Friends of Mathematics Education
- A European Initiative -

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Abstracts

Extracurricular activities in mathematics: a variety of actions for a variety of people -- the French experience

Prof. Dr. Martin Andler, Animath & Université de Versailles St. Quentin, France

In spite of a fairly weak French tradition of extracurricular activities in mathematics (and other fields) several interesting experiences have appeared in the last few years, which can be classified according to different parameters:

- "talent", with activities for a range going from very talented youths to everyone willing to be involved ;
- nature of the project, from competition mathematics to independent research experiences ;
- social background, with some activities open to people regardless of their social background and others primarily oriented towards socially disadvantaged youths
- gender
- age
- national/international scope.

These activities are supported by a 4 year award of the French government to Cap'Maths, a consortium of mathematics organizations.

Following the Fibonacci Path: Inquiry-based Mathematics Education for Improving Teaching and Learning

Prof. Dr. Peter Baptist, Universität Bayreuth, Germany

Education will not be improved simply by evaluations and empirical investigations. In order to eliminate recognised deficiencies we need concrete content-related concepts and examples to change instruction and learning. Of course its good to prove, but its much better to improve. Inquiry-based education opens the door to interesting, stimulating and sustainable teaching and learning. Therefore just follow our Fibonacci message (originally by Paul Halmos): “Don’t preach facts, stimulate acts”.

New mathematics curricula in the Netherlands:
Opportunities for public-private collaboration
Dr. Paul Drijvers, Freudenthal Institute, Utrecht University, The Netherlands

Mathematics education in the Netherlands is often characterized as realistic and egalitarian. Due to complaints from higher education, and in line with the Ministry's focus on excellence, however, new 2015 curricula have been developed for upper secondary level (students of 16-18 year old). 'Thinking activities' are important in the curriculum reform. In addition to existing collaborations between public and private partners, for example on mathematics competitions and teachers' professional developments, this opens new opportunities for public-private partnerships, in the field of online course design in particular.

Mathematics Teaching Developmental Research in Southern Norway
Prof. Dr. Simon Goodchild, University of Agder, Norway

The Mathematics Education Research Group at the University of Agder (UiA) received substantial support from the Research Council of Norway (RCN) for a mathematics teaching developmental research project (Learning Communities in Mathematics, LCM) that ran for the period 2004-2007. The research group was solely responsible to RCN for the use of the funds received. Part of the funds was disbursed to schools to enable teachers to engage in project activities such as workshops and planning meetings. The project was led by members of the research group in consultation with teachers who participated in the project.

In 2006/7 new opportunities arose for supporting mathematics teaching development, research funds from RCN and development funds, to be applied for by local education authorities from the Norwegian Department of Education (NDE). Researchers from UiA worked with school leaders to write the proposal to NDE. On this occasion the research proposal, based on a national network of researchers, was successful, but the developmental proposal to NDE was not successful. The maintenance of the developmental research activity that had started with the LCM project was dependent upon both proposals being successful. However, at this point another proposal for funding, this time to The Competence Development Fund of Southern Norway, was made, both to support the developmental work in schools and facilitate further the related research activity at UiA. Fortunately this latter proposal was successful.

The outcome from the dual sources of funding was a binary project that ran 2007-2010. One part was a research project Teaching Better Mathematics (TBM), which was based on a national network of researchers, funded by RCN and a local network of schools funded by SKF. The other part was a developmental project Learning Better Mathematics (LBM) funded entirely by SKF, in which the school education authorities administered the funds. Thus a new management structure for the TBM/LBM project was created: a top tier (A-leaders) which included the UiA research project director and local education authority leaders; and a second tier (B-leaders) which included teacher leaders from each of the participant schools and all members of the research teams. The research element was directed through meetings of the research group at UiA and other leaders in the national network.

Transforming the mathematics teaching profession in Australia: Perspectives and potential

Prof. Dr. Merrilyn Goos, The University of Queensland, Australia

This presentation will highlight three initiatives undertaken by the Mathematics Education Research Group of Australasia (MERGA) and the Australian Association of Mathematics Teachers (AAMT) to transform the mathematics teaching profession in Australia. AAMT is a federation of associations of teachers of mathematics from all Australian States and Territories, and has around 5000 individual and institutional members. MERGA is an ICMI-affiliated association that promotes and disseminates quality mathematics education research, and has around 250 members. The initiatives focus on three types of transformation:

1. The equity transformation. Numeracy and mathematics for Indigenous students: Developing and sharing culturally responsive pedagogies

2. The professional transformation. Developing and exemplifying professional standards for teaching mathematics to acknowledge accomplished practitioners and guide professional growth

3. The networking transformation. Using interactive technologies to build online professional communities of mathematics teachers.

The presentation will also outline two additional initiatives that, while not specific to mathematics education, have fostered partnerships between schools, universities, business and philanthropic organisations. One initiative, which is sponsored by elite football players, is a volunteer mentoring program in which pre-service teachers tutor disadvantaged Indigenous students. The other is a research and development project, funded by a consortium of mining companies and the State education department, which supports teachers in rural communities to improve students' literacy development. Participants at the meeting will be invited to consider the potential for such initiatives to be taken up in mathematics teacher education.

The Nuffield Foundation and mathematics education
Vinay Kathotia, Nuffield Foundation, UK

The Nuffield Foundation is a charitable trust that works to improve social well-being by funding research and innovation in education and social policy. Underpinning our work is a belief in the importance of independent and rigorous research evidence. We have been one of the leading independent funders of education research and development in the UK for over 50 years, and science and mathematics education has been a major part of that.

We are interested in supporting research and development projects designed to improve understanding, policy and practice in the teaching and learning of mathematics. We use the term 'mathematics' in a broad sense, including statistics and the range of quantitative approaches across all subjects and disciplines that can be considered as applying and doing mathematics. Particular themes of interest are outlined at www.nuffieldfoundation.org/mathematics-education and examples of our mathematics work can be found at www.nuffieldfoundation.org/mathematics-education-0 .

Activities of the Volkswagen Foundation in the field of mathematics
Dr. Christoph Kolodziejski, VolkswagenStiftung, Germany

In this presentation an overview of funding activities of the Volkswagen Foundation in the field of mathematics will be given. As a non-profit foundation dedicated to the support of science and technology in higher education and research, it has a long tradition in funding specific projects in the field of mathematics with hopefully high impact or exemplary character. The talk will highlight three examples of past and present activities:
(1) the support of the Mathematisches Forschungsinstitut Oberwolfach (MFO) in collaboration with the Klaus Tschira Foundation,
(2) a call on "Mathematics and Perspectives at the Interface of School and University" as a reaction to TIMSS and
(3) the support of a "Summer School of Modern Mathematics" for outstanding students.

Mathematical Spanish societies and Education
Dr. Raquel Mallavibarrena Martinez de Castro, Real Sociedad Matematica Espanola (RSME), Spain

There exist several mathematical societies in Spain, all of them belong to the Spanish Committee of Mathematics (CeMat). I will summarize some recent activities of this committee related to Mathematics Education.

Fifteen plus years of the NRICH project – highs, lows and the bits in between
Lynne McClure, NRICH Project, UK

NRICH is an award-winning project based at the University of Cambridge in the UK. Originally set up as an online maths club for motivated secondary aged students, it has grown into a project for all ages (3-18), all abilities and for teachers as well as for students. NRICH has an extensive professional development focus and is freqeuently asked to contribute to policy making initiatives.

IREM network in France and the MMI project
Prof. Dr. Christian Mercat, IREM de Lyon, France

IREM network
The French Institutes of Research on Math Teaching are organized in a network of regional institutes. They mix teachers from the primary, the secondary and the university levels together with researchers in mathematics and in math didactics. Together they work on hot topics related to changes in curricula, or to evolutions in technology or math didactics. They conduct researches in the classroom, produce pedagogical resources for their fellow teachers, recommendations for curriculum builders, and organize in service teachers' training sessions.

MMI
The House of Mathematics and Computer Science (Maison des MathŽmatiques et de l'Informatique, MMI) is a place in Lyon where fun activities around mathematics will take place. Open to classes and to the general public, it will be operated by scientific mediators from associations and institutions.

The Compagnia di San Paolo and the Fondazione per la Scuola project for the diffusion of Mathematics among students
Prof. Dr. Franco Pastrone, Università di Torino, Italy

The project MATHXX supported by the Foundation is intended to involve the high schools of Piedmont, working with the most motivated students, in the study of mathematics, by means of non standard methodology.
However, it will expand its perspectives to gather together in a single proposal other initiatives that are on-going in the territory in relation to the Mathematical Olympiads, which take place each spring and involve numerous schools in the province.

The Contest Foundation – a Russian fund supporting math students
Prof. Dr. Alexey Sossinsky, The Moebius Contest Foundation, Russia

The Moebius contest, created on 1999 by two Russian businessmen, is acompetition open to all Russian students (graduate and undergraduate). The participants present a research paper in mathematics or mathematical physics (published or unpublished) to the Jury. The papers are reviewed by eminent mathematicians (not necessarily Jury members), then the Jury selects the six best papers by graduate students and the five best by undergraduates. Their authors are invited to Moscow for the final round of the contest, open to the public, in which each of the finalist gives a half hour talk about his work and answers questions about it. After a deliberation, the Jury selects the three winners of the contest for graduates and he two winners of the contest for undergraduates, who are awarded diplomas and a fairly substancial monthly stipend for two years. After modest beginnings, the contest has become well known and quite pretigious.

Golden Learning Opportunities in Preschool Mathematics
Allan Tarp, MATHeCADEMY.net, Denmark

Mathematics was born as a natural science about Many. We deal with Many by two competences, counting and adding. In school we learn to count in tens and to add on-top. In preschool, however, learning and playing go together allowing also counting in icons below ten and adding next-to. Thus 3 5s can be recounted as 2.3 6s that gives 2.1 9s if added next-to 1.1 3s, later called integration. To add on-top the units must be the same, and recounting can be used to change units, later called proportionality and linearity. To see how many 4s that added to 3 5s give 2 9s we must de-add, later called solving equations.
Allowed freely to count and recount, and to add and de-add, preschool children experience the roots of and learn about decimal numbers and fractions, proportionality and linearity, integration and differentiation as well as solving equations. Furthermore, using a restricted well-defined language code gives equal learning opportunities to mono-lingual and multi-lingual children, thus allowing the latter to receive meaningful language stimulation before beginning the traditional school.
Thus it gives good value for money to fund research in icon-counting and next-to addition as early intervention in preschool, as well as to fund contingency research that has uncovered and developed this golden learning opportunity. Funded post-doctoral contingency research in preschool mathematics can be guided by the MATHeCADEMY. net that can be franchised free of charge by any traditional university.
Reference: Workshop in Recounting and Decimal-writing, http://www.icme12. org/upload/UpFile2/WSG/1125.pdf

A pragmatic vision for the reduction of dropout rates at the transition from high school to university

Prof. Dr. Johan Thorbiörnson, Royal Institue of Technology, Sweden

Huge drop-out rates at the transition from high-school to university is a wide spread problem in higher education all over Europe. In particular at the start of STEM studies, mathematics courses are one of the main stumbling blocks. This is - among others - due to the fragmentary math-education in high-schools and the change in learning culture at the transition from high-school to university. We propose a pragmatic and effective action to cope with these problems based on our long standing experience with massive open online courses (MOOCs) in Sweden and in Germany with about 20.000 users per year. The pedagogical concept of the well established Online Mathematical Bridge Course combines the advantages of online learning and teaching with those of personal tutoring through a mathematics call center. It is so far available in English, Swedish, German and Italian.

La main à la pâte

Prof. Dr. David Wilgenbus, Fondation La main à la pâte, France

La main à la pâte has been promoting scientific inquiry-based education in primary and secondary school, in France and abroad, for more than 15 years. In January 2012, the three founding members of this programme: the French Academy of Sciences, the Ecole normale supérieure of Paris (ENS), and the Ecole normale supérieure of Lyon (ENS Lyon) have created a Foundation which aims at renewing science teaching in schools in order to help teachers implement inquiry-based science education in their classrooms.
This Foundation develops a comprehensive approach to support teachers and trainers, with main activities principally organised around:

- Disseminating, promoting and organising professional development of teachers;
- Connecting the members of the science teaching community, so as to form a skills network;
- Involving the scientific community, particularly in the form of classroom support;
- Developing and sharing teaching resources;
- Publishing a website with thousands of pages offering a variety of online services and resources, essentially aimed at teachers and teacher educators (www.fondation-lamap.org).

In 2012, the La main à la pâte Foundation launched an ambitious project named “Houses for science” (4 regional Houses and a national centre as of today) with the goal of improving science practices in primary and secondary schools, through professional development activities based on a strong partnership between educational, scientific, and industrial communities. Each "House for science" is hosted by an important university. Deeply rooted in real-life science, all the professional development activities are built and conducted by groups of educators and scientists. During its presentation, David Wilgenbus will give an overview of the activities of the La main à la pate Foundation with a specific focus on the “Houses for science” project.