12

Group work: A learning barrier?

Alberto Grossi

Department of Food Science, LIFE, University of Copenhagen

Purpose

During Block 1 2010 I was involved for the first time in "Physical and Chemical Changes of Food Quality" in the Department of Food Science, Faculty of Life Sciences. Inspired by "Teaching for Quality Learning at University" (Biggs & Tang; 2007) and by stimulating discussions with pedagogical supervisors and colleagues, I started thinking about how I could design some learning activities that could make group work (GW) the centre of a stimulating and involving learning experience.

In this project, I intended to discuss the use of GW as a teaching tool and to suggest that learning experiences will be more effective if planned in a structured way with teachers taking account of the relationships between group size, interaction type and the nature of the intended learning task.

Introduction

Background

I am a postdoctoral researcher and I was involved as a teacher in "Physical and Chemical Changes of Food Quality". It is quite common in the Department of Food Science that the responsibility to design and structure the laboratory practicals of a course is assigned to a postdoc or an assistant professor.

I was really positive about the idea of playing a role in the laboratory practicals of this course because I think that practical work is really important in science education for two main reasons: it promotes conceptual and procedural learning. The first accentuates the fact that students are physically and practically involved in some lab activities. During these activities their ability to understand is amplified, moreover, practical work can provide concrete reinforcement of abstract ideas. The second argument underlines the idea that the students are directed towards understanding the nature of scientific inquiry. On top of this, practical work gives the students experience in problem-solving, provides opportunity for creativity, motivates students and generates interest in developing laboratory skills, such as using equipment safely and accurately and process skills: observing, measuring, classifying and hypothesizing (Dewey; 1995).

Why group work?

I really think that students learn best when they are actively involved in the process. Indeed some studies report that, regardless of the subject matter, students working in small groups tend to learn more of what is taught and retain it longer than when the same content is presented in other instructional formats. Students who work in collaborative groups also appear more satisfied with their classes (Davis; n.d.). For these reasons, I intended to make GW one of the main elements when I was designing the laboratory work.

The Danish students have been accustomed to mature GW skills to some extend from their previous education, but for many international students this approach is quite unique. Since the University of Copenhagen is trying to develop itself as a leading international university and thus trying to attract more international students, it is really important to develop teaching and learning activities that can overcome some barriers to learning induced by the different educational and cultural backgrounds of the students.

My intention was to design activities during the course that could increase student-student interaction and also student-faculty interaction.

Course description

Physical and chemical changes of food quality

"Physical and Chemical Changes of Food Quality" is a course at LIFE at the University of Copenhagen which is offered to students at Bachelor's and Master's degree level. Teaching was conducted over eight weeks on Tuesdays with four hours of lectures and Thursdays with two hours of lectures and six hours of practical exercises.

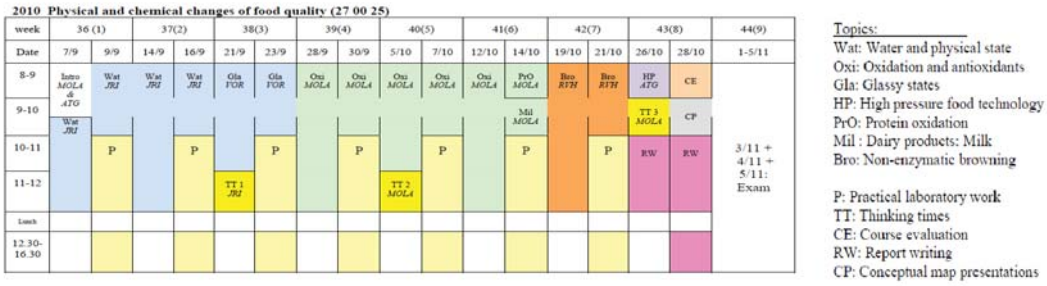

Fig. 12.1. Course structure.

On the course home page, it is stated that the course covers the following topics: thermodynamic stability of food, kinetic description of changes in foods in relation to stability and quality changes, specific physical and chemical processes, control of physical and chemical changes in foods, the use of chemical and physical principles for the description of changes, theoretical and practical experience with several experimental methods for characterization and studying the physical and chemical stability of foods.

Intended learning outcomes of the course

The specific learning objectives of the course are grouped into knowledge skills and competences (taken from the web-page). Students acquire qualifications such as skills and knowledge in the following areas:

- Identify and describe the chemical and physical mechanisms of common physical and chemical deteriorative processes in food.
- Describe commonly applied methods for preventing physical and chemical deteriorative processes in food.

- Apply concepts from chemistry, kinetics and thermodynamics to describe food stability quantitatively.
- Apply selected analytical methods that are relevant for describing physical and chemical food stability.
- Reading and using original scientific literature.
- Present orally and in writing physical and chemical phenomena that are associated with changes of food quality.

Beyond these skills and knowledge, the following academic goal was defined in terms of competences to be assessed and evaluated during the exam: Evaluate and predict the physical and chemical quality of foods based on experimental data and scientific literature.

Course activities

The laboratory practical

A detailed overview of the lab practical was presented to the students on the first day of the course (by me), this presentation was structured as a lecture using a PowerPoint presentation to illustrate graphically the project work to be carried out, the description of the samples to be analyzed and a timetable of the work. I also decided to form heterogeneous groups during this time (based on the results of the first questionnaire, see Appendix A) trying to have groups with at least one international student and one Bachelor's degree student in each group.

During the introductory lecture, I delivered a detailed map of laboratory practicals to each student group. In this map, different laboratory exercises are presented in a form of scientific protocol. At the beginning of the course, I did not give any background on the different techniques to be used during the practical, so that the students had to pay attention during the lectures in order to gain the theoretical knowledge needed to understand the exercises. In this way, the students will start working in the lab from day two without a complete overview or understanding of the experiments. During the practical, the students will receive feedback merely on the experiments.

Other activities during the course

Three more activities have been included in this course:

- Thinking time (to provide formative feedback)
- Design a conceptual map (relate key concepts)
- Presentation peer reviewed (communication skills, ability to criticize)

During the thinking time, the students will have the opportunity to receive active feedback from the teachers regarding theoretical lectures and the practical exercise. To some extent, the thinking time can be considered as a link between the practical and the theoretical lectures. Moreover, during the thinking time, they will be asked to produce a conceptual map, illustrating both the theoretical and practical part of the course. I think that in student learning the designing of a conceptual map is a very important step because it allows the students to see the connections between ideas that they already have, to connect new ideas to knowledge that they already have and to organize ideas in a logical, but not rigid structure that allows future information to be included. Moreover, the process of actually constructing their own conceptual map is a powerful learning tool that in its graphical nature has the force to help and guide the learner to think about the relationships between concepts and ideas. The conceptual map is a key element in this course since it is going to be used by the teacher as one of the tools to assess the ability of the students to relate concepts during their final examination.

The students will have the possibility to present the conceptual map to the other groups and receive feedback from their colleagues. This is also an important element to be included in a course since it stimulates critical thinking and helps students clarify ideas through discussion and debate.

Fig. 12.2. Schematic representation of the alignment of teaching and learning activities.

Evaluation

Questionnaires

In addition to the standard course evaluation sent out to the students through Absalon (virtual learning environment), two additional questionnaires were delivered to the students also using Absalon: a pre-course questionnaire and a mid-course questionnaire. The focus of the first questionnaire was on student background, with regard to nationality, education and experience with GW, and identified students' views on the advantages and disadvantages of GW. The latter was intended to evaluate the students' perception of the GW in this course by using rating scales from "strongly disagree" to "strongly agree" for twelve questions and open answer possibilities for two questions (see Appendix B). The questions were based on other questionnaires used to evaluate GW and collaboration between international students identified from an internet search using the terms "Collaborative learning", "Co-operative Self-Evaluation" and "Peer Work Group Evaluation" and from identification of specific issues concerning GW based on our own previous experiences.

What did the student say about GW?

The students were generally satisfied with GW and they thought it was a positive experience (see Appendix B for the results of the questionnaire in detail). The majority of the students stated that their group worked together well and that everyone shared responsibility for the work. Despite a good GW environment, students gave different answers on the fact that discussions were dominated by few people, but the disagreements did not delay the work and they still managed to solve the problems that they encountered during group work. One-third of the students disagreed that it was an advantage to have people from different nationalities and that it was an advantage to have people with different educational backgrounds. This was supported by the fact that one-fifth of the students thought that language was a barrier to working well together. Despite these few difficulties, a great majority of students agreed that the GW enhanced their learning and the GW during this course was a successful endeavour for them. Finally, they disagree with the statement that during this course, too much of the teaching was based on group work.

When the students were asked to describe their contribution to the GW, the following key words were recorded:

Organized, efficient, fun, engagement, smiling, organization, responsibility, determination, equal contributions, enjoyable, educatory, participate in discussions, capable of working independently.

The students also listed a few suggestions when asked which changes they would implement in the course. Among these, it was stated that it would be better to change from four to three students per group and that it was a problem to have a group of students following different courses because it made it difficult to find time to meet for writing reports and discussing data.

Final remarks

I found it very interesting to be involved in this project because it also gave me the opportunity to experience how to align intended learning outcomes with teaching activities in connection with other teachers involved in the course. Moreover, I found it very involving to work on student group work (GW) considering the impact of the international and educational background. In the courses in which I am involved, GW is one of the main didactical tools used to facilitate student learning. According to my experience, I consider GW as one of the most stimulating activities for students, but some obstacles are faced by students, especially in an international environment. Among these different cultures, languages and educational backgrounds, barriers could be created between the students and limit their possibilities to succeed. For instance, I realized how important it is to plan each stage of GW carefully from the beginning of the course; like how to organize students in groups and help groups negotiate among themselves, and to provide prompt feedback to the groups. I also think that when making any assignment, it is fundamental to explain the goals of the group and define any key concepts. In addition to a well defined project, every group needs to know the time frame of the various activities and some guidance about the possible contribution of the group members might be necessary, especially in inexperienced groups. It is also important to explain how students will be graded. One of the main messages that I gained from this experience is that the teacher should learn how to deliver the skills to the students which they need to succeed in groups. Many students have never experienced GW and may need practice in such skills as active and tolerant listening, diversity understanding, building more positive heterogeneous relationships, giving and receiving constructive criticism and managing disagreements.

Upon careful analysis, my experience suggests that in order to improve GW from a student perspective, it is important that students are determined to make their self-management skills more effective in a social context. This simple message includes more complex mechanisms, like defining the goal of the project by using a team approach and to know where the GW is leading which should be kept in mind during the process. These mechanisms can be accomplished if the group of students define a clear set of goals to achieve per week over the course, this is a very important step that will ensure that the time-management does not fail and it will remove the destructive feeling of "wasting time" for the group. A few different tools could be suggested for a successful development of the process, like clarifying ideas through discussion and debate. This implies that students learn to criticize ideas and not people. In a more specific context of GW with international students, it is important that cultural differences should be considered as a stimulating factor that could promote the development of oral communication skills and social interaction skills. Under such circumstances, the students involved in international GW activities could develop the ability to view situations from other perspectives. The supervisor also plays a major role in ensuring success in GW and in particular in relation to international GW. The supervisor should provide students with clear learning objectives and a design that assists students to achieve the objectives. In order to achieve this, the supervisor should carefully explain to the students how the groups will operate and how they are going to be graded. When the assignments are given, it is important to define the objectives of the group task. In addition, the groups need to have a mechanism for getting started and a way of knowing when the task is accomplished. Providing a framework already at an early stage during their studies will increase the likelihood of the students paying attention to their own role in taking part and contributing to the group.

Finally, the supervisor needs to give prompt feedback. Knowing what you know and what you do not know focuses learning. Students need prompt feedback on performance to benefit from courses. During lectures and group activities, students need frequent opportunities to perform and receive suggestions for improvements. At various points during their course and at the end, students need chances to reflect on what they have learned and what they still need to learn.

A Pre-course questionnaire

Pre-course questionnaire

Please answer the questions below using your previous experiences from your university education. It should take you about 5-10 minutes. This questionnaire will be used to evaluate the teaching methods in this course.

1. **Name:** _____ **Age:** _____
2. **Nationality:** _____

3. **Education (bachelor /master programme + main topic):** _____
4. **I have done the main part of my university studies in (Country/Institute)** _____
5. **I have studied abroad (please circle one): YES NO**
   If yes, please state country/s, institute/s and duration/s_____
   _____

6. **Prior to this course, how many formal group projects (group work carried out during an academic course ending with completion of a specific task/project) do you estimate that you have participated in during your studies (please circle one)? 0 1-3 4-6 7-10 >10**

7. **I participate in group/team work outside of academic classes, for example, sports or committees (please circle one): YES NO**

8. **In your opinion, what are the top 3 advantages of group work?**
   _____
   _____
   _____

9. **In your opinion, what are the top 3 disadvantages of group work?**
   _____
   _____
   _____

10. **Personally I would prefer to work independently rather than in a group (please circle one):**
    YES NO

Thank you for your participation.
During the course you will receive a follow-up questionnaire regarding your specific experiences during this course.

B Mid-course questionnaire

	Course	Physical and Chemical Changes of Food Quality B1-1E10-UE (EKursusLife49500211-bb211-kk2700)
1	In general, my group worked well together:	Average: 3.96
		Standard deviation: 1.10
	1	4,2%
	2	8,3%
	3	12,5%
	4	37,5%
	5	37,5%
2	The other members of the group would agree with my evaluation of the above statement:	Average: 4.08
		Standard deviation: 0.81
	1	4,2%
	2	0%
	3	4,2%
	4	66,7%
	5	25%
3	In my group, everyone shared responsibility for the work:	Average: 3.91
		Standard deviation: 1.18
	1	8,3%
	2	4,2%
	3	8,3%

	4	41,7%
	5	33,3%
	Not answered	4,2%
4	In my group, discussions were dominated by a few people:	Average: 2.88
		Standard deviation: 1.30
	1	20,8%
	2	16,7%
	3	29,2%
	4	20,8%
	5	12,5%
5	In my group, the work was substantially delayed because of disagreements:	Average: 1.75
		Standard deviation: 1.23
	1	62,5%
	2	20,8%
	3	4,2%
	4	4,2%
	5	8,3%
6	In my group, we solved the problems that we encountered during the group work:	Average: 3.87
		Standard deviation: 1.03
	1	0%
	2	12,5%
	3	20,8%
	4	29,2%
	5	33,3%
	Not answered	4,2%
7	In my group, it was an advantage to have people with different nationalities:	Average: 2.65
		Standard deviation: 1.27
	1	25%
	2	12,5%
	3	41,7%
	4	4,2%
	5	12,5%
	Not answered	4,2%
8	In my group, it was an advantage to have people with different educational background:	Average: 2.88
		Standard deviation: 1.05
	1	12,5%
	2	16,7%
	3	50%
	4	12,5%
	5	8,3%
9	In my group, language was a barrier to working well together:	Average: 2.74
		Standard deviation: 1.36
	1	20,8%
	2	29,2%
	3	12,5%
	4	20,8%
	5	12,5%
	Not answered	4,2%
10	During this course, the group work enhanced my learning:	Average: 3.46
		Standard deviation: 1.08
	1	8,3%
	2	8,3%
	3	25%
	4	45,8%
	5	12,5%
11	During this course, too much of the teaching was based on group work:	Average: 2.25
		Standard deviation: 1.13
	1	33,3%
	2	25%
	3	29,2%
	4	8,3%
	5	4,2%
12	All in all, group work during this course was a successful endeavour for me:	Average: 3.67
		Standard deviation: 1.07
	1	8,3%
	2	0%
	3	29,2%

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/2010-3-1/

The bibliography can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/kapitler/2010_vol3_bibliography.pdf/