Korean J. Math. **17** (2009), No. 4, pp. 349–359

A STUDY ON PROBLEMS OF STATISTICS TEACHING TO USE COMPUTER PROGRAM

Hyeyoung Oh

Abstract. As students have been familiar to Internet or media which has big visual effects rather than letters, they preferred the class in computer lab to theoretical class. The class in computer lab showed all the students good reactions in concern and interest. Statistics achievements of high level students in 2008 became better than that in 2007 but those of low level students became worse than that in 2007. I analyze the reason why the achievements of low level students have become worse. The purpose of this study is to supplement of the trouble of the class in computer lab and find out a better teaching and develop mathematics education's satisfaction and qualification.

1. Introduction

At information age, a big revolution in mathematics education has occurred. Because students have been familiar with all sorts of media rather than letters, they have been interested in computer lab which is closely related to visual factor.

As the proportion of special exam than regular exam becomes high and the number of the graduates of vocational high school increase rather than that of the graduates of general high school in college, the change of teaching method becomes a good news to students in college. The time of mathematics in vocational high school is less than that in general high school and so the level of mathematics in vocational high school has gone down severely. This presents the condition which is down in concern and interest about mathematics. Using computer program which is effective in interest and motivation about mathematics, I can

Received August 10, 2009. Revised October 5, 2009.
2000 Mathematics Subject Classification: 97C80, 97U70.
Key words and phrases: computer program, visual image, technology.
This work was supported by Incheon City College Research Fund.

make students study mathematics and feel pleasant when they study in computer lab rather than in classroom class. Students showed good reactions in interest and concern when they participated in computer lab class rather than theoretical class. However, high and low level students did not show even good results. Good achievements showed only to high level students.

This study analyzes what good points and problems which can be presented in computer lab class are. The purpose of this study is to make up the problems and grope the direction of effective and better class.

2. Theoretical background

One of importance of the seventh curriculum is Application Recommendation of calculator computer. Within the range not disturbing the acquaintance of basic function such as computation ability or operation performance ability by applying various data of computer, calculator, slide, and tools, more important development of mathematical thinking ability could be achieved. Thus in the field of mathematics class of each school, the interest about the organization of mathematics class became high. Particularly, since each classroom has a big monitor and computer, mathematics teachers try to organize mathematics class applying ICT, WBI class, and the active and student-participational mathematics class which could get out of constrained mathematics class and expand the mathematical thinking[6].

NCTM pointed out that the importance of mathematical talents increased in the modern information society and suggested that they emphasized the problem solution ability to ensure students' acquirement of 'mathematical power' and that they should apply calculator and computer properly in the process of investigating mathematical problem[7].

This suggestion was concreted and presented by following 'The Technology Principle' in 'Principles and Standards for School Mathematics' of NCTM[8].

Technology is an essential element to teach mathematics and learn it. Technology affects the mathematics contents to teach and improves students' mathematics learning ability. Technology rearranges mathematical environment and school mathematics should reflect this kind of

change. Students can learn mathematics more and more deeply by using the technology properly. Teachers should decide carefully when and how they would use technology[5].

Since students of nowadays have grown up in various media, they feel more familiar with mathematics when they get the information through visual image such as computer rather than traditional type to neglect visual aspect. Computer lab class expands the range of visualizing the mathematics class and it helps students study mathematics with interest.

As a result of class to use computer program, if students are able to use mathematics concepts more significantly or levelly, computer lab class is not only done for thinking but also plays a mid role as the tool to help to develop the thinking[1]. However, in mathematics education of school field there are problems in making the best use of technology effectively[2].

The followings are the problems.

1) Confusion technology education with mathematics education to use technology
2) Analysis about mathematics concepts and lack of understanding about them
3) Lack of most teachers' knowledge related to technology and fear due to it
4) Teaching preparation for education effect and the lack of research when using technology as learning aid tool about specific mathematics concepts.

And there are the individualized teaching preparation and the problems of supplementary teaching of low level students behind.

3. Research method

3.1. Research objects.

Objects of this study are freshmen entered in the department of computer information science of my school in 2008, 2007, and 2006.

I taught usage of SAS and let students perform it to practice the contents related to statistics from program correction to data summary and analysis of output result by using computer program(SAS) for one semester.

Item	2006	2007	2008
interest, motive	3.87	4.06	4

TABLE 1. Comparison of interest item

3.2. Research process.

For this study 1) I compared the scores of the end of first semester of 2006, 2007, and 2008 and investigated the average of them. 2) I investigated the proportion of low level(D, F) and high level (A, B+) students of 2007, 2008. 3) I compared the interest item of a questionnaire. Here, the year 2006 was the year which provided only theoretical class and the year 2007 and 2008 were the year which provided both theoretical class and computer lab class.

Experiment 1: Comparison of average

Comparing the scores of the end of first semester, average of scores of students entered in 2007 was 79.68 point and that of scores of students entered in 2008 was 75.71 point. All students of two years were the students participated in computer lab but the average of students entered in 2008 went down rather than that of students entered in 2007.

Experiment 2: Low level and high level students' proportion

The fact that average of students entered in 2008 became lower than that of students entered in 2007 did not mean whole students' decline of scores. It meant that the proportion of low level(D, F) students who neither adapted to class nor concentrated to it increased.

In fact, students who got D or F in 2007 increased from 13.3% to 20.0%. On the other hand, I could confirm that students who were faithful to class, concentrative, and excellent in accomplishment and got A or B+ increased from 39.8% to 44.6%.

Experiment 3: Comparison of interest

Students with bad accomplishment also showed that interest item and item which motivated learning motive were relatively high.

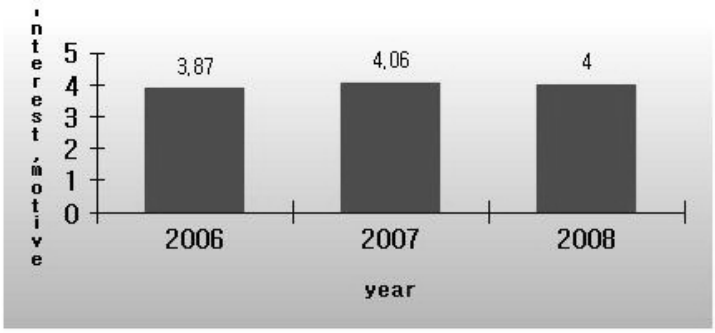

FIGURE 1. Comparison of interest item

Year	2006	2007	2008
score	76.56	79.68	75.71

TABLE 2. Comparison of statistics scores

Here, the year 2006 was the year which used only the theoretical class without computer lab class. Item for interest and item which motivated learning motive were items of questionnaire which performed in my school. These items have the five point as a perfect score.

4. Research Result

Result of Experiment 1:

We observed the achievement of statistics as the first experiment result. Average of statistics scores of students entered in 2008 was 75.71 point, which was lower than that(79.68 point) of students entered in 2007. The grade of 2008 was also lower than that of 2006(76.56) which did not use computer program and used only the theoretical class. This was very low decline proportion corresponding to 1.11%.

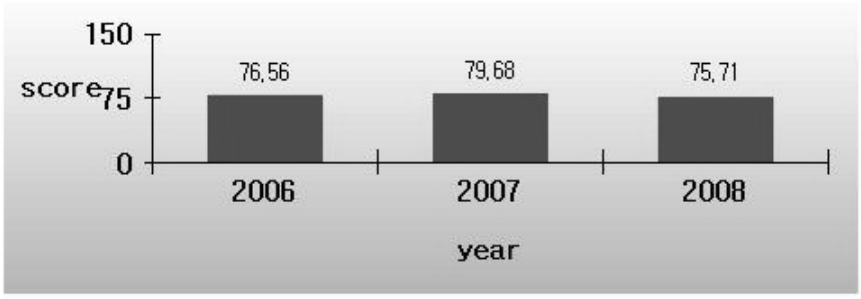

FIGURE 2. Comparison of statistics scores

Year	2007		2008	
Grade	D	F	D	F
Percentage(%)	9.4 %	3.9 %	16. 2%	3.8 %
	13.3 %		20.0 %	

TABLE 3. Comparison of low level students' grades

Year	2007		2008	
Grade	B+	A	B+	A
Percentage(%)	19.5 %	20.3 %	21.5 %	23.1 %
	39.8 %		44.6 %	

TABLE 4. Comparison of high level students' grades

Result of Experiment 2:

Average score went down. However, this was not corresponding to all the students but just to low level students. The fact that high level students' proportion increased from 39.8% to 44.6% when comparing 2008 with 2007 and low level students' proportion increased from 13.3% to 20.0% proved above.

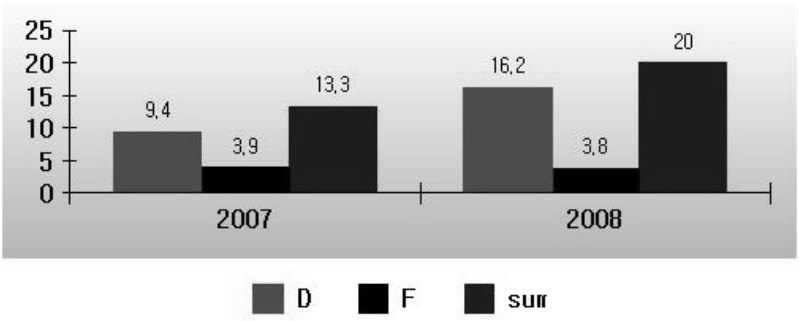

FIGURE 3. Comparison of low level students' grades

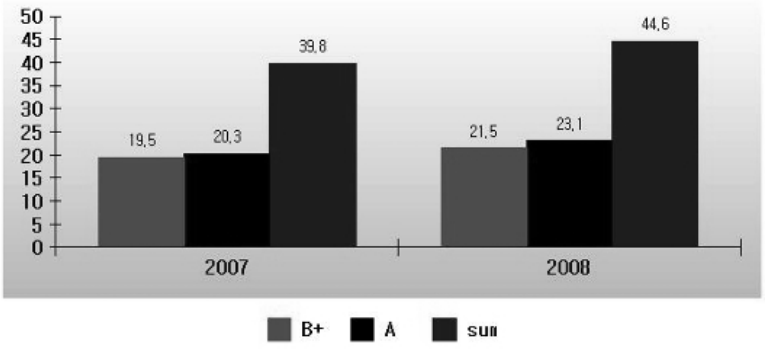

FIGURE 4. Comparison of high level students' grades

5. Analysis of Problems

In the case of high level students, computer program was used as an aid tool of teaching and so it was helped not only in interest but also in understanding of the class. But low level students' proportion increased when they were in the computer lab rather than in the theoretical class. The low level students had the difficulty in problem adaptation and understanding of concepts when they were both in the computer lab

and in the theoretical class. Computer lab class to low level students presented the burdensome status instead of helping the theoretical class because students should study in two ways.

But low level students recorded relatively high number in scores of interest and item which motivated learning motive. This fact presented positive in giving students internal pleasure because students didn't feel bored rather than theoretical class and participation in the lab was high.

Not only in theoretical class but also in computer lab there occurred the level difference. This was a problem. The solution to this problem was needed. In theoretical class students listened to the concepts and solved the problems in textbook. At that time the degree how much students understand them does not appear. On the other hand, students' mistakes occur and the problems appear in the computer lab class even if examples of textbook are performed. The level difference became deeper in computer lab. Hence the solution to the level difference is needed.

High level students solved the problems immediately by their own discovery or professor's help. But low level students needed time and some people who concentrically help them because they had difficulty in correcting even examples of the textbook. Low level students needed much more help not only in some examples of text but also in applied problems.

For this to form the group in computer lab and study was needed. Since the effect of the class was not so good when people in each group was too many, people of each group was within 3. Each group had the head of group and I made him(or her) practice the contents to learn in class under responsibility of group not responsibility of individual.

Low level students felt happy to see the monitor and the participation and response were also good. But understanding of the relationship between skills and concepts was not easy because they learned both skills and concepts and related with them each other. Students who dealt with the computer poorly and didn't know the theoretical contents had the problems which double the difficulties.

I gave lessons in computer lab in 2007 and 2008. The reason why a gap between high and low level students was open just in 2008 and low level students' proportion increased was that I reflected lab grade to the exam grade.

In 2007, there was a computer lab class and I made computer lab class help theoretical class. Even if students don't know computer program,

the achievement of statistics was not affected at all. Computer lab class in 2007 was as a continuation of theoretical class. It gave interest to class and motivated motive and played an important role in making statistics class pleasant.

Computer lab in 2008 was tighter than class in 2007. It was proceeded in the same time as 2007. But I gave more assignments in computer lab in 2008 and evaluated final exam which added computer program in related to assignments. High level students did many assignments and related concepts of theory to computer lab and so they understood theoretical concepts of statistics well. Hence, students' proportion with high-achievement was increased in 2008.

It was pleasant for low level students to look at the result in computer lab rather than boring class. But to participate in the computer lab without understanding of true statistics theory was beyond their ability in taking lab exam. So they couldn't get good grades in computer lab class. Because lab exam was added to final exam, the low level students' proportion can't help increasing.

Since lab exam was reflected to statistics grades, high level students studied the assignments harder and realized the relationship between theory and lab and so the achievement became high. I knew that high level students became mature in effect of amplification which Berger asserted and concept development. The effect of amplification and concept development was surely a big gain. The effect of amplification became maximum in solving the related problems and participating in the computer lab.

The chapter of correlation analysis and regression analysis is extremely complicated enough not to calculate with hand. Students felt that through theoretical class the examples in text were complicated and numbers were big and the calculations were not easy and it took a lot of time. So students appreciated it for the computer program which played an important role in complicated calculations. High level students felt interesting and showed the interest in complicated problems. On the other hand, since low level students were in the status which concepts didn't be developed sufficiently, they didn't know the true meaning why they should solve complicated problems by program. Computer lab class did not help in extending low level students' problem solving ability. Simple data editing and looking at output presented by monitor were all that they could do.

6. Conclusion

Computer lab class had good reaction not only in motivation but also in class participation. But all the students didn't show good achievements. Particularly low level students' achievement in 2008 was lower than 2007. It's because computer lab grades were added to statistics grades.

Similarly in theoretical class, a gap of level occurred in computer lab class. It is true that low level students who wanted fundamental concepts needed repetition education for achievement progress and individualized education proper to learner's level or characteristic[3]. But there is little realization under the present school circumstances where professor-one person teaches a lot of students. In my school, team learning was executed and one team consisted of 3 students but it was not effective.

Mentoring method which Goodlad(1998) researched, which taught and learned to students who knew each aptitudes well, was one of methods which could improve low level students' own grades[4]. If low level students' achievement is improved with this method, then the big problem in computer lab class will be solved. Education to apply computer program will contribute greatly that students understand mathematics properly and improve problem solving ability.

However, to be effective by mentoring, data preparation for students-centered class and operation method will be researched continuously. Moreover, professor's active effort for obtaining good result in applying this is needed.

References

[1] M. Berger, *Graphic Calculators: A interpretative framework*, For the Learning of Mathematics, (1998), 13–20.

[2] S. S. Choi-Koh, *The Effective Use of a Technology Tool for Students' Mathematical Exploration*, J. Korea Soc. Math. Ed. Ser. A: The Mathematical Education, **42** (2003), No.5, 647–672.

[3] Y. S. Choi and W. S. Yoo, *A Case Study of Students' Mentoring Activities for the Special-Supplementary Curriculum in Math Classrooms*, J. Korea Soc. Math. Ed. Ser. E: Commnications of Mathematical Education, **20** (2006), No.3, 483–502.

[4] S. Goodlad, *Mentoring and tutoring by students*, London: Kogan Page Ltd., (1998).

[5] H. J. Hwang, *New Theory of Mathematical Education*, Moon Eum Co., http://www.mathlove.org., (2001).
[6] N. H. Kim, *The Case Study of Using GrafEq. by Pre-service Mathematics Teachers for Exploring Secondary School Mathematics*, J. Korea Soc. Math. Ed. Ser. A: The Mathematical Education, **43**(2004), No.4, 405–417.
[7] NCTM, *Curriculum and Evaluation Standards for School Mathematics.*, (K. J. Koo, 1992), Kyungmoonsa, (1989).
[8] NCTM, *Principles and Standards for school Mathematics*, The National Council of Teachers of Mathematics, (2000).

Department of Computer Information
Incheon City College
Incheon 402-750, Korea
E-mail: hyoh@icc.ac.kr