

Beyond the Cooperative Learning: A Classroom Response System (CRS) Embedded into Marine Science Education Curriculum

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Abstract

Cooperative learning allows students to learn together in their peers, support each other, express their opinions, and finally share the results. However, Releasing on the stage becomes a major obstacle for shy or introverted children. In order to assist all students to deliver their opinions and help teachers evaluate smoothly, this study used mobile devices to design coral reef teaching courses. Classroom Response System (CRS) was used to help teachers ask questions in class, promote discussions between the teacher and students, and successfully to conduct a field trip. The coral reef course was no longer limited to classroom cognitive education, but combined mobile devices and outdoor observations to provide students with a richer and more diverse learning experience.

The study found that using CRS and mobile devices for teaching can enhance students' learning interests and more than 90% of the students thought that using mobile devices to answer questions with less stress. In addition, more than 80% of the students felt the joy of teacher-student interactions. CRS did help to explore related teaching topics. However, when mobile devices are used in primary schools, students may be confused about interface design or unfamiliar operations, which may cause some students to have difficulties in using them. Teachers should assist in the individualized differences to maximize the effectiveness of teaching.

Key words: Cooperative Learning, Classroom Response System, Field Trip

Introduction

Taiwan is a beautiful island with excellent marine resources and a unique coral reef resource due to its subtropical location. However, with the development of the ocean and leisure, the coral reef ecosystem has been destroyed. How to effectively conserve coral reef resources deserves the attention of the government.

Classroom Response System (CRS) enables teachers and students to interact in the classroom through computers or mobile devices. Socrative 2.0 can provide instant feedback, assessment tests, and teacher reports for teachers and students. This study uses CRS and mobile devices to teach coral reef ecology to senior students in the primary school. The research objectives are as follows:

1. Understand students' perceptions and attitudes about coral reefs

2. Explore the impact of CRS and mobile devices on teaching
3. Discuss the importance of outdoor teaching to students

Literature

A. The importance of coral reefs

The coral reef ecosystem has excellent biodiversity and high primary productivity and is known as the tropical rainforest in the ocean. Coral reefs also provide resources such as human food sources, recreational recreation, and natural medicines, which are closely related to the human economy, life ,and aesthetics.

However, natural disasters and vandalism have caused coral reef ecosystems to be threatened. Climate change, overfishing, marine development, and pollution all result in the imbalance of coral reef ecosystems, which not only damages habitats but also threatens the marine resources on which humans depend[2] [5].

B. The meaning of cooperative learning

Cooperative learning is a systematic and structured teaching strategy. Teachers use heterogeneous groupings in the classroom. Students help each other in the group to benefit the course content. Students learn about each other's ideas through constant discussions, and as a result, each member is well versed in learning [1] [7].

C. Mobile device inspiration for education

The advent of the digital age has changed the quality and methods of education. With the development of science and technology, traditional lecture methods are often criticized for lack of teacher-student interaction. Research indicated that the CRS system can enhance students' interests in learning and achieve effective learning through peer interaction [6]. In addition, the use of a tablet combined with an App facilitates the development of teaching activities. Not only do students learn well, but teachers also have an immediate understanding of student comprehension [4].

D. The importance of a field trip

A field trip can expand the learning experience outside the classroom. It is an interdisciplinary teaching activity. After considering the students' prior knowledge, teachers should plan the teaching contents well. If they can make good use of technology tools to assist outdoor teaching, they can effectively improve students' learning motivations, help them record the

learning processes, and in the end enhance the learners' abilities [3] [8].

Research Method

A. Study design

This study adopted purposive sampling and selected two classes from the sixth grade in the northern region of Taiwan as the research object, with a total of 50 students. The timing of the implementation was in line with the science and technology curriculum. The teaching activities were divided into three lessons, totaling 120 minutes. The first lesson was based on group reports and teacher talks as shown in Fig.1.



Fig. 1 This group of students introduced the coral reef ecosystem through a film that would allow all students to better understand the species that coral reefs breed.

Classroom Response System (CRS) is a technological tool that can be effectively implemented in the class and be used to promote students' active learning.

In this study, Socrative, a Web 2.0 software, was integrated with active learning activities and used as a CRS to explore primary school students' perceptions of the use of this tool. As long as the devices operated by the teacher and students have browser functions and Internet services in their environment, they can easily use this software for teaching activities. In the classroom, the teacher used CRS to assist in teaching, which allowed the teacher and students to interact instantly through computers or mobile devices. The actual interaction of the class is shown in Figure 2-4.



Fig. 2 Students scanned the Quick Response Code to log in to the Socrative 2.0 system.

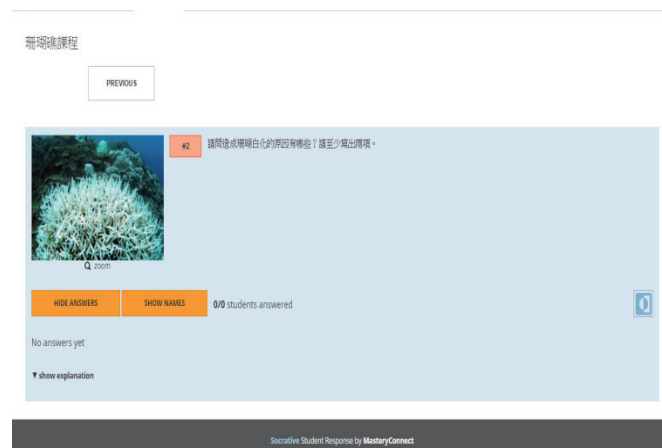


Fig. 3 Online interactive topics could be designed by groupmates or the teacher based on student report content.



Fig. 4 Immediate interactive feedback was presented on the projection screen, and the teacher could immediately see the responses of each student.

The second class was a field trip. The teacher led students to the National Museum of Marine Science & Technology to learn about coral reefs. Through practical visits, students could freely use mobile devices to take photos and make records. The teacher used CRS in a timely manner to guide students to collect information, and could immediately ask questions and implement formative assessments.

The third class was engaged in group discussion, feedback, and used CRS again to promote learning interaction. In the end, students filled in the on-line attitude scale. The Socrative 2.0 system automatically collected the data and sent it to the teacher's e-mail address as an Excel file, which simplified the time and process of data collection, greatly improved the difficulty and trouble of collecting paper, and was also more environmentally-friendly. The design process of the primary school coral reef course is shown in Figure 5:

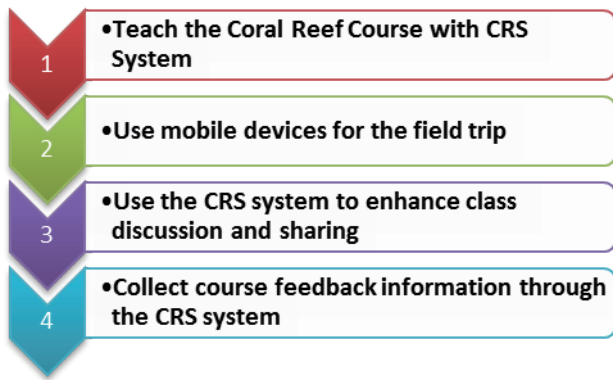


Fig. 5 Primary school coral reef design process

B. Research tools

This study used the CRS system to assist teaching, which provided the teacher and students to interact through computers or mobile devices. Socrative 2.0 was used as a tool of the response system in the classroom.

C. Data processing

In the teaching process, in addition to observing students responses, the researchers used Socrative 2.0 for real-time assessment and data collection.

Research findings and recommendations

Based on the observation of students' performance in the classroom, the interaction between the teacher and students, and the results of completing the questionnaire after the course (as shown in Table I), the results and discussion of this study are as follows:

A. Coral reef issues raise students' resonances

Students were quite interested in this topic. The results of the question (1) showed that more than 90% of students regarded that the coral reef courses were very important. It was obvious that this topic could lead to students' resonances and concerns.

B. Mobile devices enhance learning interests

In the past, students could only watch the teacher operating the computer for the course activities. But now the students had the chances to personally operate and they felt quite excited about using the mobile devices to learn. The result of the question (2) showed that up to 90% of the students like the mobile devices course, and also found that when students actually master the mobile devices, they could pay more attention to their learning.

C. CRS enhances learning interactions

Through observation, teaching with the Socrative 2.0 system, the students' responses were quite hot. Compared with the traditional lecture method, the feedback system was integrated into the teaching, which could provide instant feedback and enhance the interactions between the teacher and students. According to the question (3) in the questionnaire, more than 80% of the students thought that the Socrative 2.0 system could enhance the interactions between the teacher and students, thus making the whole teaching and learning

atmosphere more active. Moreover, the results of the question (7) showed that students were quite relaxed and comfortable with the anonymous way of answering the feedback system. More than 90% of students regarded that using Socrative to answer questions was less stressful.

D. The field trip can strengthen the extracurricular experiences

The students actually went out of the classroom and used the mobile devices to take pictures of the coral reefs. The students thus had new experiences and learning gains, and they were quite interesting. The results of questions (4) and (5) showed that more than 90% of students believed that outdoor learning activities could enhance the relevant knowledge of the course.

E. The software interface still has room for improvement

Since the Socrative 2.0 system is currently only available in English, even if the teacher's question can be presented in Chinese, the interface of the operation is still in English, which makes the students feel a little pressure. From the results of the question (6), it showed that more than 10% of students thought it was difficult to operate Socrative, so there was still room for improvement or enhancement in interface or use.

Table I
Questionnaire results of students after the end of the course
(unit: %)

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
(1) The coral reef course is very important.	82	12	6	0	0
(2) I like the course of using a mobile device.	60	30	10	0	0
(3) Using the Socrative 2.0 system can enhance teacher-student interaction	60	28	12	0	0
(4) The field trip help me understand coral reefs better	74	20	6	0	0
(5) It is interesting to take pictures of coral reefs in the museum and share them with my classmates.	78	20	2	0	0
(6) It's not difficult for me to operate Socrative on a mobile device.	26	20	36	12	6
(7) Using Socrative to answer questions during class, I feel free from stress	80	14	6	0	0

Conclusion and Suggestion

A. Making good use of mobile devices can help students improve their learning interests

If teachers can make good use of mobile devices, they can effectively enhance students' interests in learning. However, they must also pay attention to whether the students stay on the screen requested or taught by the teachers, and avoid students browsing other websites or playing games when using mobile devices.

B. Using the feedback system can effectively enhance the interactions between teachers and students

The use of the CRS system can give feedback to teachers and students in a timely manner. However, teachers must observe and assist students who are unskilled or have difficulty reading English, and give them help or explanations to facilitate students' activities.

C. Properly arrange a field trip can expand students' learning experiences

Outdoor teaching activities can provide students with real situations and learning areas outside the classroom, which allow students to explore and search freely, and help students to learn independently. However, teachers must ensure that students learn safely and appropriately constrain the scope of student activities.

References

- [1] Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher Motivation to Implement an Educational Innovation: Factors Differentiating Users and Non-Users of Cooperative Learning. *Educational Psychology, 24*, 201-216.
- [2] Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. *Ecological monographs, 81*(2), 169-193.
- [3] Chen, Y. S., Kao, T. C., & Sheu, J. P. (2005). Realizing outdoor independent learning with a butterfly-watching mobile learning system. *Journal of Educational Computing Research, 33* (4), 395-417.
- [4] Chung, W. M., & Chang, C. Y. (2014, May). *A study of using mobiles in a climate change course*. Paper presented at the 18th Global Chinese Conference on Computers in Education. Shanghai, China.
- [5] Langham, N. P., & Mathias, J. A. (2018). The problems of conservation of coral reefs in Northwest Sabah. *Marine Research in Indonesia, 17*, 53-58.
- [6] Preszler, R. W., Dawe, A., Shuster, C. B., & Shuster, M. (2007). Assessment of the effects of student response systems on student learning and attitudes over a broad range of biology courses. *CBE-Life Sciences Education, 6*, 29-41.
- [7] Slavin, R. E. (2015). Cooperative learning in elementary schools. *Education 3-13, 43*(1), 5-14.
- [8] Thorburn, M., & Allison, P. (2010). Are we ready to go outdoors now? The prospects for outdoor education during a period of curriculum renewal in Scotland. *The Curriculum Journal, 21*(1), 97-108.