

## Effectiveness of Blended Learning Method on Digital Logic Circuit

Se-Young Lim<sup>\*</sup>, Dong-Kyun Lim<sup>†</sup> and Ji-Eun Lee<sup>†</sup>

<sup>\*</sup>*Hanyang University Graduate school of Education, Seoul, Korea*

<sup>†</sup>*Hanyang Cyber University, Seoul, Korea*

### **Abstract**

*An ideal teaching-learning method, such as the blended learning method, is to motivate interests in education and to allow active class participation of students. Students exposed to this method are hypothesized to be dedicated in learning and their school life. A research was conducted on 11<sup>th</sup> graders in Daejeon city high school specialized in industry; the blended learning method was applied to a course, digital logic circuit and the effects on the students' learning were monitored. The result shows that compared with a common leaning method, the blended learning method is very effective in terms of increasing educational interest, class participation, the level of concentration in class and academic achievement of students. Also, it shows positive feedbacks from the students on the educational videos and the usage of the contents. Conclusively, the blended learning method effectively increases academic achievements through improved educational motivation and active class participation which positively affect the overall satisfaction of participants.*

**Keywords:** *Blended Learning Method, Digital Logic Circuit*

## 1. INTRODUCTION

Due to the development of data communication technology, the digital era has come along with a society relying on the technology. Corresponding to this change, an educational paradigm has changed from the professor-centered to the learner-centered. The blended learning method overcomes the limit of e-learning and increase the learning effect by compromising both benefits of face-to-face class education and the cyber space [1]. For data communication technology classes, applying an education system centered on students, who are familiar with internet, can motivate educational interests and active class participation. These motivations are expected to solve dropout rates and maladjustment of students in specialized high schools. Therefore, this study sought to apply the blended learning method into the digital logic circuit, a subject taught at specialized high schools; a discussion regarding the effectiveness of the blended learning method applied on the digital logic circuit class is carried out [2].

## **2. RESEARCH CONTENTS**

The research topic is the effectiveness of the blended learning method applied on the digital logic circuit class. The detailed research contents are as followed: How does the blended learning method influence educational interests, class participation and the concentration level; how does the blended learning method influence the academic achievements; what is the satisfactory level on the blended learning method ?. [3]

## **3. THE PROGRESS OF THE BLENDED LEARNING METHOD**

### **3.1 Producing the education videos and uploading the web**

Each educational video summarizes theories behind the desired educational content in order to motivate proactive learning. It also allow repeats on the desired parts of the video for a sufficient learning. These videos are produced using explain-everything app (an electronic board app) on cell phones or tablet PCs. The usage of the app was referenced from a post on the internet.

### **3.2 Analysis of Pre-investigation on Educational Interest**

The purpose of this pre-investigation is to question the students' interest in the course, digital logic circuit, before the application of the blended learning method. The investigation was conducted on both the experimental and the control group of the students taking the course. The results of the pre-investigation show that only 19.9% of the experiment group and 20% of the control group were interested in the course. The results were analyzed that, overall, the students show a low interest on the subject. [4]

### **3.3 Analysis of Pre-investigation and Post-investigation on Class Participation**

The purpose of this investigation is to test students' participation during the class, digital logic circuit, before and after the application of the blended learning method. This investigation was conducted on both the experimental and control group. The questionnaires are the exact same questions for pre and post-investigations. The pre-investigation reveals that 33.3% of the experimental group replied as an active participation. The post-investigation shows that 40% of the experiment group replied as an active participation. This value is 6.7% higher than the pre-investigation value. On the other hand, the control group shows 40% as an active participation on the pre-investigation but on the post-investigation, 26.6% of the control group shows as an active participation. Based on the result, the face-to-face lecture method doesn't trigger students' interest in the course which results in less participation. However, the blended learning method triggers interest in the course which positively improve the class participation. [5]

## **4. CONCLUSION**

Currently, specialized high schools are facing higher dropout rates and maladjustment of the students. These students lack the will to study. This is related to a low educational motivation and an ambition along with educational expectations from apathetic parents. Therefore, a teaching and learning method such as a blended learning method, that triggers educational interest and motivates active class participation, is expected to improve the quality of school life and stronger dedication in education. The blended learning method (online and offline) combines the usage of the educational videos and the classroom participation.

This research paper investigated the positive effect of the blended learning method applied to a subject, digital logic circuit. The research was conducted on 11<sup>th</sup> graders in Daejeon city high school specialized in

industry. The experimental group was exposed to the blended learning method and the control group was exposed to the usual face-to-face lecture method (offline) that only provides classroom participation. The result is explained in three parts: pre and post-investigations, academic achievement and satisfactory level.

The results from the questionnaires show that the blended learning method applied in the digital logic circuit course positively influences students' learning rate through educational interest, class participation and the level of concentration during class. The pre-investigation questionnaire shows that 19.9% of the experimental group and 20% of the control group showed an interest in the course prior to taking the course. The post-investigation questionnaire reveals that 39.9% of the experimental group (20% higher than the pre-investigation result) was still interested in the course whereas 20% of the control group showed an interest (the same percentage as the pre-investigation).

In a sense of class participation, 33.3% of the experimental group showed an active participation in the beginning of the course. By the end of the class, 40% of the experimental group showed an active participation with the blended learning method. This value was 6.7% higher than the pre-investigation value. With the control group, 40% of the group showed an active participation in the beginning but by the end of the course, only 26.6% of the control group showed an active participation. This value is 13.4% lower than the pre-investigation value. These values prove that the face-to-face lecture method fails to trigger the interest in course which negatively influences the class participation. On the other hand, the blended learning method triggers the interest in course which improves higher class participation rates. The results from pre and post-investigations on the level of concentration in the class, also supports this finding.

The pre-investigations shows that 20% of the experimental group and 26.6% of the control group replied to have an effective time focusing during the class. The post-investigation reveals that the same 26.6% of the control group replied with a positive feedback on focusing during class. On the other hand, 53.4% of the experimental group replied to have an effective time focusing in the class with the blended learning method. This value is 33.4% higher than the pre-investigation data. Overall, the blended learning method positively affect educational interest, class participation and the level of concentration of students who are familiar with the face-to-face lecture method.

The results from the test scores show that compared to the usual face-to-face lecture method, the blended learning method improves the academic achievement. The control group previously had an average test score of 66.40 and by the end of the class, digital logic circuit, the control group was at 63.80 which shows a decrease in the average score of 2.60. Through T-test,  $t=1.00(p>.050)$  showed a negligible difference. On the other hand, the experimental group previous had an average test score of 66.60 and the average test score of the course, digital logic circuit, with the blended learning method was 78.50 which shows an increase in the average score of 11.9. Through T-test,  $t=3.78(p<.05)$  showed a significant difference. This result shows a positive effect on the academic achievement of the students taking the digital logic circuit course with the blended learning method. A correlation between the previous results from the questionnaire and the academic achievement is observed. Due to an increase of interest in the course, class participation and the level of concentration, the educational achievement naturally increase.

The third result from the satisfactory survey shows an overall satisfaction towards the usage of the blended learning method and the educational videos. A majority of the experimental group showed an improvement in their test scores and a better understanding of the class material. These students replied with a positive desire to continue the blended learning method for the upcoming semester. Also, 66.7% of the experimental group replied 'mostly yes' and above to suggesting the blended learning method to another friend. The usage of the educational videos and the blogs were generally replied as simple and easy to use and 72% of the experimental group replied 'Mostly yes' to the access of the blog through smart phones.

Conclusively, the blended learning method applied to a course, digital logic circuit, improves the academic achievement through an increase of educational interest, class participation and the level of concentration in class. Therefore, these improvements positively influence the overall satisfaction towards the blended learning method.

## REFERENCES

- [1] Yvette Gelogo, Hye-Jin Kim, "Educational Paradigm Shift from E-Learning to Mobile Learning Toward Ubiquitous Learning," *International Journal of Internet, Broadcasting and Communication(JIIBC)*, Vol. 4, No. 1, pp. 8-12, 2012.
- [2] D. Ronnie, Caytiles, Hye-Jin Kim, "e-Friendly Personalized Learning," *International Journal of Internet, Broadcasting and Communication(JIIBC)*, Vol. 4, No. 2, pp. 12-16, 2012.
- [3] You-Sik Hong, Cheonshik Kim, Eun-Jun Yoon, ChangDuk Jung, "Intelligence E-Learning System," *The Journal of The Institute of Webcasting, Internet and Telecommunication*, Vol. 10, No. 1, Feb., pp. 137-144, 2010.
- [4] Kyung-Tae Kim, Dong-Kyun Lim, Seung-Jung Shin, "Design and Implementation of Computer Architecture's Web based Learning System for Self-directed Learning," *The Journal of The Institute of Webcasting, Internet and Telecommunication*, Vol. 10, No. 6, Dec., pp. 287-292, 2010.
- [5] Young-Ju Joo, Chung-Ae Kyung, Kang-Jeong Jin, Kyung-Yi Go, "Identification of the Predictability of SNS Intention to Use and Related Variables in Collaborative Learning," *The Journal of The Institute of Webcasting, Internet and Telecommunication*, Vol. 15, No. 3, June, pp. 191-199, 2015.