CHARACTERISTICS OF REAL ANALYSIS AND LINEAR ALGEBRA FROM AN UNDERGRADUATE'S PERSPECTIVE

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Mathematics bachelor courses at university still come along with high dropout rates, mainly during the first year. The research for conditions that favour students' academic success and prevent dropout is multifaceted. Among other things, beliefs are analysed. Students' beliefs have an impact on mathematical learning as they influence "how one chooses to approach a problem, which techniques will be used or avoided" (Schoenfeld, 1985, p. 45) and the willingness to exert effort.

At German universities, the first year is traditionally characterised by courses in real analysis and linear algebra (Halverscheid & Pustelnik, 2013). From past experiences, the failure rate in the exams at the Ruhr University Bochum tends to be higher in real analysis than in linear algebra. Due to the impact of beliefs and the experience of the divergent results in real analysis and linear algebra, we are interested in the characteristics of both domains from an undergraduate's perspective and her related domain specific beliefs.

The case study was carried out in a qualitative way, using a semi-structured interview with a narrative focus ("How would you describe real analysis and linear algebra to a secondary student?"). Additionally, a semantic differential (Osgood, Suci, & Tannenbaum, 1957) with 25 opposite pairs of adjectives, such as *theoretical-practical* or *concrete-abstract,* was used. For analysing the data, we used the documentary method.

We interviewed Hakima, a second-year student who was chosen because she attended the same courses twice within two years due to her failing the exam in the end of the first semester. Therefore, she had a more comprehensive perspective than ordinary first year students. Furthermore, being taught by two different professors in each subject, she may have benefitted from multifaceted experiences.

The findings indicate that most mentioned differences are not related to characteristics of the mathematical domains but focus on characteristics of the lecturers and their teaching style or the organizational structure of the lecture. Being asked to describe the domains to a secondary student, Hakima characterised the domains foremost among the topic *vector spaces* for linear algebra as well as *sequences* and *series* for real analysis. Based on these examples, Hakima describes the domains as rather practical in the case of linear algebra and rather theoretical in the case of real analysis. While her description and evaluation underlined the different topics, she did not refer to any mathematical technique or to any mathematical way of thinking.

Our results indicate that the lecturers' teaching style is way more important to the students than domain specific beliefs regarding the content. Therefore, it seems necessary to give more attention to the form of presentation. However, it remains unclear whether the content influences students' beliefs about real analysis and linear algebra and whether each domain calls for special supportive strategies.

References

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