Application Research on Group Cooperative Learning in Geology and Geomorphology Experiment

Fang LUO* and Zhan-hong LIU

Key Laboratory of Water Resources and Environmental Engineering in Universities of Shandong (University of Jinan), Jinan, 250022, PR China
School of Resources and Environment, University of Jinan, Jinan, 250022, PR China
Shandong Provincial Engineering Technology Research Center for Groundwater Numerical Simulation and Contamination Control, Jinan, 250022, PR China
Shandong Provincial Engineering Technology Research Center for Ecological Carbon Sink and Capture Utilization, Jinan, 250022, PR China

*Corresponding author

Keywords: Group cooperative learning, Geology and geomorphology experiment, Teaching reform.

Abstract. Group Cooperative Learning is a teaching method based on cooperative learning group as a basic form, which uses the interaction between dynamic factors in teaching to promote students' learning, and achieve teaching goals by team achievement as evaluation criteria. The application of Group Cooperative Learning in the experiment course was very feasible. It could further improve the students' interest in learning and effectively improve the teaching effect.

Introduction

As a professional basic course, Geology and Geomorphology are widely opened in natural geographical environment and resources, geography education, water conservancy, environmental geology majors. The complexity of geological phenomena and the limitations of human cognition require students to have strong observation, hands-on and analytical reasoning abilities. Therefore, experiment course of Geology and Geomorphology is particularly important owing to its practicality. Under the guidance of the teacher, through the practice of the experiment course, the students can get the perceptual knowledge of the basic geological phenomena, better grasp the abstract theoretical knowledge learned in the classroom, learn the basic method of preliminary geological work, but also learn how to think, how to understand and grasp the geological phenomenon. The most important thing is to cultivate interest in Geology and Geomorphology to learn scientific method of reasoning[1][2].

At present, Geology and Geomorphology have been opened in natural geography and resource environment, geography education majors in School of Resources and Environment, University of Jinan. The school hours are 64 hours in natural geography and resource environment and 48 hours in geography education majors. The school hours of experimental course are set to 16 hours. There are seven parts in the experiment course: common mineral identification, identification of common magmatic rocks, identification of common sedimentary rocks, identification of common metamorphic rocks, observation of field lithostratigraphy, application of geological compass, interpretation of geological map and observation of paleontological fossils.

The Necessity of Cooperative Learning in Geology and Geomorphology Experiment Course

Group Cooperative Learning is a kind of creative teaching theory and strategy commonly used by many countries in the world. Because of its remarkable effect, it has been praised as the most important and successful teaching reform in the past ten years. Group Cooperative Learning in various countries is not very consistent in its specific forms and names, such as "cooperative learning" in the European and American countries and "cooperative education" in the former Soviet
Union. On the whole, Group Cooperative Learning is based on cooperative learning group as a basic form, which utilizes the interaction among dynamic factors in teaching to promote students' learning, and achieves teaching goals by taking group performance as the evaluation standard[3]. Cooperation refers to the process of cooperation between two or more students or two groups in order to achieve a common purpose. Group Cooperative Learning is a kind of teaching method in the background of class teaching system. Teachers take the student learning group as the main driving force on the premise of recognizing that teaching is the basic form of teaching organization. Team members begin to cooperate by teachers' guidance and play the positive role of groups to improve individual learning motivation and ability, and achieve the purpose of completing specific teaching tasks. Group Cooperative Learning has changed the situation that teachers monopolize the information source of the whole classroom, and students are in a passive position, and has stimulated the initiative and creativity of the students.

The experimental course is an important part of the practice of knowledge in the theory course, which requires teachers "Face to face" to guide students. In the experiment of traditional geology and Geomorphology, the teacher is the main body and the students' observation is supplemented. The number of mineral and rock specimens is limited, so the time for the students to observe the specimen is numbered. Due to the limited teaching time and the limited communication between teachers and students, the students' problem cannot be answered in time, which leads to the decline of students' interest. In the examination mode of traditional experiment course, the only criterion for evaluating students' learning level is the experimental report, while the evaluation of students' comprehensive quality, practical application ability and innovative ability is very lacking. Therefore, the results of the experimental report do not fully reflect the degree of students' knowledge that is very bad for the realization of the teaching effect. The practice of teaching methods of Group Cooperative Learning is an attempt and innovation in teaching reform of Geology and Geomorphology experimental course.

Practice of Group Cooperative Learning in Geology and Geomorphology Experiment

The Teaching Process of "Group Cooperative Learning"

According to the principle of "intra group heterogeneity and group homogeneity", and the reasonable matching of sex ratio, interest inclination, learning level, communication skills and discipline, the whole class is divided into several learning groups. There are 5-6 students in each group, which sitting around the rectangle to inspire and guide the students to face the group discussion face to face. A different division of labor is carried out according to the special strengths of each person. The students who are good at organizing activities are the group leader; the students who are good at recording are the recorder; the students who are good at expressing themselves are the central speakers. The main speaker is regularly rotated in order to let every student have a chance to speak. In the event of omission, the spokesman of the central spokesman may add to the speaker. Teachers are the organizers and the masters of the group cooperative study, the participant in the group discussion and the guide of the group discussion.

Set Goals. Teachers design some questions of basic knowledge according to the content of the experiment before class. The problems can be from shallow to deep, and have certain value of thinking and divergence. At the beginning of the course, teachers should use some time to briefly introduce the contents of experiment, explain the basic requirements of the course and related experiment exercises to students, and draw out the assignments and problems of the experiment. Then, teachers let the students design their own solutions and questions.

Give a Learning Method. At this stage, teachers focus on putting forward questions and teaching methods, providing students with transition bridges from known to unknown. Students focus on independent learning and thinking, initially perceiving teaching contents, and preparing for necessary psychological preparation.

Group Cooperative Learning. During the group discussion, teachers participate in group
learning and do the necessary guidance and control on the process of group learning. Before the communication in the group, each student thinks and studies independently. The mode of communication in the group should be diversified, the main way of which can be as follows: the central speech, the designated presentation or the discussion in the group. In a word, every student should be able to fully express his own opinion.

**Whole Class Communication.** At this stage, teaching is mainly guided by the reports of different groups, and teachers should conduct proper guidance, or students can further read and learn, and find answers from textbooks.

The process of Group Cooperative Learning is a recurring process. After teachers raise a question, the student tries to solve it by himself by carefully observing the specimen and looking up the information. Then group cooperative learning is used to enable students to exchange learning situations, show learning ideas, conduct group judgement and synthesis and obtain the ways to solve the problem. Finally, a deeper level of problems or new problems are discovered through reflection and deepening which promote the further study of the group.

**Practice of Group Cooperative Learning in Geology and Geomorphology Experiment**

In the laboratory experiment of identification of magmatic rocks, many contents need to be observed and mastered such as mineral composition of igneous rocks, color, structure, fluxion structure, vesicular structure, amygdaloidal structure and occurrence. These contents have been taught in the course of theoretical study, and teachers need to carry out a simple curriculum review with students. Then the focus of the observation description is to be described, which include the following contents: the influence of SiO$_2$ content on the igneous rocks, minerals and dark color, light colored mineral structure, rhyolitic structure etc. Then the questions of the course are derived which include: how to describe the igneous rock? The combination of mineral assemblages? the formation and formation of igneous rocks?

Each group should discuss the key content and issues that teachers teach. The group leader finally work out a learning program to study the mineral and rock specimens for self-study in class. The learning task are completed by division of labor and consulting the relevant information according to the needs. If there is any doubt, students should consult teachers at any time. So as to achieve the purpose of understanding and accurate understanding of knowledge. After that, the teacher collated the students' problems. The teacher should observe and record the performance of each student in the group discussion during the course and should be aware of the progress and problems encountered by the groups at any time, and communicate with students in a targeted manner. After the end of the group cooperative study, all groups are summarized and reported. Combined with students' performance in group discussion, the cooperative learning situation of each group is commented. A supplementary explanation is made when necessary. The teacher give guidance to students' questions so as to ensure the solution of the problem.

**The Problems and Prospects of Group Cooperative Learning in Geology and Geomorphology Experiment**

The effect of the application of Group Cooperative Learning in Geology and Geomorphology Experiment course is very significant which has expanded the students' vision and fostered interest. Students generally have a good grasp of the characteristics and identification of minerals and rocks. However, there are still some problems in the application of group cooperative learning.

Firstly, the problem of teaching organization. When we take cooperative learning, there will be a little confusion in the class order if the guidance is not enough. There will inevitably be a conflict of opinions among the learning partners. If there is no correct guidance, members will often argue with each other, which leads to the bias of learning. It is believed that with the advance of group cooperative learning mode, under the careful organization of teachers, it will soon be able to solve such problems and avoid wasting valuable learning time among students in disagreement and procrastination. Teachers should also be good at guiding students to listen to other students' speeches, avoid too much content when communicating, so as to improve the effectiveness of
learning. Secondly, the problem of learning methods. If the learning method used improperly, will be less effective in Cooperative learning. Teachers should make good use of methods to strengthen the guidance of students' learning and stimulate their enthusiasm for learning and use the teaching means of intuitional, image and close to the actual life of the students to reappear the situation provided by the teaching materials. Only in this way, group cooperative learning can really play the role of mobilizing the enthusiasm of students, cultivating students' self exploration ability, innovative ability and practical teaching ability.

References