels of achievement, their
teams of authors have made problem books (collections of problems) as
supplementary material for school. They are called ‘Matematicke stepenice’
(Mathematical Steps). In these books the problems are organized by levels of
achievement. The student solves those problems that represent an achievable
challenge, and the problems become more complex in increments. At each level,
the student is asked to prepare for the next «complication» (or level of difficulty),
in order to climb another mathematical step, and in this way they develop their
mathematical competency. In addition the teacher’s manual presents ideas on
how to differentiate the learning process. Finally Svjetlana pointed out that children with special needs are not included in the "regular" elementary schools at all.

Tamara Mezga explained that in Croatia they do not mark their books for different groups. They have, however, started one year ago to publish textbooks for groups of children with special needs. She presented some textbooks for Biology grade 5 to 8 directed at learners with special needs. The books can be used along with any Biology textbook. Features of these new books include bigger font size, simplistic drawings and photos, and all tasks and exercises closely related to everyday life.

Márton Bozsó said about the situation in Hungary that they have no special books for special groups. In Science books, however, easier and more demanding tasks are often marked.

Martina Griessner explained that in Austria differentiation is an important issue. There are classes with pupils with very mixed abilities. Differentiation is an important topic in all subjects. The differentiation issues are indicated clearly in the teacher’s manuals; the publishers produce supporting materials for individualisation, for example they often offer workbooks A (easy) and workbook B (difficult). She also presented two textbooks “mathematiX” and “mathematiX Kompakt” from Veritas Verlag: Both books have clear labels indicating which tasks are for weaker learners; in the first book they are labelled with levels 1, 2 and 3 plus an extra level called X with surprises. In the “Kompakt” book some topics have been changed to lower levels called A and B. The point is that the books can be used together in the same class.

Summary of the meeting and suggestions for topics of coming meetings of the network

Potential topics for coming meetings of this network:

Integrated Science vs. separate subject matters
Impact of tests (nationally and internationally)
New Mathematics and Science teaching (problem solving, real life situations)
Special needs
Business models for on-line learning

After the meeting all participants visited the Technical Museum in Vienna:
On behalf of all participants I wish to thank the people from Veritas for helping to organise this fruitful meeting – including the wonderful weather situation!

Preben Späth