Research on Improving the Teaching Effectiveness of LED Courses

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Abstract: This study proposes to assess the learning effectiveness of LED courses among senior engineering university students, aiming to invigorate teaching. It suggests incorporating 'LED Creative Implementation Competition Model' and 'LED Creative Card Set Challenge' into innovative teaching strategies, to compare and identify differences between traditional teaching methods and the innovative approaches presented in this project.

Index terms: Innovative Teaching, LED Training, Learning Effectiveness Assessment.

I. INTRODUCTION

Dr. Shuji Nakamura of Japan won the 2014 Nobel Prize in Physics for his research on LEDs, which suddenly accelerated people's understanding of LEDs. This is the mainstream light source lighting product that humans can use besides solar energy. Nowadays, the main application products of LED include brake lights, display backlight modules, outdoor displays, car headlights, special lighting, indoor lighting, etc. It can be seen that LED has brought about an amazing industry explosion rate. Under this background demand, this study implemented the "LED Principles and Applications" course for fourth-year university engineering students. We hope to activate teaching and propose to incorporate "(LED Creative Implementation Competition Model)" and "LED Creative Card Group Challenge" into the innovative teaching of the course. We hope to improve the learning effect and compare and find out the differences between general traditional teaching and the innovative teaching of this project.

II. RESEARCH DESIGN AND METHODS

The entire study is divided into three parts. The first part will first establish innovative teaching methods in the competition mode, use competition mode teaching strategies to stimulate students' motivation to participate in the course, and redefine the rigid LED engineering course model. Part Two: Design LED Creative Competition During the course teaching, the impression of "hands-on" technology is strengthened. Students discuss the principles and needs of the development of creative teaching aids, so that students are no longer just users, but learn, explore and develop. The third part establishes a peer self-learning model to improve technical understanding. The peer self-study model combines the first two parts of "LED Creative Practice Competition" and "LED Card Game Teaching Aid Assistance" to organize and discuss the results and understand the "hands-on practice" and "peer self-study" in technical courses. Pattern and relational pairing. Through the LED card board game teaching aids, students can start the self-study mode during the game and among their peers, which complements the previous hands-on work and enhances their impression of LED practical technology.

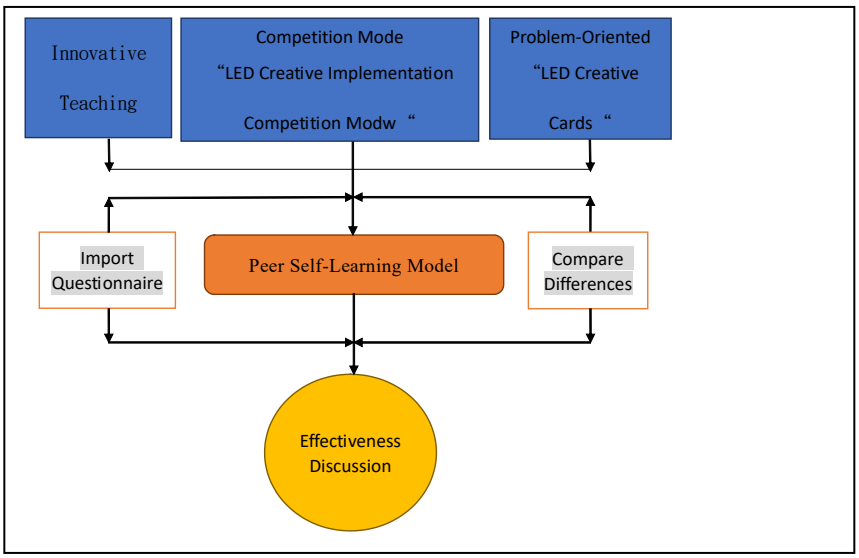

Figure 1. Establish innovative teaching in competition mode and auxiliary teaching aid structure of LED card and board game teaching aids

The research design is to examine whether innovative teaching content (LED Creative Implementation Competition Model and LED Creative Card Group Challenge) are involved in the teaching of students' LED courses, and use questionnaires and tests to determine whether there is any improvement in learning outcomes. A quasi-experimental research cluster sampling design was adopted in the process. The implementation steps are as follows: (1) The research subjects solicited about 12 students each to serve as the control group; (2) 19 students were solicited to serve as the experimental control group. In addition to streamlined teaching intervention, the experimental control group , and added the intervention of innovative competition teaching and board games, while the control group received ordinary traditional classes; (3) The data collected by the two groups of students included quantitative and qualitative data, and the quantitative data used self-made knowledge, communication and cooperation skills Scales and heart flow meters; qualitative data (including communication and cooperation, learning experiences and suggestions, and verbatim transcripts of focus interviews) are presented using content analysis methods to supplement the quantitative conclusions.

This study uses Likert's five-point scale, using action research method and single-group two-way measurement experimental research design, as shown in Table 1:

Table 1 Research Design of Planning

	Pretest		Posttest
Traditional class (Control Group)	O1		O2
Flipping class (Test Group)	O1	X1, X2	O2

O1：Conduct a pre-test in the first week of the semester based on "student basic information", "electronic circuit knowledge", "LED principle awareness", "instrument measurement skills", and "learning satisfaction scale".
X1: "LED Creative Implementation Competition" intervention
X2： "LED basic engineer knowledge card board game teaching aids teaching" intervention
O2: In the final examination week (week 14) after the intervention measures are completed, a post-test will be conducted on "Electronic Circuit Knowledge", "LED Principle Cognition", "Instrument Measurement Skills", and "Learning Satisfaction Scale", and qualitative interviews will be conducted.

Quantitative Research

The research tools include "student basic information", "electronic circuit knowledge", "LED principle awareness", "instrument measurement skills", and "learning satisfaction scale". Each question is answered in the form of a multiple-choice question. 1 point is given for a correct answer and 0 points for an incorrect answer. The higher the score, the more correct the student's knowledge of electronic circuits is.

III. PROCESS AND RESULTS

(1) Teaching process and results

This project is implemented through innovative teaching methods such as competition mode, LED card board game teaching aids, group challenge competitions, industry teacher teaching and other innovative teaching methods. The results will be presented through questionnaire statistics after the operation.

1-1 Innovative teaching methods in competition mode:

LED creative implementation allows students to actually make their own designed works in class and also participate in competitions. During the process, teachers use many LED creative products and video sharing methods to discuss with students the background of each creative idea and the problems expected to be solved, how to complete the production of LED creative products, etc., to inspire students' hands-on motivation. In the first stage, teachers provide various materials, and students use their favorite materials to make and solve problems, improving their willingness to learn and self-confidence.

In the second stage, students will go on stage to present their results one by one through a results presentation. By filming their own videos, students will go on stage to explain the design reasons and production process, and train their presentation skills in oral expression.

1-2 LED card board game teaching aids to assist teaching:

LED card board game teaching aids to assist teaching and group challenge competitions: This LED card board game teaching aid was produced with the help of four juniors and two students in the class, and was printed by the teacher. The LED card part is based on the basics of LED Engineer test questions are integrated into the card board game. Through the game review question bank, students learn from the card board game and gain the power energy brought by knowledge, and then control the weight of the competition and the final win or loss.

IV. RESULTS AND DISCUSSION

The interviews and questionnaire contents of this innovative teaching plan were reviewed and approved by the IRB Ethics Committee of Taiwan National Cheng Kung University and the IRB Ethics Committee of Taiwan Antai Hospital. They respectively implemented non-interventional innovative teaching in traditional classrooms and innovative teaching in this project. The results are shown in Figure 2. The BCD test scores of the traditional class averaged 32.5 in the pre-test and 36.7 in the post-test, with an average increase of 12.9%; Figure 3. The BCD test scores of the flipped class averaged 36.3 in the pre-test and 58.4 in the post-test, with an average increase of 60.9%. This statistic shows that flipped classrooms provide adequate learning and growth compared to traditional classrooms and are in line with expectations.

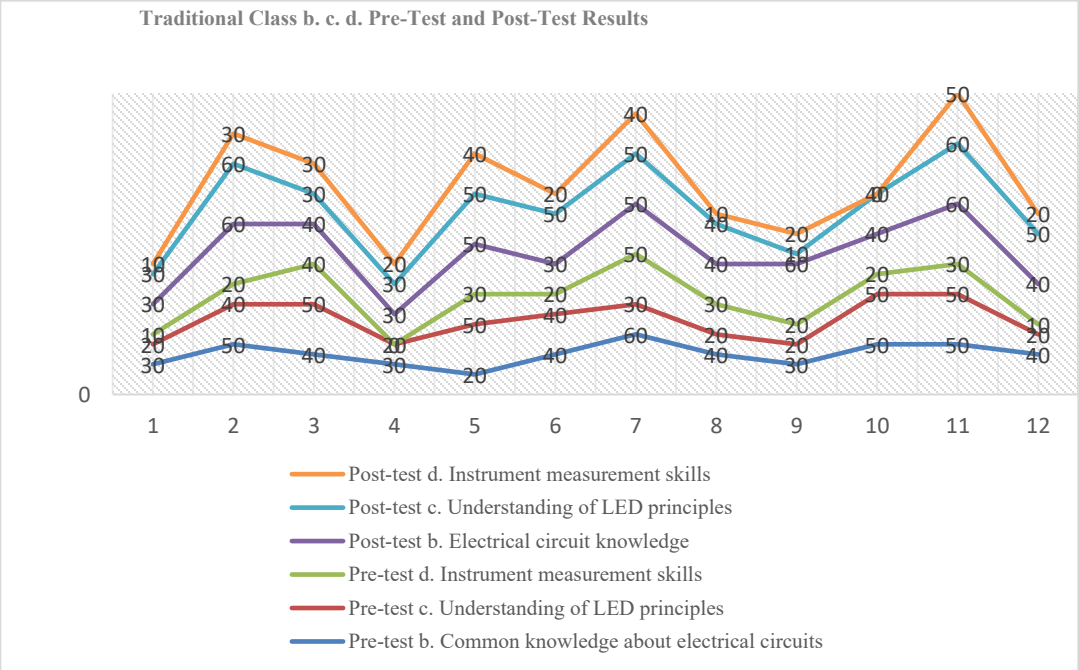

Figure 2. Traditional class b.c.d. pre- and post-test results chart

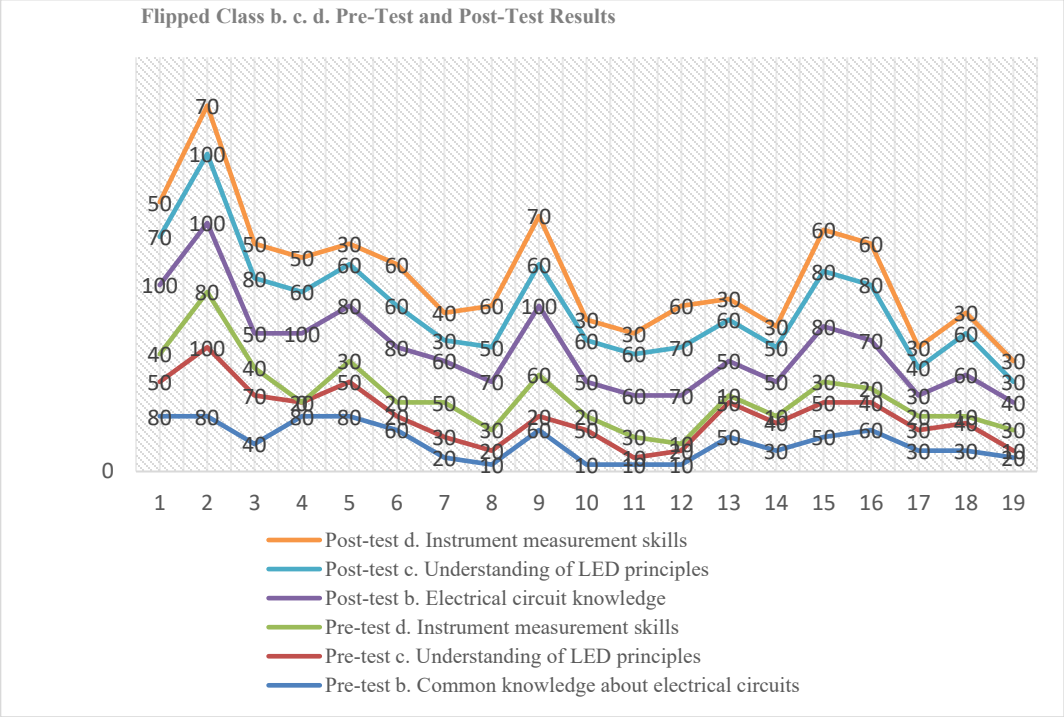

Figure 3. Flipping class b.c.d. pre- and post-test results chart

V. CONCLUSION

It is quite helpful to discuss the questionnaire quantitatively or qualitatively. According to the "quantitative" aspect, the bcd (b.electronic circuit knowledge, c.LED principle cognition, d.instrument measurement skills) knowledge score can be improved "quantitatively", or the "qualitative" aspect can be used to improve the innovative teaching and professional teaching ability of the competition mode. "Improvements are all positive help to classmates. Therefore, this education and training model should have good results in cultivating talents. In the end, the flipped classroom BCD test scores averaged 36.3 in the pre-test and 58.4 in the post-test, an average increase of 60.9%. This statistics shows that compared with traditional classrooms, flipped classrooms have sufficient learning and growth, and are in line with expectations.

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