

Editorial

TEACHING MATHEMATICS AND INFORMATICS AROUND THE WORLD

This special issue of *Open Mathematical Education Notes* comprise five articles written as a follow-up on paper presentations at the 13th Serbian Mathematical Congress (Field 5: History, Learning and Teaching of Mathematics and Informatics) that was held in May 2014 in Vrnjačka Banja, the most popular spa resort of Serbia. Traditionally, the Congress, being the major scientific event in the life of the country, has an international flavor. This tradition is reflected in the diversity of contributors to the special issue representing, besides Serbia, such countries as Bosnia & Herzegovina, Germany, Trinidad & Tobago, and the United States.

The first article written by Bernd Steinbach (Germany) and Christian Posthoff (Trinidad & Tobago) describes challenges in the tertiary teaching of combinatorial problems using Boolean equations. The authors demonstrate that the level of complexity of certain coloring problems related to four-colorable rectangle-free grids require knowledge of both mathematics and computer science. As an example, the modeling of a popular Sudoku game using Boolean equations and the solution using the XBOOLE system is presented. A special problem in the Boolean domain is the satisfiability problem (short SAT). The aim of this problem is to answer the question whether a characteristic Boolean equation with the conjunctive-form expression in the left-hand side has at least one solution (i.e., the equation is satisfiable). The authors developed a new method to model the problem of the rectangle-free four-colorable grids as a SAT problem and used a SAT-solver to find a solution among more than 10^{195} different color patterns. This method allowed for a new teaching approach to the analysis and design of digital circuits. Created by the authors and available free on-line the XBOOLE-Monitor made it possible to replace time consuming studies of the details of low-level algorithms and associated programming skills by the teaching of high-level executable algorithms applicable to many practical problems.

The second article written by Sonja Šumonja, Vesna Veličković, and Tatjana Šubarević shares the authors' experience using technology in the teaching of mathematics at the Electro-technical school "Nikola Tesla" in Niš, Serbia. The main focus is on the application of *GeoGebra* and *Wolfram Alpha* to teaching topics in trigonometry, algebra, and calculus. Another technological tool described in the article is *Moodle* – a virtual learning environment which delivers and manages the mathematical content taught, supports students' independent study, and facilitates assessment of their work by teachers. The authors argue that teaching mathematics with technology is conducive to the development of students' creative thinking and reasoning skills, elevates their personal achievement in the learning of mathematics to a higher level, and prepares high schoolers to continue studies of the subject matter at the tertiary level, be it in Serbia or elsewhere in the world.

The third article written by Jelena Kurtuma and Daniel Romano deals with the political and social aspects of mathematics education within the school system of the Republic of Srpska (one of the two political entities in Bosnia & Herzegovina). The main focus of the article is the investigation of how those aspects affect the professional development of the teachers in this country. The authors' intent is to open a discussion among different constituencies and stakeholders about the professional development of mathematics teachers. Concerned with the quality of mathematical education in the schools, the authors interviewed several groups of teachers representing the whole range of mathematics

classrooms (grades 1-13) and the wide spectrum of social and economic strata. Through a series of interviews, it was found that the teachers only heard about the existence of the standards for teaching mathematics, yet they were not familiar with the standards and, consequently, did not apply them in their work with students. Furthermore, the real authors of these (rather brief) standards published by the Ministry of Education and Culture of the Republic of Srpska were not known to either the general public or the mathematics education community. That is why there was no way to determine mathematical competence of those responsible for the content of the standards. The authors argue for the need to have a strong connection between the general population (including teachers of different disciplines, students and their parents) and the academic community of mathematics teachers.

The fourth article written by Biljana Popović (Serbia) is devoted to the review of curriculum in statistics at the faculties of mathematics at Serbian public universities. The author describes non-uniformity in the professional background of faculty teaching statistics at the universities of Belgrade, Novi Sad, Niš, Kragujevac, Pristina, and Novi Pazar: while some instructors are mathematicians, others are not (e.g., economists). A similar discrepancy can be observed at the secondary level where statistics is mostly taught as part of the fourth class mathematics course. By reviewing courses in the modern day curricula at the faculties of mathematics in Serbia, the author calls for teaching and learning statistics as a mathematical method. Three levels of academic studies at the tertiary level are considered – undergraduate, graduate, and post-graduate – along with different departmental organizations of faculty in the areas of mathematics, informatics, and computer science. The article concludes with the statement that the strong knowledge of statistics is of the major importance for it enables one to appreciate the diverse physical and cultural world around us.

The fifth article written by Sergei Abramovich (United States) summarizes the author's work on the development of the computational experiment approach to pre-college mathematics curriculum using a variety of commonly available tools of technology including spreadsheets, dynamic geometry programs, and different computer algebra systems. The article emphasizes an international dimension in the use of technology in mathematics teaching. To this end, it references (available in English) mathematics education documents of Australia, Canada, England, Japan, Singapore, and the United States. Due to this worldwide emphasis on using technology, the author sees computational experiment as the modern day signature pedagogy of mathematics. The article highlights the dual nature of technology applications in the schools and that of the styles of assistance that teachers typically offer to their students. The author introduces the notion of technology-enabled mathematics pedagogy, which, by following into the didactical footsteps by the mathematical giants Archimedes and Euler, emphasizes the unity of computational experiment and formal demonstration. The article concludes by illustrating how the integration of technology-enabled mathematics pedagogy into the preparation of teachers can lead to the mathematical frontier including the formulation of an open problem in mathematics.

Sergei Abramovich

OMEN Editor-in-Chief