

# Group exams in mathematics courses

This fall, students in Math 102 and Math 221 will participate in the study called “Feasibility and effectiveness of group exams in mathematics courses” that is being conducted by researchers from University of British Columbia’s Department of Mathematics and The Carl Wieman Science Education Initiative. Principal investigator on this project is Eric Cytrynbaum with Kseniya Garaschuk and Daniel Coombs as co-investigators.

## Purpose and Objective

We aim to improve student performance in mathematics courses by continuously evaluating and bettering our instructional techniques and approaches. The purpose of this research project is to assess the feasibility and potential impact of group exams on student performance. With group work introduced into university courses, this research project is designed to evaluate how group exams can best be done in terms of efficiency and effectiveness.

## What is involved

As a part of the course experience, students will write both individual and group quizzes. Data collected will consist of all term grades.

We will use a cross-over study design, where two groups of students alternate writing individual and group quizzes. The experimental group will write a two-stage quiz (individual stage followed by a group stage) that will consist of both multiple choice and short answer questions. The control group will write an individual quiz. The groups will be switched around for the next quiz, therefore allowing students to participate in both the experimental and control conditions. Learning will be measured as the change in students’ individual performance on the corresponding topics on the subsequent comprehensive test (midterm or final exam).

After the term is over, the data will be anonymized and analyzed, when students’ performance on various topics will be compared. Students will also fill out online surveys at various times during the semester; these are meant to collect students’ opinions on the group work in the exam setting and are entirely voluntary.

## Potential Benefits

The benefits for the participants include practicing group discussion skills, strengthening their mathematical skills through discussion and peer-learning as well as immediate peer feedback on their performance. Peer discussions should promote confidence and competence in the course materials.

Further potential benefits might include an increase in the overall grade and overall satisfaction with the learning experience. If we find that group exams do improve student success and satisfaction, then the department would benefit from using an improved way of teaching.

This research will also add to the literature on implementing and evaluating teaching techniques that is essential in establishing a strong foundation for further educational improvements.

## **Potential Risks**

The research study will involve group work during in-class quizzes and hence, as with any group work, the main risk is non-optimal group dynamics. The quizzes will be run in a two-stage manner: individual portion followed by a group portion. The instructor and a TA (for large classes) will circulate the room to ensure proper group work conduct during the group stage. Moreover, the students will always be given the best of individual and combined individual/group work score, so introduction of a different teaching technique in this case will not negatively impact students' evaluation in any given quiz independent of their group's strength or composition. Students with disabilities requiring more time will be given their individual portion of the quiz earlier and will rejoin the class at the group stage.

## **Consent process**

Students will be enrolled into the study automatically as the research project runs in standard classroom conditions. The data collected will consist of student grades, which are always available to instructors. If you wish to withdraw your data from the study, you can do so by e-mailing Sandra Merchant at merchant@math.ubc.ca prior to January 15th, 2016.

## **Confidentiality and Anonymity**

Students' confidentiality and the confidentiality of the data will be protected by keeping all the research data encrypted and password-protected. Research data will only be accessible by the research team.

To protect students' anonymity, all the information will be kept confidential by removing the names and student ID numbers from the files before the analysis of the data commences.

## **Dissemination of Results**

It is anticipated that the results of this study will be shared with others via internal reporting and possible CWSEI website. The generalized results may be presented at a conference or published in an education journal.

## **Disposal of Data**

Data from this study will be disposed of in the following manner: within five years after the completion of the research, the electronic records of data will be erased and overwritten and all paper records of data will be shredded confidentially.

## **Contacts (for information and complaints)**

Individuals that may be contacted with any aspects regarding this study include Kseniya Garaschuk (kseniya@math.ubc.ca), Eric Cytrynbaum (cytryn@math.ubc.ca) and Daniel Coombs (coombs@math.ubc.ca).

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598.

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