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The Effect of Micro Mobile Science Laboratory Set on Teachers' Views towards Physics Experiments

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ABSTRACT There is not any single study in the literature on Mobile Science Laboratory type supported by micro computer technology created for the first mobile science laboratory. This study was conducted to investigate science teachers' evaluations regarding mobile science laboratory experiment sets and their applications in secondary education level both quantitatively and qualitatively. In the scale that was developed to achieve this aim, in the scale for teachers there are 15 questions. Reliability of the scale applied to teachers was found to be .92. The scale prepared for teachers was applied to 71 science teachers in Kutahya Science High School and in all Anatolian High Schools. Frequency distribution was used to assess the significance of the results, t-test and Wilcoxon Signed-Rank Test were used for pair comparisons, One-way variance analysis was used for comparisons between more than two groups and Pearson moment correlation coefficient analysis was used to assess relationships between demographic information and the questions. Results of the study showed that micro mobile science laboratory experiment set was seen as beneficial by most science teachers (.92) in terms of applicability at school and its performance regarding its comprehensibleness by students.

INTRODUCTION

Today's technology plays an active and effective role in every parts of life. Computers which have affected peoples' life in many different ways, which is continuously developed and which has entered into all phases of our lives, have great influence on education in many ways, as opposed to television and radio (Psycharis et al. 2013; Tozoglu and Varank 2001). The spread of use of computers in education has brought along some concepts with it. Some of these commonly used concepts are information and communication technology, computer-assisted education and teaching, computer awareness, computer and information literacy. Modern educational institutions are closely interested in the functions of these new concepts. What is expected from educational institutions that has overtaken the responsibility of educating students in accordance with the desired profile by the society is to equip individuals with computer and information literacy, to educate students who can use technology effectively and who can learn by themselves. These developments refer to the need to equip teachers, who have the responsibility of guiding students, with the mentioned skills in addition to students (Akkoyunlu and Kurbanoglu 2003). These important functions mentioned reveal the significance of technology and use of technology in classes together with science teaching.

Harwood and McMahon (1997) maintained that developing and using multimedia supported teaching activities that would activate students' visual and intellectual structures in order to teach concepts that are hard to learn and realize meaningful learning would have a positive effect on students' success. However, computers in computer-assisted teaching must be presented as a factor that completes and reinforces the system, not as an alternative to teaching process (Namlu 1999). Some researches (Arslan 2003; Ayvaci et al. 2004; Geban et al. 1992; Hounshell and Hill 1989) showed that computer-assisted teaching is more effective than other methods in terms of increasing students' interest in science classes.

Science classes are suitable for application of computer-assisted teaching in terms of content and curriculum. The reasons for this are that there are a lot of scientific concepts and principles in science classes and that appropriate while preparing lesson software, teaching techniques could be used to help students visually (Geban and Demircioglu 1996). Looking from this perspective, a great deal of research (Akçay et al. 2003; Asan and Haliloglu 2005; Baytak and Hirca 2013; Kenar 2010; Ozmen and Kolomuc 2004; Yenice 2003) reveal that integration of technolo-

gy and science will be very useful soon in science teaching. The best example of integration of technology and science is the use of computer-supported technologies micro mobile science laboratory experiment set in science classes which is used in more than fifty countries worldwide including Turkey (Nova 5000 2009). Instead of focusing on studies about how experimental studies conducted for science teaching in today's science teaching will contribute to science teaching, it is necessary to have work discipline, consciousness and sense of responsibility to figure out what strategies and technical equipment could lead to more correct and reliable data and to see how to realize activities and projects in the curriculum (Nova 5000 2009; Yenice 2003).

These studies are also of great importance in terms of creating countries' educational policies. Spread and application of educational changes highly depend on how teachers put individual and personal meaning into these changes, in short, on the adaption of these changes by teachers (Becker 2001; Fullan 1991; Van den Berg et al. 1999). Teachers today plays the most a central role in the effective use of computers in education and teaching (Gooler et al. 2000).There are certain factors needed to make active use of computers and teachers are the primary factor among them (Kutluca and Ekici 2010). The results of all these studies show that studies to focus on teachers' and students' technology use to be repeated and that new data about this subject are needed.

What is Micro Mobile Science Laboratory?

Micro Mobile Science Laboratory has an equal function with computers that we use today in daily life, it is also an integrated experiment set through which many physics, chemistry and biology experiments can be carried out by some sensors on it (Humidity Sensor, Oxygen Sensor, Heat Sensor, Light Sensor, Microphone Sensor, Optics, and other sensors through which mechanic and electric experiments can be conducted). A mobile science laboratory with a micro-processor is generally designed to work with some integrated loops that will be attached to it. By collecting data through sensors, Micro Mobile Science Laboratory creates tables with outputs, draws graphs that define outputs functionally and provides analytical expressions.

Aim of the Study

The aim of this study is to assess observational data regarding the use of Micro Mobile Science Experiment Set in science laboratories by teachers during learning/teaching process.

To achieve this end,

i. Teachers' evaluations towards micro computer technology-supported science laboratory applications in secondary education level and students' attitudes, success and learning levels in science experiments they will carry out through micro mobile science experiment were made,
ii. Teachers' evaluations towards micro computer technology-supported science laboratory applications will be analyzed to see if there is any significant difference based on teachers' gender, field, tenure and weekly contact hours were made,
iii. The evaluations of problems that can encountered during the application of innovation brought to science teaching by micro computer technology-supported science experiment set based on teachers' observations were made.

METHODOLOGY

Study Group

The study group consists of all 71 teachers working at Science and Anatolian High Schools in Kutahya Province where Micro Mobile Science Experiment Set was distributed in 2009-2010 academic year.

Research Design

This study was conducted to, both quantitatively and qualitatively, investigate science teachers' evaluations regarding mobile science laboratory experiment sets and their applications and students' attitudes towards carrying out experiments through this experiment set. This aim was achieved mainly in three phases:

In the first phase of the study, the researcher took part in 30-hour in-service training course given by National Ministry of Education Educational Technology General Directorate where application of micro computer-assisted science experiments were taught in Ankara Ataturk Anatolian High School between September 14, 2009

and September 18, 2009. The researcher also got an attendance and achievement certificate from the course.

In the second phase of the study, the researcher was appointed by Kutahya National Ministry of Education Directorate as the person responsible for Micro Mobile Science Experiment Set in Kutahya Province. Micro Mobile Science Experiment Set was distributed to Anatolian High Schools, Anatolian Teacher Training High School and Science Schools in Kutahya based on needs analysis. One year following the distribution of Micro Mobile Science Experiment Set, the researcher gave a course on how to use Micro Mobile Science Experiment Set to science teachers in June and July of 2009-2010 academic year. 60-hour practical lessons were taught to science teachers in laboratory environment with the formal confirmation of Province National Ministry of Education Directorate. After basic concepts and principles regarding Micro Mobile Science Experiment Set were taught during the course, presentation of educational CDs prepared by expert teachers in the field were given. Afterwards, information about 13 sensors used in Micro Mobile Science Experiment Set applications through CDs were given practically, first, 18 experiments within the context of teaching were carried out as demonstration experiments in front of teachers, then science teachers carried out the same experiments and they also prepare a report for each experiment they carried out.

Science teachers, later, conducted experiments that could be made through Micro Mobile Science Experiment Set in laboratories together with students during the term. At the end of the term, Micro Mobile Science Experiment Set evaluation scale distributed to science teachers the reliability and validity of which was made, the opinions of 4 physics, 3 chemistry and 3 biology experts who made research on their fields were gathered and the related literature was reviewed.

Data Collection Tools

Scale to Assess Micro Mobile Science Experiment Set Applied to Teachers: An assessment scale that was developed by the researcher to assess science teachers' opinions regarding Micro Mobile Science Experiment Set was used in the study. The two-factor scale includes 15 items in Likert-type. Content validity means whether scales fit the purpose in terms of content, that is, whether it measures correctly. Content validity was ensured by collection of opinions from 4 expert researchers who conducted research in physics teaching, 3 expert researchers who conducted research in chemistry teaching and 3 expert researchers who conducted research in biology teaching. 5-likert-type scale that was used is an assessment scales ranging from 1 to 5 and scores are determined as totally agree (4.20–5.00), agree (3.40–4.19), moderately agree (2.60–3.39), disagree (1.80–2.59) and totally disagree (1.00–1.79).

Analysis of Factor Structure Analysis of Teachers' Assessment Scale: That in the scale applied to a pilot group consisting of 102 science teachers with a BA degree, Kaiser-Meyer-Olkin test was found to be higher than .60 (KMO= .87), and that Bartlett tests was found to be significant($p< .05$), showed that data was suitable for factor analysis. The result of factor analysis revealed that there were 2 dimensions of assessment scale. The first dimension of the test expresses from a science teacher's perspective that "micro mobile experiment set motivates students, increases their scientific process skills and creates a positive effect on students' science education". The second dimension expresses from a science teacher's perspective whether "micro mobile experiment set includes knowledge, skills and suggestions that are considered to be a prerequisite so as to conduct experiments in the experiment guide book easily, whether it includes experiment activities students can do outside school. It also tries to assess the efficiency of this experiment set in terms of its strength and usability in student environment. It is seen that factor loadings range between .56 and .87 in the first dimension; those in the second dimension range between .50 and .70. In the two-dimension scale, the first factor constitutes 38 % of the variance, the second factor constitutes 20.74 % of the variance and the total variance was found to be 58.74 %. This percentage shows that the scale measures what it is supposed to be measuring (Tavsancil 2002). Since the Cronbach α reliability coefficient was found to be .92, it was found to be reliable. The questions in the scale applied to science teachers are given in the Appendix Table 1. In the rest of the research, opinions of 71 science teachers who filled out the assessment scale were collected and their thoughts were presented in the findings part.

Analysis of the Data

The researcher gave science teachers in-service education consisting of 60 hours of lesson about Micro Mobile Science Experiment Set for science teachers, in which the teachers were asked to do all 18 experiments -6 for each three branches namely Physics, Chemistry and Biology- by practicing. For each experiment, 20 minutes were allocated. SPSS was utilized for the analysis of the data obtained from teachers and students. $\alpha = .05$ significance level was taken as the basis for significance tests between groups.

Kolmogorov-Smirnov Test was applied in order to determine whether teachers' data showed a normal distribution and determine the way of analysis fitting the situation because of the fact that sample size was greater than 50. Consequently, it was obtained that distribution of the points does not show a significant difference than the normal distribution ($p>.05$); it was decided that parametric tests were to be used. For the analysis of teachers' data, arithmetic mean depending on variants, standard deviation, t-tests for non-depending groups, one-way analysis of variance (ANOVA) were used. Later in the research, Pearson product-moment correlation coefficient analysis showing the relation between total sum of points for each question asked to teachers in evaluation scale and teachers' demographical features was utilized. Pearson product-moment correlation coefficient analysis is a technique used for determining the relation between variants (Kaptan 1998). There are not certain boundaries while interpreting Pearson product-moment correlation coefficient in terms of size; however, the following ranges are generally used while interpreting the correlation: if the absolute value of the Pearson product-moment correlation coefficient is between 0.70 and 1.00, it is considered high; if it is between 0.30 and 0.69, it is considered medium level; if it is between 0.00 and 0.29, it is considered low correlation (Buyukozturk 2008).

In the question asked to science teachers, the name of the Micro Mobile Science Experiment Set was used; for ethical issues, the phrase "Micro Mobile Science Experiment Set" is used instead of the name of the set throughout this article.

RESULTS

First of all, frequency distribution and percentages will be given according to gender, branch, time passed as a teacher and amount of classes they have in a week for teachers. Findings and conclusions related to teachers about Micro Mobile Science Experiment Set can be found on the other sub-sections. Under these sub-sections, objective findings on science teachers, and subjective findings on teachers can be found respectively.

Frequency distributions and percentages according to teacher's gender [female (1), male (2)], branch [Physics (1), Chemistry (2), Biology (3)], time spent as a teacher [(6-10) years (2), (11-15) years (3), (16-20) years (4), (21-above) years (5)] and total amount of classes they have in a week [(15-20) hours (1), (21-25) hours (2), (26-30) hours (3), (31-above) hours (4)] are stated below.

Twenty-nine (40.80%) out of all taking part in the research are female teachers, 42 (59.20%) are male teachers. 26 (36.60%) of these teachers are from Physics branch, 20 (28.20%) are from Chemistry branch, and 25 (35.20%) are from Biology branch. The number of teachers with 6-10 years of experience is 11 (15.50%); the number of the ones with 11-15 years of experience is 24 (33.80%), the number of the ones with 16-20 years of experience is 17 (23.90%); the number of the ones with 21-and above years of experience is 19 (26.80%). 14 science teachers (19.70%) have between 15-20 hours, 28 (26.80%) of them have between 21-25 hours, 27 (38.00%) of them have between 26-30 hours, 2 (2.80%) have 31-and above hours to conduct in one week. T-test findings and conclusions showing the relation between the gender of the teachers and their evaluations about Micro Mobile Science Experiment Set can be found in Table 1.

As can be seen in Table 1, teaching science with Micro Mobile Science Experiment Set contributes to science teachers' attitude towards experiments and computers. When we look at the means of answers on question basis and overall mean from Table 1 (Overall mean (1)= 3.47; Overall mean (2)= 3.51, corresponds to "I agree" on likert type scale), it can be seen that science teachers think that Micro Mobile Science Experiment Set will be beneficial in terms of teaching science in high school no matter which their gender is. This result reveals that education given to teachers about use of computers has similar beneficial effects on their use of computers and teaching behaviors. Literature supports this conclusion, as well (Bahr et al. 1992; Cagiltay et al. 2001; Seferoglu et al. 2008). It is also noteworthy

Table 1: t-test results that show the relation between the gender of the teachers and their evaluations about micro mobile science experiment set

	Gender	*N*	*Mean*	*S*	*sd*	*t*	*p*
s1	1.00	29	3.37	.94	69	-.90	.36
	2.00	42	3.57	.83	55.27	-.88	.37
s2	1.00	29	3.55	.98	69	-.48	.62
	2.00	42	3.66	.97	60.13	-.48	.63
s3	1.00	29	3.72	.92	69	-.06	.95
	2.00	42	3.73	.96	62.08	-.06	.95
s4	1.00	29	3.55	.94	69	-.40	.68
	2.00	42	3.64	.90	58.53	-.40	.68
s5	1.00	29	3.68	.80	69	.41	.67
	2.00	42	3.59	1.01	67.52	.43	.66
s6	1.00	29	3.24	.78	69	-.67	.50
	2.00	42	3.38	.90	65.46	-.68	.49
s7	1.00	29	3.34	.48	69	.19	.84
	2.00	42	3.30	.86	66.45	.21	.82
s8	1.00	29	2.82	.80	69	-2.15	.03
	2.00	42	3.30	.99	67.28	-2.24	.02
s9	1.00	29	3.44	1.02	69	.33	.74
	2.00	42	3.35	1.20	66.07	.34	.73
s10	1.00	29	2.72	.99	69	-1.04	.29
	2.00	42	2.97	.99	60.49	-1.04	.30
s11	1.00	29	3.13	.69	69	-.43	.66
	2.00	42	3.21	.75	63.32	-.44	.66
s12	1.00	29	3.51	.91	69	-.63	.53
	2.00	42	3.64	.75	52.98	-.61	.54
s13	1.00	29	3.44	.78	69	-1.07	.28
	2.00	42	3.64	.72	57.34	-1.06	.29
s14	1.00	29	3.68	1.10	69	-1.22	.22
	2.00	42	3.97	.86	50.70	-1.16	.24
s15	1.00	29	3.51	.87	69	-.94	.35
	2.00	42	3.71	.86	60.02	-.94	.35
Total	1.00	29	52.17	12.23	69	-.21	.82
	2.00	42	52.73	9.65	50.84	-.20	.83
Overall mean:	1.00	3.47					
Overall mean:	2.00	3.51					

that teachers' likert points are of close values for both female and male teachers. This result, which is actually very good, is because of the fact that technology prosperity brought by micro computer supported science labs and that this technology is novice to be easy to use in classroom and it does not require too much effort and time. Similar studies had done recently Show parallelism with this one showing that there is not a significant difference in terms of gender (Birgin et al. 2008; Cobanoglu 2008; Shapkaa and Ferrarib 2003).

When the t-test showing relations among Micro mobile experiments set evaluations of teachers according to their gender is interpreted according to the sum of every question's value, there is a significant difference only for the eighth question ($p< .05$), and we cannot observe a significant difference for other questions. For 8th question, which is "Micro Mobile Science Experiment Set includes problems and assignments in order to guide students while they comment on application of the experiments they have done", male teachers' evaluations are seen better than females'.

One-way analysis of variance showing the relation among teachers' evaluation of Micro Mobile Science Experiment Set in terms of their branches is seen in Table 2.

According to the results of analysis, a significant difference for science teachers' evaluations for Micro mobile experiments set cannot be observed on branch base. $F(2, 68)=0.13$, $p>.05$. If the fact that science teachers took nearly same amount of computer lessons when they were registered to Physics, Chemistry, or Biology majors of Education Faculties is taken into consideration, it is acceptable that we do not observe a difference. This finding shows parallelism with the findings of the research done by Kutluca

Table 2: Results of one-way analysis of variance that show the relations among teachers' evaluations of micro mobile science experiment set in terms of their branches

Branch	*N*	*Mean*	*sd*			
1	26	53.35	8.10			
2	20	52.25	15.13			
3	25	51.84	9.13			
Total	71	52.51	10.71			
	Sum of squares		*sd*	*Mean square*	*F*	*Sig.*
Between groups	30.75		2	15.38	.13	.87
Within groups	7991.00		68	117.52		
Total	8021.75		70			

and Ekici (2010). However, the reason why Physics lesson has a greater mean than Chemistry and Chemistry than Biology is that the former two are respectively more appropriate for computer equipment and usage than the latter two. When one-factor ANOVA test showing the relation among teachers' evaluation for Micro mobile science experiments according to their branches is applied for sum of each question, we do not observe a significant difference for any questions.

Results of one-way variance analysis showing the relation between teachers' evaluation of Micro Mobile Science Experiment Set and their experience as a teacher in terms of years can be in Table 3.

The results of analysis show that there is not a significant difference in science teachers' evaluation of Micro Mobile Science Experiment Set according to their experience in terms of years. $F(3, 67)= .90$, $p> .05$. Results showing that there is not a significant difference depending on length of service are supported by the findings of researches carried out by Ustundag (2001), Aydogdu (2003) and Aral et al. (2006), which also state that teachers' evaluation of computer supported education does not change depending on their length of service. What's more, when table of evaluations' mean is investigated, it can be suggested that science teachers who have worked for 11-15 years are more positive towards Micro Mobile Science Experiment Set when compared to young and unsatisfied science teachers in terms of their evaluations.

Findings and implications showing the relation between teachers' frequency distribution according to teachers' weekly course hours and their evaluation of Micro Mobile Science Experiment Set are shown in Table 4.

According to the results of the analysis, there is not a significant difference among science teachers' evaluation of Micro Mobile Science Experiment Set in terms of their weekly course hours. $F(3,67)= .90$, $p> .05$. Data to be compared with this result could not be found in literature. When one looks at table of mean of evaluations, it is seen that teachers who have 26-30 hours of lesson in a week are more positive in their evaluations of Micro Mobile Science Experiment Set than those who have 21-25 hours and those who have 31-above.

Table 3: Results of one-way variance analysis that show the relations between teachers' evaluations of micro mobile science experiment set and their experience as a teacher in terms of years

Teaching experience as years	*N*	*Mean*	*sd*			
2	11	51.73	11.74			
3	24	55.08	11.41			
4	17	49.59	8.32			
5	19	52.32	11.14			
Total	71	52.51	10.71			
	Sum of squares		*sd*	*Mean square*	*F*	*Sig.*
Between groups	311.51		3	103.84	.90	.44
Within groups	7710.24		67	115.08		
Total	8021.75		70			

Table 4: The findings of one-way variance analysis that shows the relationship between the frequency of teachers' weekly teaching hours and their evaluations of micro mobile science experiment set

Teachers' weekly course hours	*N*	*Mean*	*sd*			
2	11	51.73	11.74			
3	24	55.08	11.41			
4	17	49.59	8.32			
Total	71	52.51	10.71			
	Sum of squares	*sd*	*Mean square*	*F*	*Sig.*	
Between groups	311.51	3	103.84	.90	.44	
Within groups	7710.24	67	115.08			
Total	8021.75	70				

Analysis of Pearson Product-Moment Correlation Coefficient

In the analysis of Pearson product-moment correlation coefficient showing each Micro Mobile Science Experiment Set evaluation question's positive and negative effects according to the factors as teachers' gender, branch, years of experience and weekly course hours, we can observe a significant correlation in for only eighth question according to gender (r=0.25, $p < .05$) and tenth question according to teachers' branches (r=0.23, $p < .05$). However, a significant correlation according to teachers' years of experience or weekly course hours is not observed. The fact that correlation coefficient is medium level (between 0.00-0.29) can be defined as a low level relation (Buyukozturk 2008). This relation being on item "Micro Mobile Science Experiment Set contains problems and assignments in order to guide them to comment on the applications of experiments they do." according to teachers' gender suggests that male teachers' evaluation points value tend to increase when female teachers' evaluation point values increase or vice versa. On the basis of branches, for item "Experiments set can be made use of for a long time as it is durable and useful." evaluation points value of a branch increases when others' values increase and vice versa.

Graphics showing the mean scores of the answers given by 71 science teachers to every Likert type question is seen in Figure 1.

As can be understood from the graphics in Figure 1, when the mean of the sum of 71 science teachers' evaluation points is considered, only 6 teachers (8.45%) are under score interval "I Moderately Agree" "2.60–3.39", other 65 teachers (.92) are on or above this interval.

DISCUSSION

The following are the significant ones of the teachers' comments on microcomputer technol-

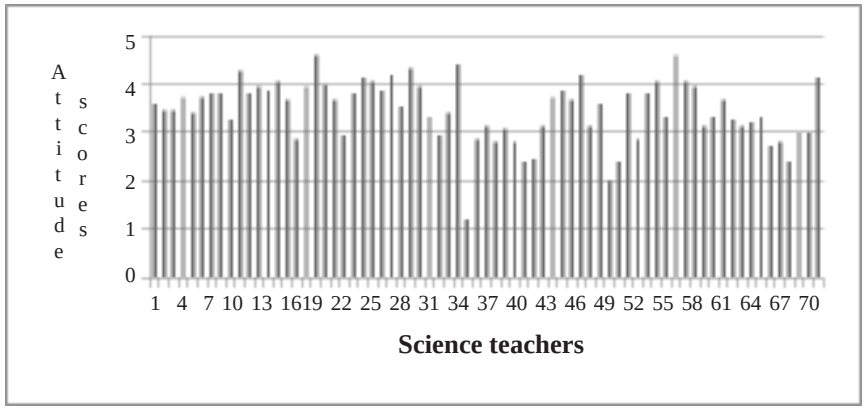

Fig. 1. Mean scores of answers to Likert type questions by each teacher

ogies-supported science experiments set during bilateral discussions: Teachers stated it is important that students can allocate most of their lesson time to scientific thinking and understanding, and they are motivated to use a high technology. Besides, students find it easy to gather data sing the experiments set and they seize the data gathered as their own data, which consequently make them more willing to realize something using Micro Mobile Science Experiment Set. The statements uttered by teachers are supported by the related literature as well (Arslan 2003; Asan and Haliloglu 2005; Ayvaci et al. 2004; Kenar 2010; Ozmen and Kolomuc 2004; Yenice 2003).

As a result of this study, it is determined that science teachers' evaluation of Micro Mobile Science Experiment Set is positive. According to that, teachers find micro computer technologies supported mobile science experiments set positive in terms of students' gains and they trust themselves to be successful when they apply micro computer supported education program in class or laboratories. This finding shows a parallelism with other studies claiming computer-supported education to be more effective in raising motivation than other methods (Arslan 2003; Ayvaci et al. 2004; Geban et al. 1992; Hounshell and Hill 1989; Seferoglu et al. 2008).

Data from the evaluation survey applied to teachers is considered to be appropriate for factor analysis as the Kaiser-Meyer-Olkin test is higher than .60 (KMO= .87) and the result of the Barlett test is significant ($p< .05$). The validity of the scale is provided as the factor loads of the items in the scale have valid values between .49 and .86 as a result of the factor analysis. It is observed that Cronbach α internal consistency coefficient is .92, which makes the scale reliable.

In general terms, teachers' evaluations for Micro Mobile Science Experiment Set do not show a difference in terms of gender, branch, experience or weekly lesson load. Nowadays both male and female students have easy access to computers. As a result, the reason why teachers' evaluations for Micro Mobile Science Experiment Set do not show a difference can be explained with the fact that everybody without considering their gender have access to computers as well as the fact that prospective teachers take computer courses in the faculty they are registered. When the literature about the issue is examined, the findings of studies dealing with attitudes towards computer-supported education such as Hizal (1989), Cambaz (1999) and Çelik and Bindak (2005), whose samples are teachers; Unaldi (2003), whose sample is instructors in universities suggest that the samples' evaluations do not show a difference according to their gender; that is a fact supporting the findings of this study. According to the results of the analysis, a significant difference between the branches of the teachers in terms their evaluations for Micro Mobile Science Experiment Set is not observed. If it is considered that science teachers take similar amount of computer lessons and their curriculum are also similar, it is not a surprising fact that we do not observe a difference. This finding shows a parallelism with the findings of the study by Kutluca and Ekici (2010), which investigates the effects of computer-supported education on prospective teachers' attitudes and self-sufficiency. In the result of this study, we do not observe a meaningful difference in teachers' evaluation for Micro laboratory science experiments set in terms of teachers' experience, which supports the findings of studies by Ustundag (2001), Aydogdu (2003) and Aral et al. (2006).

CONCLUSION

As a result, positive evaluations for Micro Mobile Science Experiment Set made by Physics, Chemistry and Biology teachers in science discipline show a significant parallelism. However, teachers expressed some concerns about the experiments carried out with Micro Mobile Science Experiment Set. According to the common opinion of the science teachers, Micro Mobile Science Experiment Set fails to contribute teachers and students to prepare projects due to the fact that error margin percentage of the sensors used in experiments are large, which is not considered good in today's world where project based education, a rough result is found with the findings of researches is taken as a reference point. Other points made by the teachers are that the experiments are more appropriate for primary school and 9th graders but easy for high school in general; that graphics at the end of the experiments are not clear and contradictions and fallacies in their meanings happen; and that explanations about graphical inferences are in an insufficient level.

RECOMMENDATIONS

Followings are suggested by considering results of the actual and other studies in the literature:

Teachers should adopt computer technologies as a tool in science education, which will prove to be helpful for themselves and their students to ground positive evaluations for attitudes towards science and computer technologies.

If the teachers have received sufficient education, they can help and guide their students in science education. There are some factors in order to make use of computers in education, leading one of which is teachers' education. For this reason, provincial directorates for national education should offer in-service education to teachers for them to gain knowledge and competence in computer-supported applications for science experiments so that much can be yielded from computer-supported education programs.

People who lack enough information on and experience in information technologies (specifically computers and computer technologies supported applications) cannot exploit these technologies as much as they need as it was observed in a study carried out in England. For this reason, institutes should encourage teachers and students to develop their competency to use information technologies and provide educational support, which can make important contribution to the matter in practice.

According to the science teachers, computer-supported science education should not be restricted to class hours only; students should be provided with the opportunity to carry out events outside the school as well. In these terms, there is a great benefit potentially coming from Micro Mobile Science Experiment Set if science laboratories are provided with the set.

Studies should be carried out to test the efficiency of science laboratories supported with Micro Mobile Science Experiment Set for Chemistry and Biology as well as Physics in the long term.

LIMITATIONS

1. The study is limited to data obtained during 6 hours of application every day totaling 60 hour by the author on 71 science teachers working at Kutahya Science High School and the entire Anatolian Teacher Training and Anatolian High Schools in 2010 summer term.
2. The study is limited to the permit of Governorship of Kutahya, Provincial Directorate for National Education.

REFERENCES

Akcay H, Tuysuz C, Feyzioglu B 2003. Bilgisayar destekli fen bilgisi ogretiminin ogrenci basarisina ve tutumuna etkisine bir ornek: Mol kavrami ve avogadro sayisi. *The Turkish Online Journal of Educational Technology*, 2(9): 57-66.

Akkoyunlu B, Kurbanoglu S 2003. A study on teacher candidates' perceived information literacy self-efficacy and perceived computer self-efficacy. *Hacettepe University Journal of Education*, 24: 1-10.

Aral N, Ayhan A, Unlu O, Erdogan N, Unal N 2006. Anaokulu ve anasinifi ogretmenlerinin bilgisayara yonelik tutumlarinin incelenmesi. *Elektronik Sosyal Bilimler Dergisi*, 5(17): 25-32.

Arslan B 2003. Bilgisayar destekli egitime tabi tutulan ortaogretim ogrencileriyle bu sureçte egitici olarak rol alan ogretmenlerin BDE'e iliskin gorusleri. *The Turkish Online Journal of Educational Technology*, 4(10): 67-75.

Asan A, Haliloglu Z 2005. Implementing project based learning in computer classroom. *The Turkish Online Journal of Educational Technology*, 4(10): 68-81.

Aydogdu A 2003. *Ortaogretim okullarinda gorev yapan cografya ogretmenlerinin bilgisayar destekli egitime iliskin tutumlari*. Master's Thesis, Unpublished. Ankara University, Turkey.

Ayvaci HS, Ozsevgec T, Aydin M 2004. Data Logger cihazinin Ohm Kanunu uzerindeki pilot uygulamasi. *The Turkish Online Journal of Educational Technology*, 3(13): 108-114.

Bahr C, Kinzer CK, Rieth H 1992. An analysis of the effects of teacher training and student grouping on reading comprehension skills among mildly handicapped high school students using computer assisted instruction. *Journal of Special Education Technology*, 11: 1-19.

Baytak A, Hirca N 2013. Prospective teachers' lived experience on computer-based instructional materials: A phenomenological study. *The Anthropologist*, 16(1-2): 97-109.

Becker HJ 2001. How are Teachers Using Computers in Instruction. *Paper presented at the March 2001 Meetings of the American Educational Research Association*, University of California-irvine.

Birgin O, Kutluca T, Catlioglu H 2008. Ogretmen adaylarinin bilgisayar kullanim durumlari ile bilgisayara yonelik tutumlarinin çesitli degiskenlere gore incelenmesi. In: I Uluslararasi Bilgisayar ve Ogretim Teknolojileri (Eds.): *Sempozyumu Bildiriler Kitabi* Canakkale: Onsekiz Mart Universitesi, pp. 1205-1219.

Buyukozturk S 2008. *Veri analizi el kitabi, istatistik, arastirma deseni SPSS uygulamalari ve yorum.* 9th Edition. Ankara: Pegem-AKADEMI.

Cambaz H 1999. *Ogretmen ve ogrencilerin ogretme-ogrenme sureçlerinde bilgisayara karsi tutum ve kaygilarinin degerlendirilmesi.* Master's Thesis, Unpublished. Marmara Universitesi Egitim Bilimleri Enstitusu, Istanbul, Turkey.

Cagiltay K, Cakiroglu J, Cagiltay N, Cakiroglu E 2001. Teachers' perspectives about the use of computers in education. *Hacettepe University Journal of Education*, 21: 19-28.

Celik H, Bindak R 2005. Ilkogretim okullarinda gorev yapan ogretmenlerin bilgisayara yonelik tutumlarinin çesitli degiskenlere gore incelenmesi. *Inonu Universitesi Egitim Fakultesi Dergisi*, 6(10): 27-38.

Cobanoglu I 2008. Bilgisayar ve ogretim teknolojileri ogretmen adaylarinin bilgisayar destekli ogretime ve bilgisayara yonelik tutumlari. In: I Uluslararasi Bilgisayar ve Ogretim Teknolojileri (Eds.): *Sempozyumu Bildiriler Kitabi*. Canakkale: Canakkale Onsekiz Mart Universitesi, pp. 298-306.

Fullan MG 1991. *The New Meaning of Educational Change*. New York: Teachers College Press.

Geban O, Demircioglu H 1996. Fen bilgisi ogretiminde bilgisayar destekli ogretim ve geleneksel problem çozme etkinliklerinin ders basarisi bakimindan karsilastirilmasi. *Hacettepe University Journal of Education*, 12: 183-185.

Geban O, Askar P, Ozkan I 1992. Effects of computer simulations and problem solving approaches on high school students. *Journal of Educational Research*, 86(1): 5-10.

Gooler D, Kautzer K, Knuth R 2000. Teacher Competence in Using Technologies. The Next Big Question. *PREL Briefing Paper. ERIC Document Reproduction Service No. ED452175*.

Hammond N, Gardner N, Heath S, Kibby M, Mayes T, Mcaleese R et al. 1992. Blocks to the effective use of information technology in higher education. *Computers and Education*, 18(1-3): 155-162.

Harwood WS, Mcmahon MM 1997. Effects of integrated video media on student achievement and attitudes in high school chemistry. *Journal of Research in Science Teaching*, 34(6): 617-631.

Hizal A 1989. *Bilgisayar egitimi ve bilgisayar destekli ogretime iliskin ogretmen goruslerinin degerlendirilmesi*. Eskisehir: Anadolu Universitesi Yayinlari.

Hounshell PB, Hill SR 1989. The microcomputer and achievement and attitudes in high school biology. *Journal of Research in Science Teaching*, 26(6): 543-549.

Kaptan S 1998. *Bilimsel arastirma ve istatistik teknikleri*. Ankara: Bilim Kitap Kirtasiye Ltd. Sti.

Kenar I 2010. Mikro mobil fen deney seti bilgisayar teknolojileri fen deney setinin okullarimizda uygulanabilirligi ve ogreticilik performansinin incelenmesi. In: *Turk Fizik Dernegi 27. Uluslararasi Fizik Kongresi Bildiri Kitabi*. Istanbul, P. 371.

Kutluca T, Ekici G 2010. Examining teacher candidates' attitudes and self-efficacy perceptions towards the computer assisted education. *Hacettepe University Journal of Education*, 38: 177-188.

Nova 5000 2009. *Deney seti, yazilim kullanma ve bakim kilavuzu(+CD'leri)*. Ankara: Fourier Systems Ltd.

Ozmen H, Kolomuc A 2004. Bilgisayarli ogretimin çozeltiler konusundaki ogrenci basarisina etkisi. *Gazi Universitesi Kastamonu Egitim Dergisi*, 12(1): 57-68.

Psycharis S, Chalatzoglidis G, Kalogiannakis M 2013. Moodle as a learning environment in promoting conceptual understanding for secondary school students. *Eurasia Journal of Mathematics, Science and Technology Education*, 9(1): 11-21.

Seferoglu SS, Akbiyik C, Bulut M 2008. Elementary school teachers' and teacher candidates' opinions about computer use in learning/teaching process. *Hacettepe University Journal of Education*, 35: 273-283.

Shapkaa J, Ferrarib M 2003. Computer-related attitudes and actions teacher candidates. *Computers in Human Behavior*, 19(3): 319-334.

Tavsancil E 2002. *Tutumlarin Olçulmesi ve SPSS ile Veri Analizi*. Ankara: Nobel Yayinevi.

Tozoglu D, Varank I 2001. Technology explosion and its impact on education. Annual proceedings of selected research and development. *Practice Papers Presented at the National Convention of the Association for Educational Communications and Technology*, Atlanta, October 2001 (ERIC Document Reproduction Service No ED470179, 1-2, 1-8).

Unaldi I 2003. *Gaziantep Universitesi ogretim elemanlarinin bilgisayar destekli egitime iliskin tutumlari*. Master's Thesis, Unpublished. Gaziantep Universitesi, Egitim Bilimleri Enstitusu, Gaziantep, Turkey.

Ustundag N 2001. *Mufredat laboratuvar okullarinda gorev yapan yonetici ve ogretmenlerin bilgisayar-tutumlari ile kaygi duzeyleri arasindaki iliskinin incelenmesi*. Master's Thesis Unpublished. Marmara Universitesi Egitim Bilimleri Enstitusu, Istanbul, Turkey.

Van Den Berg R, Vandenberghe R, Sleegers P 1999. Management of innovations from a cultural individual perspective. *School Effectiveness and School Improvement*, 10(3): 321-351.

Yenice N 2003. Bilgisayar destekli fen bilgisi ogretiminin ogrencilerin fen ve bilgisayar tutumlarina etkisi. *The Turkish Online Journal of Educational Technology*, 2(12): 79-85.

APPENDIX

Table 1: Assessment scale applied to science teachers regarding micro mobile experiment set

1.	*Micro mobile experiment set includes general aims and directions to motivate students.*
2.	It provides logical and strategic experiments in order to understand subjects.
3.	The experiments conducted develop students' scientific skills.
4.	The book covers necessary prerequisite basic knowledge and skills so as to conduct experiments easily.
5.	Micro mobile experiment set includes subject-related experiments that students can do outside school.
6.	Scientific expressions are presented in a precise and understandable way not to create any concept confusion.
7.	Micro mobile experiment set provides suggestions about how to use knowledge and skills that students have acquired.
8.	Micro mobile experiment set includes problems and assignments to guide students in making comments on the experiments they conduct.
9.	Micro mobile experiment set can help teachers to develop their knowledge level in terms of science, maths and technology which is necessary for teaching.
10.	Schools can make use of Micro mobile experiment set for a long time since it is strong and usable.
11.	It includes suggestions about how to gather students' thoughts about the subject before conducting the experiment.
12.	Subjects in the experiments attract students' attention and are real-life subjects.
13.	The experiments conducted include activities to develop students' scientific process skills.
14.	Data gathered by this experiment set can appeal to different senses through graphs, pictures, tables.
15.	In conclusion, it can be argued that this experiment set has a positive effect on attitudes towards science teaching.