Student Perceptions on Collaborative Class Projects in Gateway College Calculus Courses

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Working in small groups can be a daunting activity for students, yet also provide an opportunity to promote peer interactions and build an inclusive community (Tanner, 2013). In this focus group study, we present how students (n = 43) perceive collaborative class projects in Calculus I at Johns Hopkins University, a predominantly-White, "very high research" university in an urban metropolitan area in the Northeastern United States. 51.16% identified as women and 48.84% as men. The most represented majors were Computer Science (23.26%), Mechanical Engineering (16.28%), and Pre-Major (16.28%).

Prior to the focus group, participants filled out a questionnaire that gathered their demographic information (major, gender identity, racial/ethnic identities), first-generation student status, limited-income status, etc.). The questionnaire also asked students to rank these course assessments from most helpful to least helpful to their learning: homework, quizzes, group projects, final portfolio, midterm, and final exam. While homework ranked as the most helpful and tests (final and midterm) as the least helpful, group projects have the highest variability in helpfulness. Hence, in the focus group, Dr. Yap explored this trend by eliciting elaboration on students' group work experience. Responses were analyzed by qualitative coding of themes (Saldana, 2021) that emerged from the focus groups.

Findings show that participants who highly favored group projects saw these collaborative activities as opportunities: (1) to meet students who can be their friends outside of class, (2) to practice Calculus in a different way, such as being a teacher to a groupmate to explain a concept, and (3) to apply Calculus in practical ways. Meanwhile, other participants disliked group projects because of (1) group dynamics, (2) logistical limitations, and (3) resistance to new ways of learning Math. Examples of group dynamics include dealing with absent or uncooperative groupmates and feeling left out if groupmates are either too far ahead or behind in understanding the class topic. Logistical limitations consist of receiving limited instructions about the group project, including rubrics not being given in advance; however, instructions and rubrics were posted in the syllabus and learning management system. Finally, students complained that the group work was "busy work" forcing them to work with others, was not directly helpful in exams, was too demanding in writing in non-technical ways, was unclear how it was connected to the lessons, and too practical and connected to the real world.

These findings inform the next iteration of Calculus I group projects at Johns Hopkins University. The curriculum team will improve collaborative projects by (1) providing multiple reminders of the already existing pointed instructions and rubrics in multiple modalities, (2) providing best practices in group communication, in regards to norms for participation, work distribution, etc., and (3) providing clear connection to lessons for genuine buy-in from resistant students.

In conclusion, collaborative group projects provide opportunities for improving peer social cohesion and practical knowledge of Calculus but need targeted improvements in implementation and genuine buy-in from potentially resistant students.

References

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