Guest editorial

CONTRIBUTIONS FROM THE TOPIC STUDY GROUP ON MATHEMATICS FOR NON-SPECIALIST/MATHEMATICS AS A SERVICE SUBJECT AT TERTIARY LEVEL AT ICME-14 IN SHANGHAI

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At the tertiary level, mathematical education is not only present in mathematical study courses but can also be found as part of general education or in form of special service classes tailored to the needs of an application study course like economics or engineering. It is quite obvious that the goals and forms of mathematical education depend very much on the audience and hence on the study course within which it takes place. This was recognized by the International Commission on Mathematical Instruction (ICMI) more than thirty years ago when the first ICMI study on mathematics as a service subject was launched resulting in two volumes (Howson et al., 1988; Clements et al., 1988). The studies dealt with the questions "why", "what" and "how" addressing the goals, contents and forms of mathematical education. Since then, this topic played a minor role at ICME conferences which are organised by ICMI every four years to summarize and discuss the state of the art in many areas of mathematical education (see (Alpers 2020) for more information on the historical development). At ICME 13 in Hamburg 2016, some aspects of service mathematics were discussed in a more general group on mathematics at the tertiary level (Biza et al., 2016). The reports by Biza et al. (2016) and Alpers (2020) show that mathematics education at the tertiary level has been of growing interest in educational research for the last two decades but the mathematical education of non-specialists is still a widely under-researched area (Artigue 2016). Therefore, for ICME 14 in Shanghai ICMI installed a dedicated topic study group on "Mathematics for non-specialist/Mathematics as a service subject at tertiary level".

At ICME 14 which took place only in 2021 because of the Covid-19 pandemic, there were nine paper contributions and three posters within this topic study group. Although the majority of contributions dealt with mathematics education within engineering study courses where mathematics undoubtedly plays a very important role, there were also contributions on suitable forms of mathematical education in less mathematics-based study courses or within general university education. The four papers which appear in this special issue of the Hiroshima Journal of Mathematics Education represent the spread of contributions in the group very well. The paper by Kawazoe on "A Practice Report on Mathematical Modelling Education for Humanities and Social Science Students" describes a concept of making mathematics relevant for students of social sciences and psychology by using a mathematical modelling approach and engaging students in group activities. This concept has been in use for about ten years now such that experience on what turned out to be viable in the long run can be presented. The other three contributions deal with mathematics in

engineering study courses and address different aspects of this setting. The paper by Takagi, Hadano and Yamaguchi on "Teaching Materials on Calculus as seen from the Application to Engineering" also tackles the problem of making mathematics relevant to students and enhancing their understanding by experiencing the practical meaning of mathematical concepts. They suggest to motivate and explain these concepts by first providing a relevant application problem and giving the formal definitions and theoretical developments later on. They illustrate their approach by giving three examples. In the paper by Viirman and Pettersson on "A Small-scale Implementation of Inquiry-based Teaching in a Single-variable Calculus Course for First-Year Engineering Students", the authors introduced group sessions where students investigated application problems where the currently studied mathematical concepts are of relevance. This way, students can better understand the meaning of the concepts and recognize additional aspects like the practical numerical computation of interesting quantities. They interpret their observations within the framework of commognitive theory. Finally, in the paper by Peters and Hochmuth on "Sometimes Mathematics is Different in Electrical Engineering" the authors address the problem that mathematical presentations and practices in the mathematical education of engineers can be different from the practices and usages which can be found in application subjects of an engineering study course. They analyse the differences in practices using the Anthropological Theory of Didactics (ATD) and develop suggestions for dealing with resulting problems in students' understanding.

All in all, the four papers presented in this issue provide a good impression of the themes and methods of current educational research on mathematics for non-specialists. We hope that they will provide inspiration for additional research and development in this under-researched area which is important for many students who need mathematical understanding without intending to major in mathematics.

References

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