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*Short Research Paper*

# Teaching Practice about Flipped Classroom on Circuit Course

Yuanbin Wang[1*] & Jianwen Zhao

[1] Xi'an University of Science and Technology, Shaanxi, China

[*] Yuanbin Wang, Xi'an University of Science and Technology, Xi'an Yanta Road Middle Secion, No 58, Shaanxi, 710054, China

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***Abstracts***

*In view of the problems in circuit course, flipped classroom is introduced and new teaching mode is explored. Teaching design, teaching reform suggestion, teaching effects and results are presented. It is verified that this kind of teaching mode can enhance the enthusiasm, initiative and participation of the students, teaching efficiency is also improved. It is also a good way for comprehensive practice.*

***Keywords***

*circuit course, flipped classroom, teaching reform, teaching practice*

## 1. Introduction

Circuit course is a fundamental course for the students of electrical and electronic major. This course has strong theoretic and practical characteristics. It is very useful and important to cultivate the ability of calculating, experiment and research for students. On the other hand, circuit is very significant to succeeding subjects. However, main problems exist like the following:

(1) Learning efficiency is not very high, students are passive, and usually they are not active to involve in the class essentially. They usually listen to the teacher passively and will not think a lot by themselves. Teachers are the main role in the class, and students are secondary.

(2) Communication and interaction are infrequent between students and teachers. They seldom ask questions to the teachers or their classmates. Discussion or argument seldom occurs in the class. Students are not very active in the classroom.

(3) For students, theory and practice are separated in the course of study. Students pay a lot of attention to the theory, whereas experiments and practice are easily ignored. However, for technology students, practice is very significant. Without practice, without progress.

Aiming at these problems, flipped classroom is introduced to the circuit course. Teaching reform, effects and implementation results based on MOOC and flipped room about circuit course are presented in this paper.

## 2. Teaching Reform about Flipped Classroom

With the development of digitization and network technology, high education teaching mode has changed greatly. MOOC (massive open online course) are employed widely in universities. According to the features and laws of MOOC and flipped classroom, some reforms about circuit course have been made in this field, and many students has been trained in this way. For us, it is applied in the following way. The teaching flow chart and the figure about students learning offline are shown in Figure 1 and Figure 2, respectively.

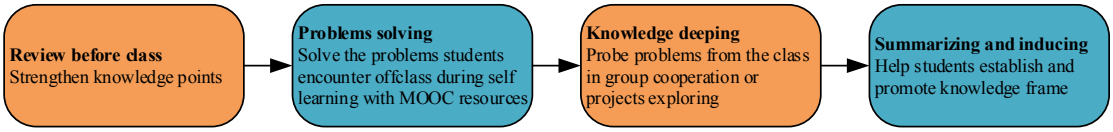


**Figure 1. Flow Chart of Teaching**

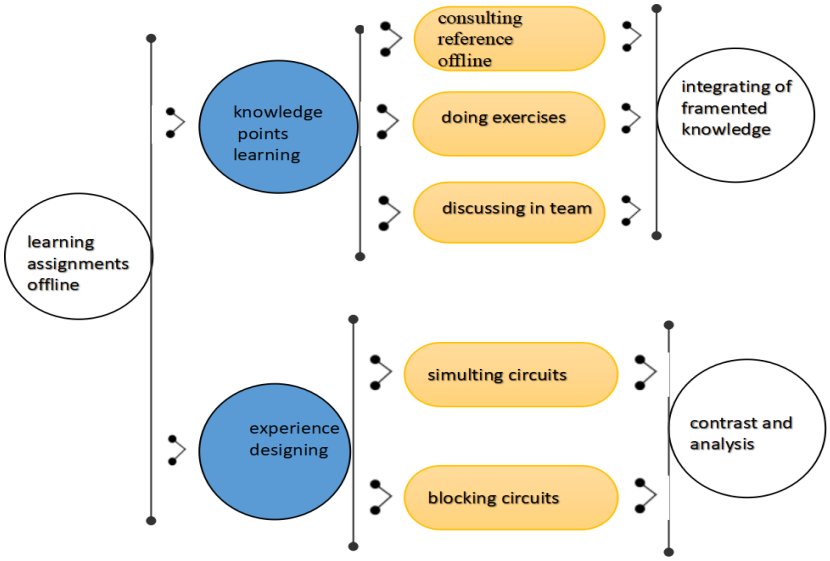


**Figure 2. Flow Chart for Students Learning Offline**

## 3. Influence from Flipped Classroom

This kind of teaching mode has the three following effects:

(1) Learning enthusiasm of students has been improved greatly, initiative has also been enhanced. In the class students are very active and can put forward their ideas or problems boldly, and even they may discuss or argue warmly.

(2) Practice ability has been improved greatly.

In this teaching mode, students are true center role in the class, but in the traditional class teachers are the center. Students are interested in some other things such as drawing circuit diagram, drawing printed circuit boarded, simulation, real circuit fabrication, etc. Furthermore, now 3 utility model patents have been authorized based on course contest in our class. Students got high scores in contest and scientific activity after class.

(3) New learning mode formation based on team learning and cooperation learning.

In flipped classroom students have more time and chance to discuss or communicate. It is helpful for students to understand the knowledge further, and they may learn in team or cooperation form. Therefore, the learning efficiency is improved, and the disparity between students in different levels is reduced.

(4) Formation of dynamic and multiple evaluation mode.

Discussion and small test in class can be recorded by special software. Teachers know the learning situation of each student well, so they can adjust the teaching schedule and strategy flexibly in time. On the other hand, the score of final exam is connected with daily behavior, such as test and discussion in class. A good basis is also built for succeeding subjects and subsequent learning.

## 4. Implementation Results Based on Flipped Classroom

In the circuit course teaching of last autumn, one class is based on flipped classroom, and the other one is based on traditional teaching mode. In the view of daily behavior, assignments, tests and final exam, this new teaching mode has better results. Students are more active, focused and engaged in class or experiments. They may find problems and solve them cooperatively and independently. However, in the traditional teaching mode, students are more passive. Table 1 is the results between flipped classroom and traditional class.

**Table 1. Results Comparison of Circuit Course in Final Exam**

| | Flipped classroom | Traditional classroom |
|---|---|---|
| Total students | 65 | 68 |
| Average scores of test paper | 72 | 65 |
| Failure rate | 30% | 42% |
| The ratio above 90 | 11% | 4% |
| The ratio below 40 | 6% | 14% |

From Table 1, it can be seen that the average score from flipped class is 7 score higher than that from traditional class, the failure rate of flipped class is 12% lower than that of traditional class. The ratio

above 90 score and below 40 score of flipped class are also higher than that of traditional class. Therefore flipped class teaching mode can improve the enthusiasm and score of the students. Better teaching results are achieved.

## 5. Conclusion

In the times of MOOC and flipped classroom, teaching reform about circuit course is explored preliminary. It is shown that this kind of teaching mode enhanced the initiative, participation and teaching effects. In addition, practice is paid more attention than before. For this kind of teaching, establishment of learning environment and innovation should be emphasized. Furthermore, specialized quality and teaching skill are also should be enhanced. Flipped classroom of circuit course will be a strong and unobstructed bridge between fundamental theory and engineering practice in future. Of course, it is a new thing, and the best teaching mode should be explored and investigated further. In addition, this kind of teaching mode brings more work to teachers and teachers should expand their knowledge view. Joint effort is needed from teachers and students for further development.

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