17

Group work in exercise classes: Evaluation of group assignment methods

Kahsay Haile Zemo

Department of Food and Resource Economics
University of Copenhagen

Introduction

Teaching and learning in higher education involves, among others, collaborative learning with small groups of students in theoretical and practical classes (Christensen, 2017; Riebe et al., 2016). Working in groups enables students to gain more information from their peers, stimulates creativity, and helps students to gain a better understanding of themselves (Burke, 2011). However, there could be coordination challenges during a group work if a group activity is poorly designed. Thus, the effectiveness of group work depends on how well it is designed and organized (Burke, 2011). Poorly designed group work will result in a poor outcome or vice versa. A design of group work requires a careful consideration of a number of factors, among others, group size, group composition, group formation or assignment (Chapman et al., 2006; Odo et al., 2019).

Group formation or assignment is one of the essential factors in group work design (Odo et al., 2019). Teachers either randomly assign students to groups or allow students to self-select or form their own groups (Burke, 2011; Chapman et al., 2006). Some teachers also use criteria-based selection (Gunderson & Moore, 2008). The self-selection method of group assignment is easy to organize and creates a good group dynamics since the members of a group are likely to be friends and close acquaintances (Chapman et al., 2006). However, there are at least three limitations to this kind of group assignment: 1) groups are less diverse and students who do not have many friends in the class may be initially left out of the groups. It may even be difficult to break into the groups after finding a group of self-

selected individuals (Chapman et al., 2006). 2) Students in self-selected groups may waste time socializing rather than working on the task (Burke, 2011). 3) Self-selection as group assignment may not produce the intended outcome when there are heterogeneous groups in the class, for example, if there are students from multiple programmes with different academic background. If students are allowed to self-select into a group, they may choose to work with students from the same programme. In the random assignment of students to groups, each student has an equal chance to be in any group, whereas in criteria-based selection, students are assigned based on specific criteria (e.g., skill) (Gunderson & Moore, 2008). Both of these group assignment methods can capture heterogeneity in groups. However, in teacher-led group formation, there may be coordination problems or conflicts among group members (Chapman et al., 2006; Christensen, 2017).

Therefore, the careful design of group work and the formation of groups is an essential step to the success of a group work. The objective of this project then is to test the different group assignment methods (self-selection, random or programme-based selection) in group exercise classes in a bachelor course at the Faculty of Science, University of Copenhagen. Students' experience of the group assignment methods (i.e., process) was evaluated using different criteria, which include effectiveness in time use, intensity of non-task-related communication, perceived success in addressing the problems, staying until the end of the exercise sessions, and students' overall satisfaction with group work.

Project context

This project was carried out during my teaching of a course, Environmental and Natural Resource Economics, for second-year bachelor students in block 3 (spring 2022) at the University of Copenhagen. The course is taught in English. The course participants are from two BSc programmes at the Faculty of Science: the BSc programme in Natural Resources and the BSc programme in Environmental and Food Economics. Comparing the students in the two programmes, students in the Natural Resources programme had a stronger background in natural resources and environmental topics, whereas students in the Environmental and Food Economics programme had a stronger mathematical, statistical, and economic background prior to this course. The main teaching methods in the course are lectures and exercise classes. The exercise classes have around 1/3 of the total course

load. After two consecutive lectures, the students work in a group to solve problems in the exercise classes. Despite the significant allocation of time, little emphasis has been devoted to the group exercise classes. Previously, exercise classes were organized as follows: problems were prepared and distributed to students; students self-select with whom to work with in a group; and solutions to the problems were uploaded the following day. Furthermore, a teacher or teaching assistant attends the exercise sessions to help students if they seek clarification on a problem. There was neither proper introduction of the problems at the start nor validation at the end of the sessions in the previous years. Moreover, time was not effectively organized, i.e., there was neither specific time allocated to the problems nor breaks given in between in the three-hour long exercise session. Most importantly, the effectiveness of this group assignment method has not been tested in the context of this course despite heterogeneity in the students' background and the aforementioned limitations. Therefore, in this project, I aim to introduce a structure to the exercise classes and test the effectiveness different group assignment methods.

Pedagogical experiment

The design of the pedagogical experiment involves three interventions in three different exercise classes:

a) Self-selection (Exercise class-1). Students were asked to form their own groups.

b) Random assignment (Exercise class-2): students were randomly assigned to group of 4-5 using the random assignment feature in Absalon.

c) Programme-based group assignment (Exercise class-3): groups that consisted of students from both BSc programmes were formed.

Each exercise class had 5-6 problems, and I followed a similar structure for all three classes. Figure 1 depicts an example of an exercise class structure. An exercise class started with a brief clarification of the first problems followed by a brief individual activity. Then the exercise session was divided into three sub-sessions. Two problems were addressed in each subsession that lasted for about an hour. The group work took 30-40 minutes, and there was a 10-minute break after the first and second sub-sessions. The

session concludes by addressing selected problems, where groups have a chance to provide answers to the problems.

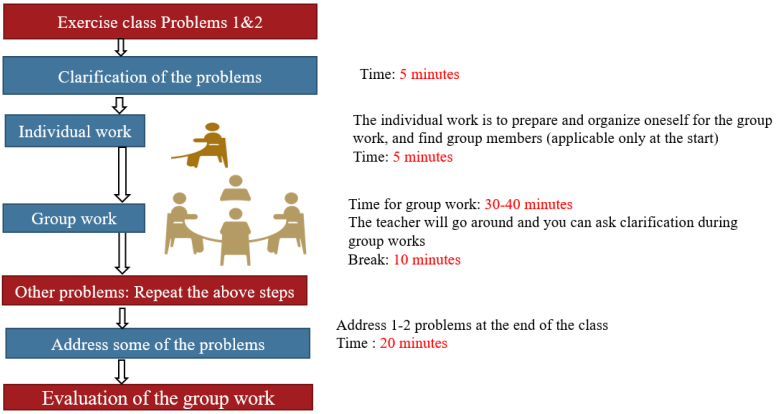

Figure 1. Structure for exercise class-2.

As soon as the exercise session ended, students were asked to evaluate the intervention, i.e., share their experience with the group assignment interventions in exercise classes 1 and 2 using an online questionnaire. 10 and 14 students completed the online questionnaire for the self-selection and random assignment respectively. In addition, I conducted focus group discussions (FGD) with students to gain more insights about the different structures.

Results

In the self-selection intervention, 40% of the respondents were students enrolled in the Environment and Food Economics programme, and 60% of the respondents were enrolled in the Natural Resources Programme. There were an equal number of respondents from the two programmes in the random assignment intervention. The group size ranged from 2 to 4 in both interventions. The group size in the random assignment is lower than the initial allocation that consisted of 4-5 members due to some absentees.

A Likert scale (1 to 10) was used to measure four of the five indicators of students' experience with the group assignment methods (self-selection and random assignment). The main reason for not following the same procedure to evaluate the programme-based group assignment is that it is highly likely that one would achieve the same outcome using random assignment.

Table 1 shows the average score for the different evaluation criteria for the two group assignment interventions. The responses indicate that groups in the random assignment intervention use their time more effectively than groups in the self-selection intervention. On a scale of 1 to 10, students believe that the effectiveness of time use in their group was on average 6 in the self-selected while it was 7.4 in the random assignment. This is also reflected to some extent in non-task-related communication, where informal chatting is more prevalent in self-selection than in random assignment. Moreover, groups in the random assignment intervention were substantially more successful in addressing the problems than groups in the self-selection intervention. On a scale of 1 to 10, it is shown in Table 1 that the success in addressing the problems is on average 5.2 in self-selection but it is 8.3 in random assignment. However, it is important to note that the nature or difficulty of the problems in the two exercise classes may partly explain the big difference between the two interventions. Students believe that the problems in the self-selection intervention was slightly more difficult than the problems in the random assignment (6.8 and 6.1 respectively).

(a) Self-selection (b) Random assignment

Figure 2. Students stay until the end of the exercise session.

Another indicator used to evaluate the two interventions is if the respondents stayed until the end of the session in their respective groups. More specifically, students were asked, "*Did you stay until the end of the exercise class?*" The responses in Figure 2 indicate that none of the respondents left before the end of the session in the random assignment intervention, while 40% of the respondents left before the session ended in the self-selection intervention.

Respondents were also asked to state their overall satisfaction with their group work on a scale of 1 to 10. The responses from the two interventions indicate that respondents in the random assignment intervention are substantially satisfied compared to respondents in the self-selection intervention (6.3 and 8.9 respectively).

Table 1. Average score of the indicators for students' experience in the interventions.

Criteria	*Self-selection*	*Random assignment*
Time use	6	7.4
Non-task related communication	5	4.6
Success in addressing the problems	5.2	8.3
Satisfaction with the group work	6.3	8.9

Data from the FGD show that four out of five students agree that random assignment and/or a group with students from other programmes are more preferred group assignment options than groups formed based on self-selection. The reasons that students mentioned for preferring random or programme-based group assignments are: help students focus on the task, get the tasks done very quickly, less non-task-related chatting and gain different perspective to solve the problems. Here are some of the responses from the students.

"*I like random group assignment a lot. When working with someone I do not know, I tend to get a lot more work done in a shorter amount of time and spend less time chatting.*"- Student 1

"*You are more focused when you work with students from other areas than your own... get different perspectives on the problems*"- Student 2

"The group work is more effective when working with students from other program- in the sense that you get the assignments done faster"- Student 5

However, students also recognized the potential challenge of random assignment or students from other programmes that there may be coordination failure. One student mentioned the following in the FGD:

"*...However, working with some people I know and some people I do not, it is natural to start splitting up and working with the people you know beforehand*."- Student 1

The potential coordination failures in the groups can be reduced by introducing a clear structure of the exercise sessions (example, see Figure 1). If the tasks and expectations are clearly communicated, groups are expected to work well. Respondents were also asked to evaluate the structure used in the exercise sessions, and it was strongly and positively evaluated by respondents. They were asked, "What do you think of the structure of today's group exercise? ". Here are some responses:

"*I think it was well timed and that we had sufficient time to solve the problems. Overall, I found the structure very helpful*"- Student 6

"*I liked the layout a lot. It gave enough time to answer the problems while also leaving time for breaks*."- Student 7

Finally, in the final course evaluation and open-ended questions in the online survey, few students indicated that the exercise plan was very restrictive and they wanted to do things at their own pace.

Conclusion

The results from the group assignment interventions indicate that students evaluate random assignments more positively than self-selection based groups, but the students also recognize the potential challenges with random or programme-based group assignments. Therefore, it may be relevant to reconsider the use of a self-selection format in the exercise sessions of the course. Random or programme-based group assignments may particularly work well if they are accompanied by a well-designed structure of exercise sessions. Introducing some flexibility to the structure to allow some groups to work at their own pace is also important. To do this, the clarification for all the problems can be given at the start of the exercise session. The results of the project will be communicated to the course responsible person and other teachers in the course, particularly those involved in the exercise

classes. However, this project has some limitations, and the results should therefore be interpreted with caution. First, the attendance rate is low in the exercise sessions, and hence the responses may not be representative of all the students in the course. Second, it is the process that was evaluated in this project, and hence it may be relevant to evaluate the outcome using objective measures such as students' performance in exams.

References

Burke, A. (2011). Group work: How to use groups effectively. *The Journal of Effective Teaching*, *11*, 87–95.

Chapman, K., Meuter, M., Toy, D., & Wright, L. (2006). Can't we pick our own groups? the influence of group selection method on group dynamics and outcomes. *Journal of Management Education*, *30*, 557–569.

Christensen, G. (2017). *The didactics of group work: Between means and aims in theory and practice*. Dealing with Conceptualisations of Learning. Springer.

Gunderson, D., & Moore, J. (2008). Group learning pedagogy and group selection. *International Journal of Construction Education and Research*, *4*, 34–45.

Odo, C., Masthoff, J., & Beacham, N. (2019). Group formation for collaborative learning. *Artificial intelligence in education* (pp. 206–212).

Riebe, L., Girardi, A., & Whitsed, C. (2016). A systematic literature review of teamwork pedagogy in higher education. *Small Group Research*, *47*, 619–664.

A

ENRE-exercise class 1

Evaluation of group exercise class-1

* Required

1. Your program: *

   Mark only one oval.

   - ◯ Environmental and Food Economics
   - ◯ Natural Resources
   - ◯ Other

2. Did you attend the exercise class in-person ? *

   Mark only one oval.

   - ◯ Yes
   - ◯ No, I attended online
   - ◯ No, I didn't attend the exercise class

3. Number of members in your group *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

4. Did you read the book or related materials before the lectures for this week *

   Mark only one oval.

   - ◯ Yes
   - ◯ No

5. On scale of 1 to 10, how effective do you think was your time use in the group? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

6. On scale 1 to 10, how difficult do you think this week's lectures were? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

7. On scale of 1 to 10, how prevalent were non-task related interaction during your group work? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

8. How experienced were your group members in relation to addressing the problem? *

Mark only one oval.

- Very inexperienced
- Inexperienced
- Neither experienced nor inexperienced
- experienced
- Very experienced

9. On scale of 1 to 10, how successfully do you think your group addressed or solved problems in this exercise class? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

10. Overall, in scale of 1 to 10, how satisfied are you with your group work? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

11. On a scale of 1 to 10, how difficult do you think the problems in this exercise class were? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

12. Did you stay until the end of the exercise class? *

Mark only one oval.

- Yes
- No

13. If 'No' in 10, can you describe the reason why you did not stay until the end (answer only if it is group related that you left early)?

14. Did any of your group members leave the group work before the end of this exercise class *

Mark only one oval.

- Yes, at the first part of the exercise
- Yes, at the second part of the exercise
- Yes, at the last part of the exercise
- No

15. If 'yes' in 12, why do you think the member/s left (answer if it is only group related) *

16. Please write down here if you have any additional comments related to the group work and the exercises?

Group exercise class-2

Evaluation of group work in exercise class-2

* Required

1. Your program: *

   Mark only one oval.

   - ( ) Environmental and Food Economics
   - ( ) Natural Resources
   - ( ) Other

2. Did you attend the exercise class in-person ? *

   Mark only one oval.

   - ( ) Yes
   - ( ) No, I attended online
   - ( ) No, I didn't attend the exercise class

3. Number of members in your group *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

4. Did you read the book or related materials before the lectures for this week *

   Mark only one oval.

   - ( ) Yes
   - ( ) No

5. On a scale of 1 to 10, how effective do you think was your time use in the group? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

6. On a scale 1 to 10, how difficult do you think this week's lectures were? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

7. On a scale of 1 to 10, how prevalent were non-task related interactions during your group work? *

   Mark only one oval.

1	2	3	4	5	6	7	8	9	10
( )	( )	( )	( )	( )	( )	( )	( )	( )	( )

8. How experienced were your group members in relation to addressing the problem? *

Mark only one oval.

- Very inexperienced
- Inexperienced
- Neither experienced nor inexperienced
- experienced
- Very experienced

9. On a scale of 1 to 10, how successfully do you think your group addressed or solved problems in this exercise class? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

10. On a scale of 1 to 10, how cooperative were your group members? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

11. Overall, on a scale of 1 to 10, how satisfied are you with your group work? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

12. On a scale of 1 to 10, how difficult do you think the problems in this exercise class were? *

Mark only one oval.

1	2	3	4	5	6	7	8	9	10

13. Did you stay until the end of the exercise class? *

Mark only one oval.

- Yes
- No

14. If 'No' in above, can you describe the reason why you did not stay until the end (answer only if it is group related that you left early)?

_____

15. Did any of your group members leave the group work before the end of this exercise class *

Mark only one oval.

- Yes, at the first part of the exercise
- Yes, at the second part of the exercise
- Yes, at the last part of the exercise
- No

16. If 'yes' in above, why do you think the member/s left (answer if it is only group related) *

_____

17. What do you think of the structure of today's group exercise (e.g., the introduction on specific time to address the problems)? Was that helpful?

Detail activities and time for exercise class-2

Activity	Time
Intro	1:00-1:10
Problems 2.1 and 2.2	1:10-1:50
Break	1:50-2:00
Problems 2.3 and 2.4	2:00-2:40
Break	2:40-2:50
Problems 2.5 and 2.6	2:50-3:30
Address some of the problems in class	3:30- 3:55
Evaluation of the group work	3:55-4:00

18. Consider that we are planning to implement the same structure and group format (random) in the next exercise or next year, what recommendations do you have? What should be improved?