Practice of group cooperative learning method

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Abstract. The group cooperative learning method is applied to the teaching of hydrodynamics. Two teaching examples are given, and the effect of applying group cooperative learning method is analyzed. It was proved that the method can effectively improve the enthusiasm of learners and the actual learning effect, and it can improve learners’ communication and cooperation, self-study ability and etc.

1. Introduction

The fluid mechanics is a professional foundation course for classes of mechanical design manufacturing and automation. This paper mainly introduces the basic principle of hydrostatic and hydrodynamic, calculating fluid resistance and dimensional analysis, etc. The traditional way of teaching is that “The teacher decides everything, and the students accept knowledge passively”, with the advantage that there is a large amount of teaching information, and as well with the disadvantage that most students get only the knowledge that is instilled in but not digested and discussed. Now, this kind of traditional teaching mode is not adapted to the teaching requirements of our school. Firstly, with the improvement of parents’ emphasis on education and the improvement of education at school, students’ comprehensive quality and communication ability have been greatly improved, and they can effectively participate in class discussions. Second, college teachers are actively improving their teaching methods, generally try to use the various inverted classroom method to improve the actual teaching effect. Third, the society and enterprises require that students not only have the professional knowledge and skills, but also have the ability of communication, and have a strong team spirit.

The group learning method [1-15] is also called cooperative learning method, which emphasizes students’ autonomy, internal cooperation and competition among groups. This is in line with the spirit of teamwork and competition within the industry. Teachers should abandon the seemingly good teaching order, and actually make the students the main body and return the students’ classes to the students. Therefore, the teaching model of group learning method is introduced to the course of fluid mechanics.

2. Practice

This paper describes the process of using group learning method to learn fluid mechanics.
2.1. Practice Basis
Although group cooperative learning method has many advantages, but to implement this teaching method, also need some objective conditions. For example, teachers must have the right to design their own process assessment methods and the performance of classroom assessment accounts for a biggish proportion.

2.2. Implementing Method
In the teaching practice, there is a phenomenon that the teacher asks the question, and some students want to answer the question, but dare not raise the hand to answer, seems to have many anxieties. The reason is that other students may feel that this student answers the question in order to get the usual score, or in order to show off his intelligence. So as to dispel the students' anxieties, the experimental class has adopted this teaching method, cultivating their team spirit and collectivism spirit, and improving their individual learning motivation.

2.3. Implementing Process

2.3.1. Grouping method
Relatively speaking, teachers are not as good as students to understand the actual situation of the students in the class, so in this teaching practice, we let students group themselves. The results of the grouping are shown in the table.

| First group | second group | third group | fourth group | fifth group |
|-------------|--------------|-------------|--------------|------------|
| 15          | 1            | 12          | 4            | 8          |
| 18          | 2            | 13          | 6            | 9          |
| 23          | 5            | 16          | 10           | 14         |
| 25          | 7            | 20          | 11           | 22         |
| 30          | 17           | 24          | 3            | 26         |
|             | 29           | 21          |              | 28         |

2.3.2. Examples

Example 1
Taking the law of conservation of mass in chapter 5, section 1 of hydrodynamics as the first example, the application of group cooperation method is illustrated. The first section is the law of conservation of mass. The derivation of the law of conservation of mass can be divided into two steps. The first step is the derivation of the partial differential of mass to t and the mathematical expression of the law of conservation of mass. The second step is the special form of mass conservation law under certain conditions.

At the beginning of the class, tasks were assigned to the students, number 18 of the first group prepared to explain the first part, number 17 of second Group prepared to talk about the second step. The other students in the two groups are reserve players.

While the students were preparing, the teacher drew the auxiliary diagram on the blackboard to save students' time. Five minutes later, the first group explained the first step on the platform. By listening to the students, the teacher can probably judge whether the students understand the paragraph. There are two key processes that students didn't tell. The teacher asked the 25 of the first group to answer a question: \[
\lim_{\Delta t \to 0} \frac{m_{e}(t + \Delta t) - m_{e}(t)}{\Delta t} = \frac{\partial m_{e}}{\partial t}, \text{why is it a partial differential, not a full differential?}
\]

The answer is not accurate enough, the teacher explains the difference between the total and partial differential, and the physical quantity of Euler method is the multivariate function of space coordinate and time.
After the second part was explained, the teacher took the students to review the concept of steady flow and the meaning of incompressible fluid.

Both students answered the questions bravely and generously.

**Example 2**
Taking the pressure gauge in chapter 3 of fluid mechanics as an example, the application of the group cooperation method is demonstrated and reproduced. The design of the pressure gauge is based on the pressure distribution law in the gravity field, and the method of solving the pressure is called isobaric surface method. Three types of pressure gauges are explained in the textbook: general pressure gauge, differential pressure gauge pressure gauge and micro pressure gauge. The three types of pressure gauges are used to solve the problem by using the pressure distribution law and constant pressure surface in the gravity field. It does not belong to the theoretical content, but belongs to the application content, and is very suitable for training students' self-study ability, expression ability and communication and cooperation ability.

There are six instances of the three types of pressure gauges, and the first five are assigned to five groups. All the students in each group preview the corresponding instance, and record a lecture on video through cooperation, and send it to the teacher's mailbox.

In the above two cases, the teacher will score the group according to their performances.

2.4. **Results and analysis**
For the first time, I applied the group cooperative learning method in the teaching of fluid mechanics. Compared with previous years, the fluid mechanics class has more smiling faces and higher head rate. Students even raise their hands and ask questions during the course of the teacher's lecture. These effects are encouraging for the role of group collaborative learning methods.

3. **Conclusion and prospect**
Group cooperative learning is an effective way to realize the turnover class successfully. The group cooperation method enables students to abandon all kinds of psychological discomfort, to study actively, to answer teachers’ questions, which can improve the actual learning effect.

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**References**
[1] Zeng, Jiyun, Zhang, Lanling. Research on the phenomenon of "marginalized people" in cooperative learning [J]. Contemporary education science, 2016(04):26-28+32.
[2] Han, Xuesong, Liu, Zhifeng. Application of process evaluation in the cooperative learning of high school chemistry group [J]. Education measurement and evaluation (theoretical edition), 2016(02):58-64.
[3] Ju. The construction of dynamic evaluation system in cooperative learning of primary and secondary school groups [J]. Education measurement and evaluation (theoretical edition), 2016(03):34-37.
[4] Hao, Xue. Current situation and reflection of group cooperative learning in middle school classroom teaching [J]. Journal of northwest normal university (social science edition), 2016, 53(03):87-93.
[5] Tang, Bing. Study on group cooperative learning in elementary school mathematics classroom teaching [J]. Journal of science, 2016(20):119-120.
[6] Shen, Huizi. Teacher role and learning evaluation in group cooperative learning mode [J]. Chinese university teaching, 2016(02):94-96.
[7] Zheng, Yan, Yang, Yong. Problems and countermeasures in the cooperative learning of junior English group [J]. Journal of education college, Heilongjiang, 2016, 35(05):67-69.
[8] cheng xiaoli. Learning organization: improving the effectiveness of group cooperative learning [J]. Modern primary and secondary school education, 2017, 33(12):26-30.

[9] bai xuemei. Study on the cooperative learning effect based on task-driven teaching mode -- a case study of "education technology research method foundation" [J]. Chinese medicine education technology, 2011, 31(02):128-132.

[10] Chen xiangming. Conditions for group cooperative learning [J]. Education research, tsinghua university, 2003(04):11-16.

[11] wang yongchun. Problems in cooperative learning in primary school mathematics teaching and its solution strategy [J]. Teaching materials. Teaching method, 2002(08):34-37.

[12] zhang chunli. A number of problems in group cooperative learning in math class [J]. Education theory and practice, 2002(01):51-55.

[13] Wen tao. On effective classroom group cooperative learning [J]. Education theory and practice, 2002(12):53-56.

[14] ji zhenhui. The application of group cooperative learning in elementary school mathematics teaching [J]. Education teaching BBS, 2015(09):224-225.

[15] deng shimin, huang xiaohui, xiong yuanhong. The conflict and adjustment in group cooperative learning [J]. Education exploration, 2015(06):24-26.