Effect of Group Size on Material Retention
CAS 352 Research Project

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**Introduction**

The workshop environment is supposed to provide a setting for students to work with peers to understand material for a specific class. Having a peer as a workshop leader enables students to ask questions in a more relaxed environment. The environment also provides students a place to meet others students and form study groups outside of workshop. It is an ideal environment for learning vast amounts of knowledge. Therefore, it is very important. Every week, we are given a workshop sheet from the professor with five or six questions. We go through these questions one-by-one as a workshop. As workshop leaders, our primary goal is to facilitate discussion on each question without giving out the correct answers. As a matter of fact, we are not even given the correct answers to the workshop questions from the professor. Our goal is to let the students figure out how to answer these questions with some guidance from us. Without being given the answers, students are able to think deeply about each question and work through the process of figuring out difficult question. This in essence helps with retention of information.

While leading our workshops, we realized that not every student could actively contribute to every workshop question because it was just not possible. At most, four people would lead a discussion on a question, which would leave about nine people out of active discussion. It is just not possible for all fourteen students to actively participate on each question because that would be chaotic. This made us wonder whether other students actually pay attention to a specific question when there are already three or four other students discussing this problem. This could be problematic when each
question in workshop is stressing the importance of different topics. We want our students to retain the most amount of information possible during workshop so we decided to test whether smaller groups were more effective to the learning process. So for our research project we decided to compare the retention of information among students depending on workshop size. We believe this is an important issue to address because the size of a workshop can significantly affect student's ability to learn material.

Hypothesis

Before conducting the experiment, we did extensive research on this subject matter. Most of our findings stated that smaller group learning was more effective for students compared to larger groups. We hypothesized that groups of two to three were ideal for the learning environment. This way, students would be able to actively participate for each question because they would be forced to participate in a smaller group. As workshop leaders, we would walk around for any help but hugely let them figure things out on their own. We thought this would improve their overall understanding.

Methods

The subjects for this study were students in workshops from The Science of Programming (CSC 171) class taught by Professor Pawlicki. Using two different workshop groups, we were able to test our methods on 22 students. There was a required weekly workshop session, where discussion of course materials and approximately 6 practice questions would take place, to facilitate learning and complement class lectures.
The purpose of our study was to determine whether working in large or small groups (of approximately 2-3 students) would lead to better retention of course materials. To start off, we were interested to see what the students thought they preferred (prior to observing small and large groups). We gave them a survey developed using Google’s forms (see figure below) to ask this question.

![Workshop Survey](image)

After questioning the students, we had three experimental stages. The first was splitting the students into 2-3 person groups depending on size of workshop, to work through a question from the workshop sheet of that week. While they were working through the problems, we (the workshop leaders) walked around the room, giving help when necessary, and made sure that everyone was solving the question correctly. The next stage was to do a question from the workshop sheet as we normally would, discussing the question as one large group. The last stage came after we had finished all the workshop questions. We prepared two quiz questions that were similar to the two questions done in the small groups and large group. We had the students complete
these quiz questions after the workshop had ended to test their material comprehension. We repeated this process in each of our workshops for two separate weeks. After we did this experiment the first week, we waited 2 additional weeks to do the experiment again, so that the results would be more representative of workshop dynamics in general. We also made sure to keep the question difficulty about the same to maintain consistency for our data.

Finally, once we had completed this process, we gave our students the same survey we administered before we started our experiment to see whether or not their preference for big or small groups had changed.

**Results and Discussion**

Upon concluding our study, we were able to assess the results found. We were surprised to see that a large majority preferred working in large groups prior to our experiment. As seen in the below graph obtained from the Google form responses, 82% of our students preferred working in a large group.

![Pie Chart showing preference for large or small groups](image)

Next, we saw that students had a much better material retention rate after working in small groups as opposed to large groups as seen in the below graphs, detailing quiz grades. We had 22 students complete 4 quizzes, 2 of which were after working in small groups and 2 of which were after working in a large group.
Figure 1. shows a graph plotting the number of students against quiz grades (graded on a scale from 1-10) who received that grade after working in small groups and large groups.

Fig 2. shows the average quiz scores of students after working in small and large groups.
Finally, we gave out the same survey again, and were pleased to see that student preference correlated with the quiz grades. More students preferred working in smaller groups after our experiment.

It can be seen that 62% preferred working in small groups after the experiment (We had one student not complete this survey, which is why there are only 21 responses).

**Conclusion**

After conducting our experiment, we analyzed our data. One surprising fact we came across was that more students said they preferred working in smaller groups after
working in smaller groups compared to when more students said they prefer working in big groups prior to working with a small group. This shows that students like the idea of working in big groups but after working in smaller groups, they realized that it was more effective to work in smaller groups. After analyzing our data, we realized that students generally did better on quizzes after working on material in smaller groups of two or three. The overall average quiz grades were higher for small groups compared to larger groups.