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TSG

Topic Study
Group 4

TSG 4: Activities and programmes for gifted students

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Introduction

The program was organized by a committee consisting of the two Chairs and Team Members indicated above. The committee is particularly indebted to Dr. Velikova for setting up a special website for the study group, preparing and publishing along with Dace Bonka, Lasma Strazdina and Inese Berzina a volume of Proceedings (supported by the Universities of Latvia and Rousse), presenting the speakers with certificates of participation and providing pens to the attendees.

The registration of more than 120 participants from at least 36 countries for TSG 4 attested to the great interest in this topic. At least ninety attended each of the four sessions.

Session 1

There are a number of aspects involved in looking at programs for gifted students. The first task is to consider the characteristics of giftedness and how such students can be identified. A few papers touched on this area.

An important consideration is to provide sufficient stimulus to stave off boredom, as talented students who are not challenged can underachieve. Their natural curiosity needs to be stimulated. Gifted students appear to have the knack of making appropriate use of memory, working in productive and flexible ways, adapting to new settings and exploiting structure. They should be encouraged to be self-reflective. As they exhibit different styles of learning, their mentors need to be attentive to the means by which they will flourish. There is a potential for attaining more acute reasoning and deeper levels of abstraction that need to be fostered.

More than ever, it is a challenge for teachers to be tuned to the characteristics of students, to identify how they may best function and track down the resources that will provide each student with appropriate challenges.

Brenda Bicknell (New Zealand), Addressing mathematical promise in the New Zealand context

Bettina Dahl (Norway): How do gifted students become successful? A study in learning styles

George Gotoh (Japan), The quality of reasoning in the problem solving process
Djordje Kadijevich and *Zora Krnjaic* (Serbia and Montenegro), Is cognitive style related to the link between procedural and conceptual mathematical knowledge?

Borislav Lazarov (Bulgaria), Resulting effect of consecutive activities



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Hye Sook Park, Kyoo-Hong Park (Korea), Analysis of the mathematical disposition of the mathematically gifted students in the middle school of Korea
Emiliya Velikova, Svetoslav Bilchev and Marga Georgieva (Bulgaria), Identifying of creative-productive gifted students in mathematics

Sessions 2 and 3

Having identified the group of gifted students, the next step is to consider how such students should be handled both inside and outside of the classroom.

Often gifted and non-gifted students are in the same classroom together, and it is a serious challenge for the teacher to make sure that all students are well-served by the situation. One can, for example, create orchestrated problem sets that start with very simple ideas and progress towards more difficult and significant mathematics. Students can be encouraged to work together on projects, presentations and publications, where each can make an appropriate contribution. Care needs to be taken to achieve a balance between first- and second-hand experiences, enough of the first to provide a solid base and enough of the second to encourage original enquiry.

Outside of the classroom, one can go further and make use of topics appropriate for youngsters than are not normally on the curriculum. This includes many topics in geometry and combinatorics, as well as recreational mathematics. With younger children, it is desirable not provide work that does not require much in the way of prerequisites. For example, it is known that many young children have a good intuition in solid geometry and this might be exploited.

Contests and rallies provide goals that gifted students can work towards and test their powers with. For the particularly well-motivated, there are many special classes, schools and clubs to which they may belong, and our speakers provided several fine examples of this activity. Finally, we must not forget that most modern of resources, the internet. The modern student not only has access to many resources but interactive activities on the web that will support the activity of individuals or of small groups and will permit contacts over large distances. Keeping up with all of this is an imperative for the modern teacher who wishes to be effective.

(a) Some of the presenters looked at regular classroom settings.

Carmel M. Diezmann and James J. Watters (Australia), Challenge and connectedness in the mathematics classroom: using lateral strategies with gifted elementary students

Victor Freiman (Canada), Mathematical giftedness in early grades: challenging situation approach

Elena Koublanova (USA), Teaching capable students in developmental mathematics classes

Mark Saul (USA): The unity of mathematics education

Bharath Sriraman (USA): Differentiating mathematics via use of novel combinatorial problem solving situations: a model for heterogeneous mathematics classrooms



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(b) Others looked at other settings. These might involve the use of contests, journals or special classes, or even, institutions devoted specifically to gifted students.

Mariam Amit and Alexei Belov (Israel and Russia), Unlocking interlocking mathematical structures – an experiment at the Kidmatika Math Club

Dace Bonka and Agnis Andzans (Latvia), General methods in junior contests: successes and challenges

Anatolii Chasovskikh and Yuri Shestopalov (Russia), The advanced education and science centre of the M.V. Lomonosov Moscow State University – the Kolmogorov College

Ziva Deutsch, Akiva Kadari and Thierry Dana-Picard (Israel), "Alef Efes": Students create and publish a mathematical quarterly and an interactive site

Donco Dimovski (Macedonia), Mathematical schools, competitions

Kathy Gavin and Linda Sheffield (USA), Project M3: Mentoring mathematical minds

Yoko Kakihana and Suteo Kimura (Japan), Activities in new curriculum for gifted students – trials in super science high schools in Japan

Peter Kortesi (Hungary), Self made mathematics

Kang Sup Lee, Dong Jou Hwang and Woo Shik Lee (Korea), Development of enrichment programs for the mathematically gifted: focussed on conic sections

Elena Levit, Larisa Marcu and Orna Schneiderman (Israel), Process of training and admission to a MOFET science class

Gregory Makrides, Emiliya Velikova and partners (Europe), European project: MATHEU – identification, motivation and support of mathematical talents in European schools

Eugenia Meletea (Greece), Educational network communicating heuristic and sophisticated mental models of mathematical knowledge – developing pedagogical reasoning to support gifted/talented students in Greece

Dimitris V. Papanagiotakis and Panayiotis M. Vlamos (Greece), Web-based mathematical problem solving database for gifted students publications for primary and secondary school students in Macedonia

Emiliya Velikova (Bulgaria), Extracurricular work with creative-productive gifted students – program and activities

Session 3

The speakers in this session considered material that was put before gifted students, and discussed in particular, technology that might be of use. In our time, mathematics has evolved in many different directions, and not just those that make use of technology. Many of these, including some that are quite abstract, are relevant to the mathematical development of the young.

Alexandr and Vladimir Chumak (Ukraine): Algorithms and symbol-graphic language in mathematics education and using of last in the internet technologies

Hanhyuk Cho, Hyuk Han, Manyoung Jin, Hwakyung Kim and Minho Song (Korea), Designing a microworld: activities and programs for gifted students and enhancing mathematical creativity



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Finally, specific examples of problems and investigations were presented.

Andrejs Cibulis and *Ilze France* (Latvia): Work with gifted students in the investigations of polyforms

Alexander Soifer (United States): One beautiful Olympiad problem: chess 7 x 7

Sang-Gu Lee (Korea), Activity of a gifted student who found a linear algebraic solution to the Blackout puzzle

There were some contributions that were not part of the oral program, but which were included in the written proceedings.

Oscar Joao Abdounir (Brazil), Music and mathematics: relationships between intervals and ratios in mathematics education

Alex Friedlander (Israel), High-ability students in regular heterogeneous classes.

Risto Malcevski and *Valentina Gogovska* (Macedonia), The role of educational methods in the teaching of gifted and talented students

Nobuaki Kawasaki (Japan), Characteristics of Bulgarian mathematical education

All the speakers cooperated by giving well-prepared and brief talks so that there was about an hour available in the final session for a discussion that was quite free-ranging.

We hope that participants and others will continue the discussion. To this end, all are invited to surf the website of the TSG at www.icme10.dk, where, in particular, they will find the names and e-mail addresses of those who attended the sessions.

This report has been written by Ed Barbeau, who can be contacted at barbeau@math.utoronto.ca for further information on the work of this TSG.