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Self-Explanation Training in Undergraduate Mathematics

Day 2 – Parallel IV (10.55-11.25)

As is well known, undergraduate mathematics students often do not engage successfully with mathematical proofs (e.g. Selden & Selden, 2003; Weber, 2010). In particular, there is reason to believe that they do not read presented proofs effectively (e.g. Alcock & Weber, 2005; Shepherd, Selden & Selden, 2012). This is of concern in a pedagogical environment in which students are expected to learn large amounts of mathematics by engaging with proofs presented in lectures or in textbooks. We therefore set out to investigate 1) the nature of effective mathematical reading, and 2) and the effects of a specific intervention designed to improve students' reading and thus their proof comprehension.

This presentation will summarise this work, and will be broken into three short sections. First, we will summarise findings from an expert/novice eye-tracking study (Inglis & Alcock, 2012) in which we observed, analysed and compared the reading processes of mathematicians with those of undergraduate mathematics students. This study allowed us to identify specific features of expert reading and to develop operational measures of concentration and of attention to logical relationships. Second, we will summarise findings from a sequence of lab-based and lecture-based experiments examining the effects of a simple self-study booklet containing self-explanation training (based on e.g. Ainsworth & Burcham, 2007; Chi, de Leeuw, Chiu, & LaVancher, 1994). These studies show that self-explanation training leads to improved student attention to, and explanations of, the logical relationships between claims in a proof, and to improved proof comprehension. Third, we will briefly describe our plans to examine the possibility that the effects of self-explanation training are different for different student groups, and our presentation will summarise our progress in making self-explanation training widely available.

References

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