The Eurasia Proceedings of
Educational & Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2016

Volume 4, Pages 64-68

ICEMST 2016: International Conference on Education in Mathematics, Science & Technology

COLLEGE STUDENTS' PERCEPTIONS OF LEARNING MATHEMATICS AND USING COMPUTERS

Tolga Gok
Dokuz Eylul University

ABSTRACT: Mathematics is the key course to interpret the science and nature. A positive attitude should be improved by learners to comprehend the logic of mathematics. However, most of the research indicated that they were not interested in learning and studying mathematics. Instead of understanding the basic principles, many students preferred to use sophisticated software packages or graphing calculators for solving mathematics problems. Thus, these tools prevent the improvement of their mathematical skills. This study investigates students' confidence when learning mathematics and using computers. Besides, the research examines the effects of computers and graphing calculators in the learning of mathematics on the students' opinions. The study was conducted with 230 technical vocational school students. The data of the research was collected using a survey of "Attitudes to Technology in Mathematics Learning Questionnaire". The results of the study indicated that many students were not interested in learning and understanding the subjects while studying mathematics on pen and paper. They preferred to solve mathematics problems with the help of sophisticated mathematics software packages or graphing calculators. Detailed results and recommendations based on the students' confidence and perceptions are presented in the study.

Key words: Computer education, confidence, higher education, mathematics education

INTRODUCTION

STEM (Science, Technology, Engineering and Mathematics) education has become very important for the future generations of our country recently. *Science* provides knowledge to us about the universe (sun, moon, plants, food, weather, etc.). *Technology* is helpful for our daily lives with the help of computer, smartphone, etc. Engineering (building, roads, bridges, etc.) makes our lives easier. College students' motivation and confidence in mathematics, science, and engineering education declined in recent years although students always come across mathematics in their daily lives (at the bank, supermarket, etc.).

"A true STEM education should increase students' understanding of how things work and improve their use of technologies. STEM education should also introduce more engineering during precollege education (Bybee, 2010)". Therefore, the researcher, educators, teachers, etc. primarily should promote and encourage all students from elementary level to university level for STEM in our educational systems (Kennedy & Odell, 2014). Although these career fields are very important for countries' future, many students do not give importance to them. Thus researchers in the education field should direct the students to these career fields and they should explain the importance of these fields to the students.

Many of college students have difficulty in concentrating on learning mathematics, have not mathematical/logical intelligence, and have the fear and lack of self-confidence of students for learning mathematics. Besides they find it difficult to comprehend mathematical concepts and they have anxiety while studying and solving the problems too much. Therefore they do not like to learn mathematics. These challenges are resulted from conventional instruction. On the other hand, the majority of students like spending time with technology (a variety of mathematical computer software, calculators, graphic calculators, etc.) except for studying mathematics. They have interest in using computer and/or graphics calculator while learning mathematics. These devices could help the students solving problem, enhancing mathematical concepts' exploration, improving the representations between mathematical concepts and ideas. These devices could encourage metacognitive abilities (planning, and checking) (Duncan, 2010; Pierce, Stacey & Barkatsas, 2007). Also students believe that these devices could help them to learn mathematics.

- Selection and peer-review under responsibility of the Organizing Committee of the conference

*Corresponding author: Tolga Gok- icemstoffice@gmail.com

Mathematics is very important to understand for everybody but learning mathematics is needed to follow logical procedures. Thus educators should develop and apply new teaching methods on their course instead of conventional instruction and these developed new teaching methods may improve learning through cognitive, metacognitive and affective processes (Pierce et al., 2007). Besides the educators should encourage students to learn and explore mathematics and they should provide positive feedback on the developing of students' positive attitudes on their course. The behaviors of mathematics educator play a central role in learning mathematics for students. Therefore they should be careful the students' affective and cognitive domains.

The purpose of this study is to examine the college students' confidence by learning mathematics and using computers and the college students' opinion about computers and graphics calculators during learning mathematics. The research questions (RQ) investigated were as follows:

1. What is the college students' confidence related to learning mathematics?
2. What is the college students' confidence related to using computers?
3. What is the college students' opinion about computers and graphics calculators during learning mathematics?

METHOD

The present study used survey methodology with questionnaire items measured on Likert scales. The questionnaire was developed by Fogarty, Cretchley, Harman, Ellerton, & Konki, 2001. The questionnaire provided the opinion, feeling, and confidence of the student related to learning mathematics, using computers and graphics calculator. The questionnaire with 34 items consisted of three main parts. The first part including 11 items is about the students' confidence by learning mathematics. The second part covering 12 items is on the students' confidence while using computers. The last one including 11 items is about the feelings of the students about computers and graphic calculators in the learning of mathematics. The statistical analyses of the questionnaire were calculated by Fogarty et al. (2001). Cronbach's alpha coefficient for internal consistency reliability for subscales was reported as 0.89 for mathematics confidence, as 0.92 for computer confidence, and as 0.84 for attitude towards use of technology in learning mathematics. The detailed statistical analyses of the questionnaire can be obtained in literature (Fogarty et al. 2001). The items of the questionnaire were coded on a scale of 1 to 5, with 1 being "Strongly Agree" and 5 being "Strongly Disagree". The students were given approximately five minutes to fill out the questionnaire. The research was performed on four departments offering two-year programs (Industrial Glass and Ceramics, Geotechnic, Drilling Technology, Natural Building Stone Technology) in Torbali Technical Vocational School of Higher Education at Dokuz Eylul University, Turkey. The study sample consisted of 230 volunteer college students whose ages were between 18 and 20. The collected data were analyzed by IBM-SPSS Statistics 22. The frequency distributions, means and standard deviations of student' responses were calculated.

RESULTS and FINDINGS

The students' responses were evaluated according to subscale as follows:

1. The Confidence of Students in Learning Mathematics

Table 1 presents the descriptive statistics related to the students' confidence while learning mathematics. The data obtained from the questionnaire are generally examined, the students did not have confidence in learning, studying, and solving mathematics themselves. According to the findings; 17% of the students had less trouble in learning mathematics than other subjects, 72% of the students did not have a mathematical mind, 61% of the students had never felt themselves capable of learning mathematics, 83% of the students found mathematics frightening, 78% of the student did not understand how some people seemed to enjoy spending so much time on mathematics problems, 78% of the students were never very excited about mathematics, and 76% of the students found mathematics confusing.

Table1. The Descriptive Statistics Related to the Students' Confidence in Learning Mathematics

QN	Items	N	M	SD
1	I have less trouble learning mathematics than other subjects.	228	4.30	1.36
2	When I have difficulties with mathematics, I know I can handle them.	225	4.86	1.20
3	I do not have a mathematical mind.	227	1.09	1.34
4	It takes me longer to understand mathematics than the average person.	224	1.94	1.24
5	I have never felt myself able to learn mathematics.	223	1.31	1.36
6	I enjoy trying to solve new mathematics problems.	222	4.01	1.23
7	I find mathematics frightening.	229	1.19	1.35

8	I find many mathematics problems interesting and challenging.	225	4.15	1.18
9	I don't understand how some people seem to enjoy spending so much time on mathematics problems.	228	1.35	1.38
10	I have never been very excited about mathematics.	229	1.26	1.34
11	I find mathematics confusing.	229	1.54	1.34

Note: 1- Strongly Agree; 2- Agree; 3- Neutral; 4- Disagree; 5- Strongly Disagree

2. The Confidence of Students in Using Computers

Table 2 shows the descriptive statistics related to the students' confidence while using computers. When the data obtained from the questionnaire were generally evaluated, 74% of the students had less trouble in learning how to use a computer than learning the other things, 80% of the students had difficulties in using a computer. They knew that they could handle the problems/difficulties, 12% of the students had never felt themselves capable of learning how to use computers, 77% of the students enjoyed trying new things on a computer, 13% of the students found using computers frightening, 16% of the student did not understand how some people seemed to enjoy spending so much time using computers, and 81% of the students did not find computers confusing.

Table 2. The Descriptive Statistics Related to the Students' Confidence in Using Computers

QN	Items	N	M	SD
1	I have less trouble learning how to use a computer than I do learning other things.	229	2.05	1.10
2	When I have difficulties using a computer I know I can handle them.	229	1.87	0.96
3	I am not what I would call a computer person.	229	3.48	1.23
4	It takes me much longer to understand how to use computers than the average person.	230	3.52	1.26
5	I have never felt myself able to learn how to use computers.	226	4.17	1.13
6	I enjoy trying new things on a computer.	227	2.00	1.15
7	I find having to use computers frightening.	226	4.16	1.13
8	I find many aspects of using computers interesting and challenging.	222	2.72	1.30
9	I don't understand how some people can seem to enjoy spending so much time using computers.	227	3.79	1.21
10	I have never been very excited about using computers.	227	3.85	1.14
11	I find using computers confusing.	220	4.05	1.13
12	I'm nervous that I'm not good enough with computers to be able to use them to learn mathematics.	228	3.51	1.13

3. The Opinions of Students about Computers and Graphics Calculators

Table 3 demonstrates the descriptive statistics related to the students' feeling about computers and graphics calculators in the learning mathematics. When the data obtained from the questionnaire are generally investigated, 46% of the students believed that computing on a devise makes it easier to explore mathematical ideas, 45% of the students realized that computers were important but they did not think that they needed to use them to learn mathematics, 66% of the students thought that computers and graphic calculators were good tools for calculation, but not for their learning of mathematics, 27% of the students reported that using technology wasted too much time in the learning of mathematics, 27% of the student preferred to do all the calculations and graphing by themselves, without using a computer or graphics calculator, 56% of the students wanted to get better at using computers to help students in mathematics, and 35% of the students revealed that the symbols and language of mathematics were difficult all by themselves even without the addition of technology.

Table 3. The Descriptive Statistics Related to the Students' Feeling about Computers and Graphics Calculators in Learning Mathematics

QN	Items	N	M	SD
1	Computing power makes it easier to explore mathematical ideas.	230	2.63	1.07
2	I know computers are important but I don't feel I need to use them to learn mathematics.	227	2.73	1.14
3	Computers and graphics calculators are good tools for calculation, but not for my learning of mathematics.	230	1.27	1.19
4	I think using technology is too new and strange to make it worthwhile for learning mathematics.	228	3.06	1.04
5	I think using technology wastes too much time in the learning of mathematics.	219	2.21	1.22
6	I prefer to do all the calculations and graphing myself, without using a computer or graphics calculator.	228	4.17	1.19
7	Using technology for the calculations makes it easier for me to do more realistic applications.	223	2.41	0.99

8	I like the idea of exploring mathematical methods and ideas using technology.	230	2.88	1.16
9	I want to get better at using computers to help me with mathematics.	227	1.58	1.17
10	The symbols and language of mathematics are bad enough already without the addition of technology.	229	2.00	1.23
11	Having technology to do routine work makes me more likely to try different methods and approaches.	227	2.58	1.05

CONCLUSION

The results obtained from findings indicate that the majority of the students had great difficulties in learning mathematics. The learning difficulties of the students by studying mathematics can be given according to RQ1 (What is the college students' confidence related to learning mathematics?) as follows:

1) They have a prejudice against mathematical thinking and learning.
2) They believe that mathematics is very difficult to achieve and is complex to understand therefore many students do not generally want to learn mathematics.
3) They think that learning mathematics causes the students to waste time and they prefer to perform different social activities to learn mathematics.
4) They believe that they do not have logical/mathematical intelligence and do not adequately have confidence in learning mathematics.

The results obtained from findings reveal that the majority of the students have interest in using computers and have confidence in understanding computers. The results obtained from findings according to RQ2 (What is the college students' confidence related to using computers?) report that many students do not have any problems while using computers therefore they would like to use the computers, they really enjoy spending more time with the computers, and find the computers entertaining.

The results obtained from findings present that the majority of the students need to use computers and graphics calculators in learning mathematics. The results obtained from findings according to RQ3 (What is the college students' opinion about computers and graphics calculators during learning mathematics?) demonstrate that the majority of the students use calculators because mathematical operation is easy to do/solve for them. Actually these graphics calculators may prevent improving of mathematical operation skills of the students because students are accustomed to use these devices instead of pen and paper. After certain period of time, these devices might be caused the lack of motivation and confidence in the students. Besides the students' mathematical operations performance can increase the possibility of failure on the examination and they almost begin to think that they have not mathematical intelligence.

RECOMMENDATION

It is clear that college students do not like to study mathematics. Therefore, mathematic educators should motivate students to the courses with the help of active learning techniques. The mathematics educators should present practical knowledge instead of more theoretical knowledge, they should teach problem solving strategies to the students instead of problem solving, they should improve the problem solving skills of the students, they should use plain mathematical language for more easy understanding of the students in the courses, they should give comprehensible and achievable homework problems instead of a lot of assignments in order to gain students' motivation and confidence, they should frequently encourage the students, and they should not threat the students with score. The students nowadays spend more time on the computers. For this reason, the educators should promote to the students for using a variety of mathematical educational software. Thus students could learn mathematics by using educational software. The educators should not allow students to use the computer (Tablet PC, Notebook, etc.) and/or calculators and graphics calculators in the courses and examination. The educators should explain the importance of calculators and computers to students and should express to students that these kind of devices are insufficient for learning mathematics. Finally, the educators should periodically provide in-service training about active learning techniques and educational software.

REFERENCES

Bybee, R. W. (2010). What is STEM education? *Science, 329* (5995), 996.

Duncan, A. G. (2010). Teachers' views on dynamically linked multiple representations, pedagogical practices and students' understanding of mathematics using TI-Nspire in Scottish secondary schools. *Mathematics Education*, 42, 763-774.

Fogarty, G. J., Cretchley, P., Harman, C., Ellerton, N., & Konki, N. (2001). Validation of a questionnaire to measure mathematics confidence, computer confidence, and attitudes to the use of technology for learning mathematics. *Mathematics Education Research Journal, 13*(2), 154-163.

Kennedy, T. J., & Odell, M. R. L. (2014). Engaging students in STEM education. *Science Education International, 25*(3), 246-258.

Pierce, R., Stacey, K., & Barkatsas, A. (2007). A scale for monitoring students' attitudes to learning mathematics with technology. *Computers & Education*, 48, 285-300.