

The Analysis of the Student's Receptivity at Clicker Application in College Physics Classroom

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Abstract

The educational technology --- clicker, has been widely used in college and middle school physics classroom in domestic and abroad. In domestic, more focuses are put on the result after using it. But in this paper, student's behaviors at clicker application in college physics classroom are analyzed. Through questionnaire survey, the student's receptivity about clicker application before, during and after class has been analyzed. The results can be used for teachers to reasonably apply clicker in classroom.

Key words

Student's Receptivity; Educational Technology; Clicker; College Physics

Introduction

Many studies show that clicker has many advantages when it is applied in classroom, such as encouragement of interactive teaching (Zhixin Huang 2010), assistance of conceptual understanding (M. K. Smith 2009), avoidance of neglecting students' individual differences (Yannan Zhang & Jiyue Hu 2013) and even solving some problems about unfairness in education (Wenwei Wang 2013).

But some problems also have been pointed out by many researches, Mazur argued that the really important thing is teaching method, such as Peer Instruction, instead of educational technology (Eric Mazur 2009). Because the educational technology has been used at moment can be replaced by some other novel method. Meanwhile, Ian. De. Beatty pointed out that educational technology and method are confused in many researches (Beatty & Gerace 2009). So it is hard to demonstrate advantages and prospect about clicker using. Melanie Brady (Melanie Brady 2013) also compared clicker with the low cost technology polling system, and draw a conclusion that clicker can lead to negative feelings and conformity effect. Autumn L. Sutherlin (Autumn L. Sutherlin 2013) also pointed out

that, although clicker using can make students happier, but it has nothing to do with performance improving, which leads to teachers do not want to spend too much time and money on clicker using.

Instead of emphasizing on performance improvement, this paper focuses on the student's receptivity of clicker application. Through collecting data from questionnaire survey, this paper investigates the student's receptivity of clicker application, including before, during and after class in college physics classroom, in order to provide some suggestion for teachers about clicker application.

Research Object, Method and Content

Research Object

Questionnaires are carried out in two classes. One of them is a biochemistry class (B-class for short) and the other is a mathematics class (M-class for short). 53 effective questionnaires are recycled in B-class and 86 in M-class.

Research Method

Questions are shown for students and they are asked to choose the answer by using clicker. Percent of correct decision determines whether students should discuss the question or continue to another question. If the correct percent is below 70%, students would be asked to discuss it and vote once again. It is clear that the second vote holds better accuracy than the first one.

Questionnaire surveys are carried out among students after they get familiar with clicker. The data are recorded and analysed by excel and SPSS.

Research Content

The questionnaire is divided into three parts in chronological order: before, during and after class.

Students' views of using clicker are reflected in this questionnaire. The views include:

- Before class: preferred way of preview; preferred way of grouping.
- During class: willingness to participate class; effectiveness of acquiring correct answers; probability of influencing by others when choosing answers.
- After class: recognition of clicker; advices to teachers.

Research Results

Behaviors of Preview and Grouping

When it comes to preview, most students prefer the traditional way, reading textbook on their own. Traditional mode of Chinese education is that teachers are the authorities and students obey them by listening and taking notes. For years, students are educated in this traditional mode and seldom have the chance to know learner-centered approach. Thus, they prefer traditional previewing.

As to choosing partners, the majority of students want to form a group with the one who they are familiar with, holding the reason that it is relaxed for them to discuss with each other. Only 3% of them clearly point out that they want to have strangers to be their partners. The rest of students hold an indifferent attitude. This is because most students are overcautious in front of strangers, but they can act naturally before acquaintances. To have a free talk, they prefer friends to be their group members.

Students' Response to Clicker Using In Class

The greatest advantage of clicker is to increase students' participation in class. The survey shows that 96% of students think using clicker helps to decrease the phenomenon of sleeping in class which means students are tired of traditional teacher-oriented teaching mode. The main body of class transfers from teachers to students after using clicker. This transfer greatly increased students' participation and attention. Students realize the value and importance of their participation in clicker class. That's why less sleep in class. FIG. 1 shows students' opinions to clicker.

Students' high recognition to clicker can be observed. The new technology, clicker, leads to an active atmosphere in class. This is one of the reasons why students like it.

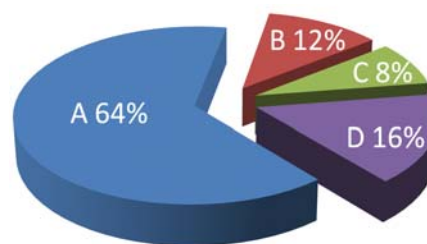


FIG. 1 WHICH CLASS DO I PREFER: TRADITIONAL CLASS OR CLICKER CLASS? (A) CLICKER CLASS. (B) NOT SURE. (C) NEITHER OF THEM. (D) TRADITIONAL CLASS.

But there are still 16% of students prefer traditional class. It is normal that they are used to the traditional education mode for they have taken it since they started to learn. Another possible reason is introversion or passive acceptance. This data can be understood that there is no teaching mode can meet every student's need perfectly, clicker is no exception.

There are 8% of students do not like neither of the two modes. Here is a question to further discuss: are the students weary of studying or are there any dead zones when applying the two approaches.

Overseas researches show that using clicker is more helpful for female students to improve their performance while domestic researches draw the opposite conclusion. However none of these researches have stated whether different gender students have the same user experience when using clicker. Here SPSS is used to do the Pearson correlation analysis.

If the Pearson correlation coefficient ranges from 0-0.2, it means the two variables have very small correlations or no relations. The result shows that gender difference have no relations with students' feelings. Male students and female students have almost the same attitude towards clicker.

Analyses of Other Aspects

1) Effectiveness Of Discussion In Class

As mentioned above, using clicker needs discussion in class. That is to say, discussion is an essential part of clicker class. Whether it is helpful for students or not? Result is demonstrated in FIG. 2.

The majority of students hold the idea that discussion is helpful. Students think actively during the discussion. Students will query about the explanation raised by other partners if it seems not that reasonable. This will help students to form the habit of critical thinking. In teacher-oriented class, students seldom doubt teachers because of the authorities of teachers. However, in group

discussion, students can discuss or even debate with their partners.

A conclusion can be drawn that, discussion in clicker class is helpful. It can help students to rethink about the question and get the right answers.

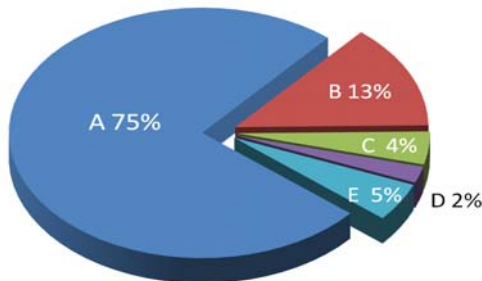


FIG. 2 WHETHER THE DISCUSSION IS HELPFUL OR NOT. (A) INSPIRE ME AND HELP ME CHOOSE THE RIGHT ANSWER. (B) CHOOSE THE ANSWER BECAUSE THE MAJORITY OF THE GROUP CHOOSE IT. (C) CANNOT CHANGE MY CHOICE. (D) MISLEAD ME. (E) INTERRUPT MY DELIBERATENESS.

2) Interruption Form Others

When using Peer Instruction, discussion is not allowed before the first vote. When the accuracy is lower than 70%, students are asked to discuss with group members and then poll again. Generally, the accuracy will largely improve. This can be attributed to the teaching method transfer from lecture to discussion, the main body of class transfer from teachers to students.

Now focus was put in students' feeling. Result can be seen in FIG. 3 and FIG. 4.

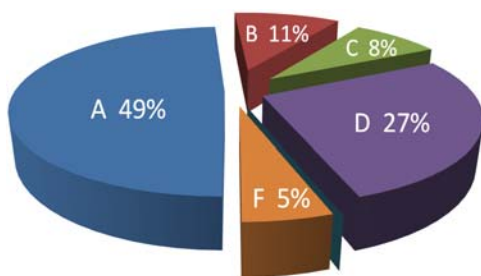


FIG. 3 INTERRUPTION COMES FROM OTHERS WHEN DISCUSSION IS NOT ALLOWED. (A) HEAR OTHERS' ANSWER UNINTENTIONALLY. (B) SEE OTHERS' ANSWER UNINTENTIONALLY. (C) INTERRUPTED BY CLASSMATES' BEHAVIOR. (D) TALK TO OTHERS HABITUALLY. (E) ALWAYS BE ASKED BY OTHERS. (F) OTHER INTERRUPTIONS.

The result shows that students may not choose the answer independently before the discussion. The reasons can be that students may not be very familiar with and strictly obey the rule of PI or teachers forget to stress the importance of independent thinking. Students may hear other partners' answer unintentionally, or some students

habitually ask others to get the answer. These also can be the reasons to be interrupted before discussion.

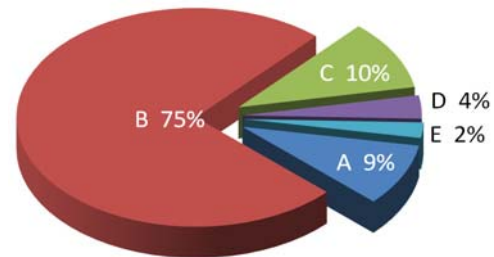


FIG. 4 INTERRUPTION COMES FROM OTHERS WHEN DISCUSSION IS RAISED BY TEACHERS. (A) BELIEVE THE ANSWER CHOSEN BY GOOD STUDENT. (B) WE EXPRESS OUR IDEAS AND SOME PARTNERS ARE PERSUADED. (C) JUST CHOOSE THE ANSWER CHOSEN BY THE MAJORITY. (D) SELDOM JOIN IN THE DISCUSSION. (E) OTHER INTERRUPTION.

After the discussion, 75% of students will get the right answer by the combination of the ideas from discussion and their own thinking. This figure happens to be the same as the figure shown in FIG. 4 which proves that the survey is reliable and discussion in clicker class is necessary and beneficial.

Advices to Teacher

Every technology needs a long time to be experimented and improved before wide application. So does clicker. It is understandable that clicker is not widely accepted by Chinese teachers and students in its initial stage. Clicker can improve students to participate class, but it also has many problems which stop clicker from further application. Students are asked what the problems are when using clicker in class. The result is shown in FIG. 5.

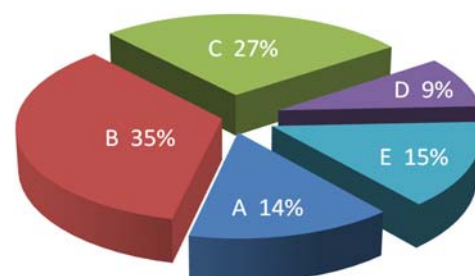


FIG. 5 PROBLEMS OF USING CLICKER. (A) CANNOT CATCH UP WITH TEACHER. (B) TOO MANY QUESTIONS LEAD TO NO TIME OF THINKING. (C) INCONVENIENCE OF TAKING NOTE. (D) DID NOT PREVIEW SUFFICIENTLY. (E) OTHER DIFFICULTIES.

As shown in FIG. 5, B and C are the two main problems that students have in clicker class. The general pattern of a clicker class is that teachers will give students some time to think about the question

and students will be asked to vote in 30-60 seconds. Fast pace is the problem. Students may not fully think about the question in the given time and they may fail to take notes of the questions in the limited time. Slowing down the pace of class or spread the teaching materials after class are solutions to the problems.

Here are some other problems in clicker class:

1) *Problem Of Time*

The usage of clicker will take up of too much time during class, thus teacher have to keep the rhythm of class. More time should be given for students to think independently.

2) *Technical Problem*

M-class has the problem of signal reception but B-class does not have. However, B-class has some problems of courseware. Some researches have reported that smart phone can be used to replace the specialized signal transmission and reception devices which provide a new prospective to solve this problem.

3) *The Need Of Establishing A Database*

The two classes are presented different exercises due to the time limitation. Therefore, the level difficulty and quality of the problems are hard to control. Then a comprehensive database of exercises in high quality is urgently needed.

4) *Explanation Of Questions*

PI can promote students to think. But for questions in science field, a good teaching activity needs the professional summary from teachers which means partners cannot replace teachers.

5) *Option Settings*

Some challenging problems will let students unable to make a choice. An option called "I do not know the answer" is set. Students can choose this option when they do not know the answer which can prevent them from making a random choice. Then the accuracy of the survey will not be obstructed by the misleading data.

6) *Others*

Teachers should keep two balances. The first balance is independent thinking and discussion in class. The other balance is between externally keep students' attention in class and internally independent thinking.

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