RELATIONS AMONG PROBLEM SOLVING/POSING, CREATIVITY AND MATHEMATICAL MODELLING

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Mathematical problem solving and mathematical modelling have several commonalities as has been pointed out on various occasions (Blum & Niss, 1991; Niss & Højgaard, 2019). In the current discourse on mathematics education and mathematics education research, problem solving/posing, creativity and modelling play an important role and their fostering is emphasized in many curricular standards all over the world, being quite often strongly connected within the curricula.

However, although mathematical modelling and mathematical problem solving/posing share many commonalities in their emphasis on non-routine and open-ended solution processes, where creativity is concerned, both approaches have also many differences in their orientation and foci. Especially their relation to the real world as a context for the problems tackled and their requirements concerning authenticity and proximity to reality are quite different. The creativity-directed approach involves students in creative mathematical processing. The fostering of creativity through challenging mathematical problems and tasks play an important role within mathematics education and have been connected in the past especially to problem solving and complex problems in mathematical competitions. However, in the recent years the scope of fostering mathematical creativity has been widened, focusing on mathematical problems with different stages of complexity and a great variety of solution processes, also within real world contexts.

In all three approaches scaffolding activities play an important role as the teacher should function as a mentor supporting students to find their own solutions on their own pace, as independent as possible.

The panel will discuss the complex relations between these three important approaches concerning the following topics:

- What kind of tasks are important in the three approaches, how can they be characterised?
- How can the solution strategies be characterised?
- How can problem solving/posing competency and modelling competency be conceptualised, respectively? How can they mutually support each other for further advances?
- Which scaffolding activities have proven to be successful for mentoring students in their solution processes?
- Which kind of theoretical framework is appropriate, for example concerning the relation to real-world contexts or to metacognition?
- Under which conditions foster problem solving/posing and modelling tasks creative mathematical processing?

The panel will close with prospects for further research and effective practices.

References

Blum, W., & Niss, M. (1991). Applied mathematical problem solving, modelling, applications, and links to other subjects: state, trends and issues in mathematics instruction. *Educational Studies in Mathematics*, *22*, 37–68.

Niss, M., & Højgaard, T. (2019). Mathematical competencies revisited. *Educational Studies in Mathematics*, 102, 9-28.