Cooperative Learning Practices in University Classrooms

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Abstract. Student-centered pedagogy has been widely applied in higher education and it is becoming a major trend of teaching and learning in universities. Cooperative learning is one of the practices that improve learning environments, enhance student learning and thinking, and cultivate student social skills. In this paper, we aim to discuss the advantages of using Cooperative Learning in improving learning efficacy, and evaluate its impact on student learning and classroom engagement. Our study shows that group learning practices, such as spontaneous group activity with Kahoot!™, group presentation, structured inter-group feedback, and hands-on group activity have all been effective methods in improving student classroom engagement, comprehension and knowledge application, as well as social skills.

Introduction

Traditional classrooms are the places where instructors spend the majority of class time lecturing and students play a passive role in learning. This type of education usually makes the teaching and learning environments static, and results in students’ rote learning [1]. In recent years, more and more studies from neuroscience, biology and psychology illustrate that students need more than being a passive listener to learn effectively [2]. As a result, student-centered pedagogy emerged and became popular. Student-centered approach assigns teacher as a guide for learning, and more importantly, it shifts the education emphasis from teaching to learning.

Student-centered pedagogy is characterized by the following features: 1) Students participate actively in constructing their own knowledge system. 2) Each student’s interests, abilities and experiences are valued and each student is treated as a partner in the teaching and learning process. 3) Instructors coach the learning process, including organizing the class, answering questions, and facilitating students’ learning [3,4].

Student-centered pedagogy takes various forms, and some are especially prevalent in university settings, such as, blended learning, student-response-system (i.e., Clickers, Rain Classroom), and cooperative learning. Blended learning combines face-to-face teaching with off-classroom learning, and it improves students’ engagement in the class [5,6]. Student-response-system helps instructors gauge the process of students learning [7]. Cooperative learning, which emphasizes the use of small groups, encourages students to work together to maximize their own and each other’s learning [8]. Among these student-centered pedagogies, instructors discover that cooperative learning is a very powerful and efficient approach to enhance student-centered learning.

Cooperative learning is the instructional use of small groups to improve learning efficacy. It involves group discussion, group task (presentation, projects), and inter-group evaluation. During the cooperation, students work together to accomplish shared goals. In this case, the structure of the classroom changes from “lecture hall” to study groups. These groups provide an environment where students feel secure, develop social relationships, and can conduct both independent and interdependent research activities [9]. Moreover, Caine and Caine [10] shows that students who take an active role in talking, listening, reading, acting and evaluating, would yield better engagement in learning.
Practices of Cooperative Learning

Cooperative learning methods are initiated and investigated to target the obstacles met in university teaching. These obstacles are: 1) Classes rich in jargons and abstract concepts, result in students’ rote learning. Students don’t have enough time to meaningfully explore the concepts. Instead, they are filled with tons of memorization work. 2) Many students don’t feel responsible for their knowledge acquisition. They usually don’t have enough motivation to study before the class, or join the discussion in the class. 3) Students seldom have the chance to develop their social skills [1].

From 2012, instructors in Tsinghua University started to explore various pedagogies using cooperative learning to overcome the above obstacles. Specifically, Tsinghua University has established initiatives to encourage university lecturers to use new ways of teaching to engage students in classrooms and improve their learning efficacy. From these teaching innovations, we report practices and cases of improvement from classes. These practices are from courses in two different fields: biology and psychology. Biology is the science of life and Psychology is the science of mental process and behaviour. Although these two fields overlap with each other, the students’ backgrounds and teaching strategies are different.

In the following, we select examples from several practices on cooperative learning: Spontaneous group activity, group presentation, structured inter-group feedback, and hands-on group activities, and discuss its impact on learning efficacy. We chose these practices because they are the typical cooperative learning strategies [1,2]. For this paper, we surveyed our students for 3 consecutive semesters via questionnaires, personal interviews and in-class observations.

Practice 1: Spontaneous Group Activity

Students of the new generation are fluent with using social media and mobile apps in learning. Nowadays, there has been increasing attempts to organize learning environments in a way to meet the needs of this new generation. In our study, instructors use Kahoot!™ to combine online game-based learning with in-class teaching. Kahoot!™ is a game-based online learning platform to gauge learning [11], and it is a fantastic way to break from traditional classroom activities. In a typical classroom environment, instructors can launch quiz questions using desktop with an Internet connection, and students can use their cell phones to receive and answer the questions instantly. Kahoot!™ is designed in a way that the players are required to work together. In particular, Kahoot!™ allows three students or more to gather around with one common screen using one cell phone, and work collectively towards a final answer.

In the undergraduate class on Introduction to Modern Biology, we usually launch Kahoot!™ questionnaires at the beginning of each class. The questions are designed specifically to check comprehension of the key concepts in the session. For example, the key concepts for the lecture on immunology include antigen, antibody, virus, and immune memory. Instructors launch Kahoot!™ questions before lecturing and expect students to make mistakes before diving into the lecture. Using Kahoot!™ is efficient as each question has time limit (usually 30 seconds) for submission. Everyone in the group has to work in coordination and efficiently as a team. When time is up, the top three teams who have the fastest and accurate answers will be revealed on the big screen.

Previous studies showed that biology classes which emphasize competition for grades create more tension, self-doubt, and anxiety in students than do those that employ non-competitive and coordinate learning situations [12] learning environment. The critical difference is that Kahoot!™ only list the top three teams amongst many, and due to time limit and technical issues with the Internet connection, becoming the top three can be quite random. Therefore, most of the teams will not appear in the ranking board, and the majority of the participants do not feel anxious in “losing” the competition. On the other hand, the top three teams that do appear on the board get an extra boost in their game spirit.

According to our interview with the students, many loved Kahoot!™. They gave the following feedbacks about using this application: “full engagement in the class”, “best quiz format ever”, “group members working very efficiently”, “easy to remember where mistakes were made”. The feedbacks from the students suggest that group work with Kahoot!™ is not only a fun experience, but
more importantly, an alternative way to process the key concepts via their mistakes. With the mistakes they made and urge to understand why, the students become more focused on the relevant content in the lecture that follows.

Amongst many forms of cooperative learning, group Kahoot! (see Fig. 1) is one of the most favoured form voted by the students. In this figure, several other forms are surveyed, and we will discuss them in the following practices.

![Figure 1. Students Voting (Multiple Choices) of Effective Cooperative Learning Forms in Introduction to Modern Biology Classroom.]

**Practice 2: Group Presentation**

Group presentation is widely used in university classrooms, especially in liberal art domains. Usually in one semester, students may have one or more chances to stand on the podium and do group presentations in front of the class. Group presentation is often used when an open discussion needs to take place, and it is often preferred by the lecturers to assess the overall ability of the presenting students. Students often spend a significant amount of time preparing a presentation, and learning take place effectively in the process of group work. Students often meet up numerous times to plan, design, and integrate knowledge and ideas from each group member to make a satisfactory delivery. In this process, students learn not only from textbooks, journal articles, online resources, but also through exchanging their views amongst their learning partners. They learn many skills in this process, including how to lead a group, how to construct logical argument, how to persuade others, how to work as a team, as well as the observing different styles of learning and thinking from each group member.

In a freshman lecture of *Mind, Individual, and Culture* (2017) twenty-eight students were assigned into six groups, and each group were given a topic for group presentation. The topic is related to introducing the brief history and main approaches to study human behaviour from one of the chosen perspectives in psychology. There are six perspectives: biological, behavioural, cognitive, developmental, humanistic, and whole-person. Each group got one perspective, and they were asked to work in groups of four or five to make a ten-minute presentation. Each group were given a list of references, and they were asked to read the corresponding part in the textbook before class.

This group activity was initially intended to serve as a comprehension check on their reading assignment for the first chapter of their textbook. As it is the beginning of a freshmen lecture, both the instructor and the students need to gauge the depth of teaching and the potential in learning. The result from group presentation far exceeds its original purpose, and both the lecturer and the students were surprised by the revealed potential. This realization boosted the confidence both for the students in their future learning and to the lecturer in the depth of teaching. The advantage of group presentation is that no upper limit is set for the melioration of the group project. Students in Tsinghua University are quite competitive in nature, and they are willing to invest a great amount of effort to perfect their project. Such effort pays off in making the students take ownership of their learning process and outcome, and pride is attached to the final presentation. In the evaluation at the end of term, the majority of students were in favour of using group presentation as an effective form of learning. The concerns that lecturers have about shifting the responsibility of learning to the students can be dismissed in the end. Not only were knowledge gained and made more memorable through active
learning, social skills such as cooperation, sharing, expression and respect of others’ views were also developed in this process.

**Practice 3: Structured Inter-Group Feedback**

Even though group presentation is a widely applied form of learning, most feedbacks of such activity come from the lecturer. As a result, the group presentation is often targeted toward the lecturer. We can see from videos footages, which filmed some of the student presentations, eye gaze of the presenter is often directed toward the instructor, who makes assessment and grade the presentation. When presenters are not looking at the instructor, they often look at their notes or toward their fellow group members. In this common style of group presentation, the value of cooperative learning is impaired through this one-way communication between the presenters and the instructor. In order to maximize the value of cooperative learning, a structured form of inter-group feedback is implemented.

**Structured inter-group feedback** is different from the other forms of spontaneous feedback in the classroom. It has the following features: 1) Each non-presenting group is pre-assigned the role of reviewers before the presentation. 2) The reviewers need to use a sandwich method to construct their evaluation carefully. 3) A communication cycle is completed allowing dialogues between groups as well as feedback from the instructor. This structured form of inter-group feedback is practiced in several classes, and it makes a huge difference to the students having been taught how to provide feedbacks. Often in a Chinese classroom, being smart is often mistakenly casted as being critical. Student reviewers often throw very harsh questions to challenge the presenters, and presenters consequently are very defensive and even hostile. Interactions in the classroom can be boggled down to some nit-picking details, and the activity can lose its overall value.

From our practice, it becomes increasingly clear that the skill of providing feedbacks and conducting inter-group feedbacks need to be taught and learnt. In the class of Behavioural Economics, the lecturer introduced a sandwich method in providing feedbacks. Feedbacks need to come in three-layers: 1) Acknowledgement of the presentation, highlighting the unique contribution toward clarifying concepts; 2) Specific questions and constructive suggestions toward the content of the presentation; and 3) Overall assessment of the presentation, often in a positive light.

It is quite amazing to see the interaction between students when they employ the sandwich method. Students don’t just pay lip service to praise the work of their peers, and even though it does not come easy, they quickly become comfortable in crediting the efforts of others. The students who receive positive feedbacks from their reviewers reveal genuine gratitude, as it is quite rare to be praised by their same-aged peers. Through this structured evaluation, students learn this ritual, and also learn to respect the work of others, no matter the work is of better or worse quality than their own. Students end up enjoying giving more positive than negative feedbacks to one another, and the learning atmosphere becomes more friendly and special. Inter-Group feedbacks also include the feedback from the class instructor, and this practice develops positive student-teacher attitudes. Lines of communication are opened and actively encouraged. Students’ attitudes, motivation and interest are greatly enhanced when students are given the opportunity to take charge of learning.

**Practice 4: Hands-on Group Activity**

In introductory biology classes, students usually have trouble visualizing the structure and understanding the function of DNA. However, it is essential to understand these key concepts in molecular biology in order to comprehend the central dogma and the manipulation of DNA. From our previous teaching experiences, we find that undergraduate students typically lack a coherent comprehension of DNA related concepts when they learn in a lecture-intensive environment. These concepts are abstract and disconnected in their minds. To make matters worse, students often are unaware of this problem and also lack the motivation to clarify their understanding in this non-interactive learning environment.

Tackling this situation, we employ a hands-on group activity: **Building DNA structure models**. First, students watch a MOOC video about DNA structure, understanding the characteristics of DNA
double helix and DNA composition. Second, a small group of three students is formed and assigned a model platform to build DNA double helix (see Fig 2). During the model construction, group members discuss, look up information, and build models together. In the end, when students finish the model building, instructors check their models and summarize the key features of DNA double helix. This type of group activity enhances group interaction, interpersonal cooperation and management skills. Through communicating their needs and negotiating with other group members, students learn to work with one another. This cooperative work results in a more in depth understanding of DNA related concepts, and clarification of key features of the DNA structure. From students’ survey and interview, they reported building models as their favourite group work (see Fig 1). This teaching and learning process is blended with video watching, model building, and lecture summary. In the course of learning, students can comprehend the concepts better, develop new perspectives and even become creative in making bold innovations in molecular biology research.

Figure 2. Students Building Models of DNA Double Helix.

Discussion

In our study, we applied several cooperative learning approaches and examined their effects on students’ learning efficacy. From our survey, compared to traditional classes, 90% students believe that cooperative learning enhances engagement in the class, 75% students agree that cooperative learning improves learning efficacy, and 95% students admit that cooperative learning promotes effective interactions with teachers. These results were consistent with previous literature [1],[2]. Students in the group learning interact with each other, share ideas and critiques, look up information and make decisions together. This enhances learning and improves the overall instructional environment in the classroom. By giving examples of different practices of cooperative learning, students believe that their communication skills, critical thinking skills, presentation skills, organization skills and self-confidence are also enhanced (see Fig 3). This result further support that cooperative learning improves students’ cognitive, emotional and social skills, through which higher achievement is achieved, higher self-esteem is cultivated, and greater collaborative skills and attitudes are acquired.

Figure 3. Results from Students Survey on Skills Enhanced via Cooperative Learning.
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References