COLLABORATIVE LEARNING IN UNIVERSITY CLASSES IS A POWERFUL TEACHING STRATEGY

May Gómez Cabrera. Universidad de Las Palmas de Gran Canaria. España
may.gomez@ulpgc.es

María Ascensión Viera Rodríguez. Universidad de Las Palmas de Gran Canaria. España
maria.viera@ulpgc.es

1. Introduction

1.1. The Marine Biodiversity Course

Marine Biodiversity is a core subject in a Bachelor of Marine Science Curriculum and provides students with basic knowledge of the different marine plants and animals from the point of view of ecology and taxonomy. The knowledge gained serves as tool-kit to address many topics in Marine Science and qualifies the students for professional work.

Upon completion of the various tasks the students will achieve the following new levels of understanding:

- Basic knowledge on systematics, taxonomy, morphology, reproduction, evolution and ecology of marine organisms, and the capability to analyse and synthesize this new material.
- Basic terminology used in Marine Biology and Botany the ability to use experimental language, and the ability to express the new terms and language in oral and written communication.
- Practical knowledge applicable to sampling the coastal environment, and recognizing at first glance, the large groups of organisms that inhabit it.
- New skills in the proper use of laboratory equipment, in cooperating with colleagues, and in the processing and interpretation of high-quality experimental data.

1.2. Teaching methodologies

An active teaching methodology is one that ensures that students are able to activate their minds and discover what they want to learn themselves. As applied by the teachers, this methodology uses diverse learning techniques that promote great autonomy so the students develop techniques to learn on their own and learn to organize themselves. In the case of a scientific discipline, the new science material should be understood, not only as a body of new realities and new theoretical information to memorize, but as new tools and techniques to process information, solve problems, and integrate it all with the new realities that change over time and space.

The achievement of the objectives mentioned above is possible only if adequate teaching methods are used. Teachers should arouse the interest of students in the subject, making them want to study, giving them reason to want to please the teacher, teaching them, from the beginning, the true joy of science.

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The appeal of what is taught is another form of motivation for students; what is learned must have purpose and meaning. If the material has these characteristics the students will know that it is worth their effort to learn it. The teacher needs to employ different teaching strategies, using not only lectures, but also laboratory exercises, seminars, tutorials, field trips, etc.

An important aspect to consider when teaching are the activities undertaken by the students (learning process). These activities, of course, need to be consistent (as bidirectional and dialectical process) with the teaching methodology that is contemplated for the development of the teaching-learning process. In this interactive process not only the educational influence of teachers is highlighted, but also the importance of personal processes by which each student learns. Thus, the most active teaching procedures (participation, discussion, collaborative work) are related to elaborative learning strategies (related to previous knowledge, extension, clarification and consultation, etc.).

Different tasks require the use of different learning strategies. This means that both mental and physical actions are performed by the students not only to process information, but also to manage motivation and time. Emotions are modulated towards different tasks that the subject has to face, in addition to the characteristics outlined above.

Here we present our experience implementing collaboration in delivering the lectures of the Marine Biodiversity course for the second year of the Marine Sciences Degree.

1.3. Collaborative Work

Collaborative Learning offers a powerful tool with great potential for the teaching-learning process as well as new criteria for its renewal (Luján, 1998). Furthermore, it facilitates the development of generic and frequently needed skills. In the definition given in Cabero and Márquez, (1997), collaborative work is presented as a teaching and learning strategy where small working groups are organized, in which all members are parts of the team and have the same goals to reach. According to Maldonado-Pérez (2007), collaborative work used in university classrooms is relevant and timely, since not only is student learning achieved in different aspects of the discipline, but much social understanding is also achieved. Activity in collaborative groups develops reflective thinking, stimulates decision making, promotes evaluation, and facilitates the identification of values while developing respect and tolerance for the opinions of others. It is very important to create a team that seeks to achieve the goals they have in common. The group should generate a knowledge reconstruction process where each individual learns more than he would learn by himself, due to the interaction with other team members.

The members of each group may recognize their skills and also their differences, so you must create communication, be able to listen and respond to each point of view of the different group members. In this way you can acquire and apply knowledge in the development of projects that are proposed in this working group. In the words of Martínez-Sánchez (1994), collaborative work is teamwork, but teamwork is not always collaborative work. Collaborative work is the creation of a group of individuals with similar skills in the field, where a leader doesn't emerge such as in a normal group, and conversely, leadership is shared by all members of the team as well the responsibility for the work and / or the learning.

For Maldonado-Pérez (2007), collaborative work in an educational context, is an interactive learning model which invites the students to build together, which requires combining efforts, talents and skills through a series of transactions that will achieve the goals consensually established. So the collaborative work is considered more than a technique, it is a philosophy of interaction and a personal way of working. A way of working which involves handling issues such as respect for the individual contributions of the group members. Thus among team members, a concept is developed of being mutually responsible for learning from each other.

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The ultimate goal of the collaborative work is not to complete a task, but to develop a relationship among the group members and to attain understanding. The role of teachers in this kind of work is limited, only observation and feedback is possible in the development of the task. Teachers are not the source of information. Depending on the goals, each participant receives a set of material or a part of it. Then the participants are required to interact and encouraged to contribute to the success of the activity. This ensures that there will be interdependence among group members to perform a task.

2. Methodology

We have tried this approach on 5 different topics over the last three years. We have always chosen topics that could be covered in two hours sessions and that would benefit from group participation. Previously we had developed tasks designed to require collaboration rather than competition (the most suitable are complex tasks requiring creative and divergent thinking).

To apply this methodology in the classroom, it was necessary to divide the class into groups of 5 students, each of which was assigned a special task. The task was chosen at random, trying to avoid previous student relationships, so as to encourage interaction throughout the whole class. Once the class was divided into groups, the schedule in Table I is followed. The teacher will make a small presentation covering the topic, explaining, and identifying the immediate tasks (20 minutes). Then the prepared material is distributed to each of the "specialists" of the different groups and they are given 10 minutes read and evaluate the subject.

After this time the "specialists" of the different groups meet and discuss the material for 15 minutes. Next, they have another 15 minutes to individually develop a schematic plan to explain the material to the companions of the original group. Finally, they meet for 35 minutes during which time each original group of "specialists" present their schematics to their group and work on getting the whole group to understand it. As a tool for feedback and in order to assess the degree of learning, a series of questions about the contents worked on (10 minutes) are formulated. Finally everyone reflects on the collaborative work done (5 minutes).

TIME SCHEDULING	
Presentation of the tasks by the professor	20 minutes
Individual reading of the material	10 minutes
Meeting of the "specialists"	
Discussion of the material	15 minutes
Individual elaboration of schematics, graphs, etc.)	15 minutes
Meeting of the original team	
Presentation of the schematics	35 minutes
Formulation of questions	10 minutes
Reflection on the job done	5 minutes

Table I. Schedule of activities in the collaborative work experience in the subject of marine biodiversity

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3. Results and Discussion

The implementation of collaborative learning in our course took place in the year 2013-2014 and in some ways was motivated by the drastic decrease in the percentage of students who passed after the implementation of new graduate studies (Table II).

Academic year	Failures	Passes	Nº students
2011-2012	35 %	65%	22
2012-2013	58%	42%	38

Table II. Learning outcomes in the two years prior to the implementation of learning by collaborative work in the subject of Marine Biodiversity.

The results obtained show that with collaborative learning the majority of students (81.5%) are able to successfully complete the short questionnaire of 10 to 15 questions that had to be answered at the end of the class. (Table III). Furthermore 35.7% obtained a grade of 70/100 or higher.

Academic year	Failures	Passes	Nº students
2013-2014	19,8 %	80,2%	35
2014-2015	20%	80%	15
2015-2016	15,5%	84,5%	45
MEAN	**18,4%**	**81,5%**	**32**

Table III. Learning outcomes of the collaborative work experience in the subject of Marine Biodiversity in the last three years.

In our five trials of this teaching approach there was never a case in which a whole group failed. Only 1 or 2 individuals in a group ever failed.

In the survey conducted at the end of work, 95.5% of the students were satisfied and very happy with the experience. They considered that it had been very positive experience and that they had learned much more than they would have learned in two hours of conventional lectures. Only 4.5% said they prefer lectures in the traditional model and some of these students were foreign exchange students who were not fluent in Spanish and therefore found it hard to understand and communicate with their peers. In all cases we observed positive interdependence, effective improvement in verbal communication, personal enforceability (no one wanted to look bad with his group) and improved interpersonal skills. In the cooperative learning process, the students need skills to work collaboratively and these skills are learned through practice and exercise. In the work of Cabero and Román (2004), as part of their teaching experience, it is concluded that collaborative learning and collaborative work are powerful strategies to work with adults, because it is a method where students work in small teams toward a common goal: to learn. Each participant is responsible, not only for his/her own learning, but also for the learning of each of the other members of the group, as well. Thus the success of a student influences the success of the rest of his/her teammates. Therefore, participation, commitment, and motivation are essential to achieve positive results for the entire group.

On the other hand, as in the statement in Domingo et al., 2010, we note that in face-to-face interactions, that is, at short distance, the use a meta-language characterized not only by verbal expressions, but also by gestures and attitudes, is an essential ingredient to social learning. For

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the new generation with strong skills and habits developed using the social networks like Facebook or Tuenti, a picture is worth more than the word. This generation is used to a profusion of images and videos in which texts are limited to packaged language that facilitates the immediacy of the response time.

This experience has allowed us to know the shortcomings of students in terms of reading comprehension, ability to discern between what is essential or relevant from the accessory, storage capacity, etc. Recognizing these difficulties allows us to improve the delivery of traditional lectures. We also note that the application of this methodology in our subject matter requires two hours per chapter and only rarely is this time available in the degree schedule. As proposals for the future, we consider the possibility of introducing Moodle questionnaires for the evaluation of collaborative learning and co-evaluation, or the formation of working groups in response to different types of learning by applying the methodology of preferential complementary learning (PCL). Finally, and in light of our experience we agree with Domingo (2010), and we believe that with collaborative work we have been able to incorporate a lot of elements into the teaching of the subject of Marine Biodiversity that facilitate the achievement of the basic skills of the course, greatly improving the degree to which they are understood by the students.

4. Conclusions

The collaborative work methodology has proven to be an effective method in teaching the subject matter of Marine Biodiversity, by improving academic achievement, (over 80% pass), providing advantages such as an increase of the interest of the students, favoring their interaction, promoting critical thinking and communication, and improving the use of language. This approach favors the acquisition of social skills, promotes coordination, develops skills of self-discovery, and, in turn, improves self-esteem.

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