

Promoting co-operative learning in undergraduate mathematics via primetime instruction

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In our poster, we describe a new teaching model in undergraduate mathematics that combines an existing student-centred teaching model with co-operative learning facilitated by “primetime” meetings. We also analyse student reflections (n=63) on what supported their co-operation.

Keywords: Teachers’ and students’ practices at university level, Novel approaches to teaching, Co-operative learning, Group work, Mathematics education.

INTRODUCTION AND THEORETICAL BACKGROUND

Teamwork and social skills are important working life skills that are rarely developed enough in university curricula. This has remained so, even though small-group co-operative learning has shown its effectiveness in education from primary school to universities (Johnson & Johnson, 2009). In mathematics, meta-analyses by Springer et al. (1999) for undergraduate mathematics, and Capar and Tarim (2015) for all ages, show that small-group learning enhances mathematics achievement, mathematics self-esteem and attitudes towards mathematics.

In this report, we describe how we have introduced co-operative learning to an already established student-centred teaching model. We also analyse students’ perceptions of those aspects that have supported their group work. We base our analysis on the five criteria of effective co-operative learning by Johnson and Johnson (2009): positive interdependence, individual accountability, promotive interaction, appropriate use of social skills, and group processing.

PRIMETIME-FACILITATED GROUP WORK

The course investigated in this study is an undergraduate course in abstract algebra that was taught in a Finnish university in spring 2020. The course was taught on campus and had 83 students. The teaching practices of the course were built on a student-centred model of Extreme Apprenticeship (Rämö et al., 2020), and co-operative learning was promoted using primetime learning (Koskinen et al., 2018). Individually, the students completed weekly tasks using the textbook and the help of tutors who taught in an open learning space. For co-operative learning, the students worked in groups of six people that completed two projects during the course. Promotive interaction was facilitated by requiring that the groups meet regularly to work on the projects and by giving feedback on their work process. Positive interdependence and appropriate use of social skills were built by making visible the roles of group work

and letting the students try out different roles in their group. Group processing was facilitated by giving the groups tasks which required reflecting on the group's actions. Individual accountability was supported by creating an assessment system in which students' individual achievements influenced the group's grade. The teacher supported the groups' working in primetime meetings, in which each group had a 15-minute one-on-one meeting with the teacher.

ANALYSIS AND RESULTS

The data for this study consists of students' reflections they wrote at the end of the course (n=63). The students were asked to describe what supported their group's work, and their answers were analysed using qualitative content analysis based on the criteria for effective co-operative learning by Johnson and Johnson (2009). Of the dimensions in Johnson and Johnson's framework, the most frequently mentioned were *Promotive interaction* (30 mentions, e.g., "Common meetings in which everyone participated") and *Appropriate use of social skills* (21 mentions, e.g., "Open and supportive atmosphere"). A few instances of *Group processing* (4 mentions, e.g., "We needed an organised method for solving the tasks") and *Positive interdependence* (4 mentions, e.g., "Different learners in the group noticed different things") were found. *Individual accountability* was not identified in any of the answers. The results indicate that either the learning environment supported promotive interaction and appropriate use of social skills more than the other dimensions of effective co-operative learning, or alternatively, those dimensions were easier to identify for the students than other dimensions.

REFERENCES

- Capar, G., & Tarim, K. (2015). Efficacy of the Cooperative Learning Method on Mathematics Achievement and Attitude: A Meta-Analysis Research. *Educational Sciences: Theory and Practice*, 15(2), 553–559. <https://doi.org/10.12738/estp.2015.2.2098>
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational researcher*, 38(5), 365–379. <https://doi.org/10.3102/0013189X09339057>
- Koskinen, P., Lämsä, J., Maunuksela, J., Hämäläinen, R., & Viiri, J. (2018). Primetime learning: collaborative and technology-enhanced studying with genuine teacher presence. *International Journal of STEM Education*, 5(1), 20. <https://doi.org/10.1186/s40594-018-0113-8>
- Rämö, J., Lahdenperä, J., & Häsä, J. (2021). The extreme apprenticeship method. *PRIMUS*, 31(10), 1106–1120.
- Springer, L., Stanne, M. E., & Donovan, S. S. (1999). Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. *Review of educational research*, 69(1), 21–51. <https://doi.org/10.3102/00346543069001021>