Summary of the Discussion on „Putting the concept of mathematical competencies into practise“ (19th SEFI Maths Working Group Seminar, Coimbra 2018)

Burkhard Alpers

In this discussion, the participants addressed the following questions:

- Which learning/teaching scenarios are suitable for competence acquisition?
- Is the traditional lecture/exercise scheme sufficient?

Traditional lecture/exercise schemes can serve as a basis but do not cover the complete range of competency goals. One has to take into account, though, that in the past the scheme produced successful engineers, so it should not simply be removed but improved. We particularly need activation and reasoning in lectures (e.g. by problem discussions, by gaining time by placing some material in videos).

Projects seem to be a particularly good means for competence acquisition. They can address modelling and application in realistic contexts where problems might also come from students themselves. Modelling projects can comprise the acquisition of several competencies at a time. This also includes communication when students work in teams and document and present their work. Involvement of all group members could be taken into account by letting one randomly chosen group member do the presentation. Such projects often also include the use of technology. There certainly is a need for scaffolding and feedback in such projects requiring additional lecturer time.

As a major obstacle to projects large student cohorts were stated. Another problem is the weight put on project results. Often higher weight is given to final written exams since there assessment is strictly individual. But this diminishes the incentive to spend much effort on projects. Another problem is the coordination with other subjects: If projects are also used there, then it should be avoided that they all run during the same few weeks in a semester.

Finally, it has to be taken into account that mathematical competencies (like the modelling competency) are also acquired in application subjects. So, it remains to be investigated which part should be included in the mathematics education and which part can be “delegated” to application subjects.

Summary of the Discussion on „Assessing mathematical competencies“ (19th SEFI Maths Working Group Seminar, Coimbra 2018)

Burkhard Alpers

In this discussion, the participants addressed the following questions:

- How must mathematical competencies be specified such that they can be assessed?
- What are suitable forms of assessment?

Since mathematical competencies are not simple binary variables but more complex constructs comprising several aspects, they must be specified in more detail for a specific study course in order to enable proper assessment. In addition, the overlap of competencies makes them even harder to assess.

It was discussed whether it is possible to assess mathematical competencies already in year 1. It was suggested that this could be done with lower levels already by using small projects or assignments (there need not only be “high-level” modelling tasks). One could have assignments with different notations (not just y(x)) in order to check for the ability to handle formalism or have tasks where the role of parameters in models is investigated (mathematical reasoning).

It was suggested to use a variety of assessment forms like short-term tests, projects, quizzes, and written exams. It was also stated that assessment of the eight competencies is very ambitious.

Problems are again large groups where it is problematic to have suitable schemes of assessment which do not place to big a time burden on lecturers. There also might be strict university rules to be taken into account. Moreover, students often want to be assessed on procedures rather than on competencies. One should also not neglect the traditional check of knowledge and skills.

A lot of work still needs to be done on the assessment aspect. This is important since students are rather assessment-driven.