

## From John Amos Comenius to COMENIUS Projects

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**Abstract:** The article describes background, aims, process, results, outcomes and dissemination of two international COMENIUS projects in maths and science teachers' education. The first project: PROMOTE MSc was realized in 2003-2006 by four partner European universities. The second, following project, in which five universities participate, is in its first year realization. Both projects represent good European practice in teachers' education.

**Key words:** John Amos Comenius, Comenius Multilateral Project, teachers training, mathematics education, science education, European school practice.

### Introduction

Teaching mathematics is not easy task whatever school, level or position mathematics teacher occupies. Teaching teachers is special attitude, especially in these times, when many official and non-official documents are describing crisis of education. The crisis is often described as the discrepancy between everyday needs of human being and knowledge obtained during schooling. This situation is mainly observed at secondary school everyday practice: formal, full of theoretical knowledge curricula and not active methods using in teaching (not only) mathematics. Many other nowadays observations make mathematics (and sciences) unpopular school subject.

The simple solution does not exist. There are several possible attitudes how to slightly change the situation (Swan-Smith, 2001). One possibility urges universities, which prepare future teachers of mathematics. As we hope, the majority of new generations of teachers, who have find mathematics as their favourite subject during their secondary school education (mostly thanks to their excellent maths teachers), are open to learn not only pure maths knowledge, but new skills and methods to cope with attractive maths teaching. We have them just now at our universities; meet them at our seminars and lectures. We can perform them new ideas, practice new methods with them, introduce them international experience, invite them to participate on projects in maths education, etc.

The teacher competencies are discussed at different levels and from the different points of view (Spagnolo, 2000; Grevholm, 2003; Molnár, 2004; Šedivý, 2005). Let us assume them from the point of view of everyday school practice, every simple lesson activities, according the ideas of experienced maths, physics and informatics teacher at secondary school (Beňačka, 2007):

- **Deep professional mathematics knowledge:** deep understanding mathematical topics,
- **Planning and preparation:** definition of aims of the lesson and choosing appropriate methods and tools,
- **Realization and governance:** motivation and inspiration of students, students' attention maintaining and involving students to activities,
- **Discipline sustaining:** keeping discipline in the classroom,
- **Evaluation of students:** formative and summative,
- **Professional development:** own work feedback and its refining.

University teachers from four European universities (Vienna University, Austria; Sunderland University, Great Britain; Palacký University in Olomouc, Czech Republic; and Constantine the Philosopher University in Nitra, Slovakia) met together in 2003 and started activities in maths and science teachers training project, with the aim to develop better attitudes of their students – future maths and science teachers to learning and teaching their subjects.. Activities in 2003-2006 were covered by the scheme project COMENIUS action 2.1 – Training of School Educational Staff, project: 112208-CP-1-2003-1-AT-COMENIUS-C21: PROMOTE MSc - PROvide MOTivation through Exciting Material in Maths and Science, and following project in 2007-2010 covered by COMENIUS Multilateral project scheme: 129572-CP-1-2006-1-AT-COM: MOTIVATE ME in Mathematics and Science.

As the teacher born in Czechoslovakia, let me start with short historical remark and remember the compatriot according whom the scheme of European educational project is entitled:

### **John Amos Comenius**

The strong influence of ideas and work of John Amos Comenius (Slovak: Ján Ámos Komenský, 1592-1670) was and still is persisting in Slovak and Czech school system such as his ideas in teaching and learning (not only) mathematics. Comenius is rightly described as one of the earliest champions of universal education, the father of modern education, the teacher of nations.

We mean only two of his works we assume should be consider in the context of mathematics education and mathematics teachers training []:

***Orbis Pictus***, or *Orbis Sensualium Pictus* (The Visible World in Pictures, originally published in 1658 in Latin and German) is a children's encyclopaedia and is considered to be the first picture book intended for children. *Orbis Pictus* had a long-lasting influence on children's education and was a precursor of the use of audio-visual techniques in the classroom.

***Didactica Magna*** (The Great Didactica, written 1628-32, published in 1649 in Czech). The book preached a different style of education, one based on six stages of life and positive reinforcement. Its synonym is often written as: The Whole Art of Teaching. Comenius explored how people learn and how they should be taught from infancy through the university and beyond. And it is useful to repeat the main principles of education described in *Didactica Magna*:

- Education for everyone
- Learning is natural
- Learning by easy stages
- Play
- Lifelong learning

The ideas described in *Didactica magna* one can feel in every today Slovak school and many accurate Slovak teachers are in everyday contact with John Amos Comenius ideas and principles of teaching.

### **COMENIUS – European Cooperation on School Education**

The brief introduction of COMENIUS project scheme is described on its web side ([http://ec.europa.eu/education/programmes/llp/comenius/index\\_en.html](http://ec.europa.eu/education/programmes/llp/comenius/index_en.html)):

*COMENIUS focuses on the first phase of education, from pre-school and primary to secondary school, and it is addressed to all members of the education community in the broad*

*sense – pupils, teachers, other education staff, but also local authorities, parents' associations, non-government organizations...*

*COMENIUS supports school partnership; individual mobility of teachers and student teachers; projects for the training of school education staff and school education networks. It thus aims to enhance the quality of teaching, strengthen its European dimension and promote language learning and mobility.*

*COMENIUS also emphasises certain important issues: learning in a multi-cultural framework, which is the cornerstone of European citizenship, support for disadvantaged groups, countering under-achievement at school and preventing exclusion.*

## **PROMOTE MSc.**

This part of the article is adapted from the original project proposal and from the evaluation report written by project evaluator Dr. Alex Dockerty, Principal Lecturer, Team Leader and Science Education Coordinator at the School of Education and Lifelong Learning, University of Sunderland, UK.

### ***Background of the project***

In all of the participating countries (Austria, United Kingdom, Czech Republic, Slovakia), there was a lack of mathematics and physics teachers registered in last ten years, as well as shortage of students in mathematics and physics entering teacher training. There was a concern that school children may not be motivated to be interested in mathematics and physics, this may be partially because of lack of motivating material and partially because the lack of mathematics and physics teachers leads to non-subject-specific teachers (e.g. biology teachers) having to teach mathematics and physics. Therefore many schools produce children with little or no interest in studying mathematics and physics or becoming mathematics and physics teachers, exacerbating the problem.

### ***The aim of the project***

The main aim is to address the problem of the shortage of young people, attracted to study and enter teacher training in the mathematical and scientific subjects of the school curriculum.

### ***Specific objectives***

- to exchange data and views on this problem in a European context,
- to collect material from the participating countries, from teacher training institutions, teachers, etc.,
- to design and implement curriculum materials which reflect the best European practice for use with trainee teachers,
- to make materials available for use in teacher training institutions, and by students in schools,
- to evaluate the project products,
- to disseminate evaluated project products, using electronic format where possible.

### ***Target groups and expected impact***

**Primary target group:** Mathematics and physics trainee teachers (at universities, and eventually at other teacher training institutions for primary and secondary school teachers).

**Impact:** To provide motivation through exciting materials, leading to more motivating into teaching and generally to help to create a better image of mathematics and physics in society.

**Secondary target group:** School children taught on practice by these trainee teachers.

**Impact:** To provide motivation through the trainees of the primary target group by using the collected and produced materials, thereby motivating the children to become more interested in the subjects, eventually leading to more secondary school students interested in studying mathematics and physics, and/or becoming teachers in these subjects.

***Process and results***

The realization of the project lied on meetings and workshops at universities of participated countries and on field work (at home university and country schools) of every responsible country coordinator. The most remarkable result was the result of an equal sharing of collecting materials, based on the expertise of the participants and availability of materials from different countries. By the end of the project there were 61 mathematics unit descriptors and 60 science/physics from 46 contributors, mostly secondary school teachers and teacher trainers. Mathematics units covered topics: Probability/statistics (5 units), Arithmetic (7 units), Calculus (8 units), History of Maths (1 unit), Algebra (11 units), Geometry (22 units), Didactics of Mathematics (3 units), Discrete Mathematics (2 units), and Functions (2 units). A unit descriptor briefly lists the unit title, aims, and content and includes brief notes on resources and other matters so a teacher can decide on use of the unit. The name of the author (proposer) of the unit and his/her contact e-mail address includes is a part of the unit descriptor, too. Unit descriptors and examples of sample units were published in three forms: the booklet (in all four languages), CD ROM and on the project web site ([www.promotemsc.org](http://www.promotemsc.org)). These forms have provided an efficient means of dissemination of obtained materials.

However the project products are to be used in a new Comenius project: MOTIVATE ME in Maths and Science.

**Disseminations PROMOTE MSc and new project MOTIVATE ME – Slovak example**

Slovak project team have decided to promote maths topics published as results of project PROMOTE MSc using chosen appropriate methods prepared by project MOTIVATE ME to student teachers during their education in the subject Didactics of Mathematics as well as to teachers in practice during seminars organized by Department of Mathematics in next academic year, 2007-2008. There is an idea to join both these groups several times during the academic year and realize seminars together. We expect active communication, deeper understanding or explaining methods of teaching by practicing teachers to trainee teachers and better coping with new active methods and helping in refreshing pure math knowledge or applications by trainee teachers to practicing teachers, vice versa.

The most interesting topic for education teacher trainees in maths were indicated those units, which are connected with computer aided education and using graphics calculators, and also those, which evoke to use active methods in the classroom. The first task of the new project was to formulate the list and short description of teaching methods, which are going to be used in units performing. The list contents educative methods such is: project works, case studies, maths writing, concept mapping, debate, brainstorming, class discussion, collaborative learning, inquiry, problem-based learning, etc. Majority of methods are not isolated but their using in everyday practice is in synergy with several another. The role of didactics of mathematics, as the important subject in university programmes in teachers education, is in explaining or showing students as much methods as it is possible, to prepare didactical situations they can take part in exercising methods and evaluate themselves and colleagues in using the method from at least two position: as the student and as the teacher.

In contrary of (Swan-Smith, 2001, pg. 3-4), who writes about necessity of transformative learning of teachers in practice, teaching teacher trainees required mainly additive learning and then, after some personal experience at schools during practice, the

transformative point should follow. The role of university education in didactics is to show, perform and to allow trainee teachers as much as mastery of teaching maths as is possible.

## Conclusions

The present-day situation in teaching maths by practicing teachers at the majority of schools is: „I am sage on the stage“, we would like to change it into: „I am guide on the side“, (Krantz, 1999). There is not wise to do the revolution in schools, but by small steps, by unhurried examples using in trainee teachers education and by keeping ideas of Comenius as well as COMENIUS in minds, we should notice some progress.

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## Web sides

<http://www.britannica.com/eb/article-9024927/John-Amos-Comenius>

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[http://ec.europa.eu/education/programmes/llp/comenius/compendia/training03\\_en.pdf](http://ec.europa.eu/education/programmes/llp/comenius/compendia/training03_en.pdf), pg. 30