Clash of cultures? Teachers' and students' perceptions of differences between secondary and tertiary mathematics education

Helena Johansson[1] & Magnus Österholm[1,2]
[1]Mid Sweden University, [2]Umeå University

Introduction

The transition problem between secondary and tertiary mathematics education has been addressed from various perspectives over the years, e.g., concerning gap in mathematical content (Brandell, Hemmi & Thunberg, 2008) and metacognitive awareness (Wingate, 2007). Through a literature review of studies covering a range of aspects of the transition problem, Jablonka et al. (2017) identified five dimensions of research that highlight mismatches in criteria for what counts as "mathematics" at upper secondary and tertiary levels. These dimensions are: (1) *Change in Expected Learning Habits and Study Organisation*, e.g., university studies require a higher degree of autonomy, (2) *Different Teaching Formats and Modes of Assessment*, e.g., mostly lectures at university in contrast to individual work, with teachers scaffolding, at upper secondary school, (3) *Differences in Pedagogical Awareness of Teachers*, e.g., lack of steering and old-fashioned teaching methods at university, (4) *Curriculum Misalignment*, e.g., the expectations of mathematics departments are not aligned with the curricula for upper secondary mathematics, and (5) *Changes in Level of Formalisation and Abstraction*, e.g., mathematics at university emphasises proof and rigour in contrast to more informal reasoning at upper secondary level. Furthermore, Jablonka et al. (2017) concluded that changes in criteria are often diffuse for students entering university, for example, concerning what counts as a proof, what has to be proven and what could be expected to be known.

Many studies focus on some specific aspect of the transition problem (Jablonka et al., 2017). Therefore it is valuable to use all dimensions that emerged in the literature review to approach the problem from a more general perspective. The purpose of this on-going study is to analyse if any of the dimensions influences the transition more than any of the others, both from a student and a teacher perspective, and if different groups of students are affected differently by the dimensions. Our research questions are: In which of the dimensions is there a perceived transition gap between upper secondary and tertiary education? How do teachers' and students' perceptions of transition gaps differ? How are perceived transition gaps related to students' backgrounds and course results?

Method

To capture students' and teachers' perceptions of the gap of "what counts as mathematics" with respect to the various dimensions, we use an on-line questionnaire with structured items providing quantifiable responses. Various aspects that represent each dimension were identified, and six to nine questions for each dimension were created. Answers are given either on a five-point Likert scale (strongly disagree/…/strongly agree) or a five-point scale capturing the direction of a possible difference (much more at upper secondary/…/equal/…/ much more at university). "Don't know" is also always a possible response. In the first step, nine mathematics teachers that teach first year mathematics courses at engineering programs at one Swedish university have answered the questionnaire, which also function as a piloting for the next step. Next, the questionnaire will be sent out to approximately 470 first-year engineering students participating in mathematics courses at the same university. In a third step, similar data will be collected also from other universities.

Analyses and Results

At the moment, only descriptive analyses of data from the nine teachers have been done. First, the two scales were quantified, 0 to 4 and -2 to 2, respectively. Then, a measure of the severity of the perceived transition gap was constructed by normalising the two scales in a linear manner: 0 for no gap (0 on both scales) and 1 for maximum gap (4 on the first scale and -2 and 2 on the second scale). Our analyses focus on the dimensions, by using measures, such as mean values, over all questions in each dimension. The analysis shows that the dimension *Differences in Pedagogical Awareness of Teachers,* had quite many "don't know" answers: 38% compared to 9% to 29% for the other four dimensions. Especially *Changes in Level of Formalisation and Abstraction* seemed to be regarded as a gap (0.70 on the normalised scale), which can be compared with the corresponding measures for the other four dimensions: between 0.41 and 0.59. To draw any general conclusions, we will analyse more data and use statistical methods in the next step of the study. During the short presentation, we will also discuss possible interpretations and implications of our results.

References

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