

THE EFFECT OF MICROTEACHING METHOD ON STUDENTS' ATTITUDES TOWARDS CHEMISTRY IN WEB-BASED PROJECT APPLICATIONS

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ABSTRACT

Pre-service chemistry teachers perform intensive web-based applications during their education. One of these is project-based application. Also microteaching applications are performed in course designs. Microteaching method is a small group activity which can be used for helping students to gain various skills. The main goal of microteaching method is providing a practical learning environment to teach students self-evaluation skills. In this study project-based applications related to various chemistry subjects have been conducted to determine the effect of microteaching method on students' attitudes towards chemistry and these applications have been followed by microteaching method. 42 students attending Hacettepe University, Faculty of Education, and Department of Chemistry Education have been participated in these applications. Prior to the applications, students have filled Attitude Scale towards Chemistry as pre-test. Students have worked in teams (3-4 students) and each team has prepared a project related to the chosen subject. Totally 11 web-based projects have been prepared. When teams have completed their products, they have realized their presentations by using power-point. Project presentations have been followed by camera. After presentations, project studies and presentations have been displayed consecutively and discussed in class. When researchers have evaluated projects of each team by "Project Sufficiency Form", team members have evaluated themselves by "Microteaching Assessment Form". At the end of the applications, Attitude Scale towards Chemistry has been administered as post-test. Students' project achievement scores have been accepted as performance criteria. Statistical evaluation has been done by using above mentioned measurement tools. Pre- and post-test results of attitude scale have been compared by using paired-samples t-test. A statistical difference have been found between pre- and post tests. A relationship between students' attitudes and performance has been examined by using regression analyze.

KEYWORDS

Microteaching method, project based learning, performance, attitude towards chemistry

INTRODUCTION

Microteaching was first used in 1950-60s after people could not take benefit from the traditional teaching methods in teacher training. Microteaching is generally defined as a teaching method whereby the teacher reviews a videotape of the lesson after each session, in order to conduct a "post-mortem". Microteaching is conducted with limitation of aims, behaviors, educational process and the number of students that will be in this process (Wallace, 1987). Microteaching is an effective method that provides pre-service students opportunities to educate them as a teacher (Kupper, 2001). The aims of microteaching method are following:

- Encouraging pre-service students to more specific thinking about how students will learn presented knowledge,
- Recommending pre-service students about how their teaching styles are perceived by individuals in other disciplines or same disciplines.
- Providing pre-service students opportunities to evaluate and observe other teaching styles and to share these observations with others (www.brown.edu/heridan_center).

Microteaching can provide pre-service students opportunities to apply specific, technical and teaching abilities by using visual-audio records until reaching acceptable performance level. Finally, students will learn not only critical analyze of their performance but also peer feedback (Al-Methan, 2003). There are many studies conducted related to microteaching method. Lockledge and Ray (1986) conducted a study in order to determine the attitudes of the students towards the critics of their classmates. Research findings showed that class mate evaluations especially conducted with the guidance of a teacher provides positive attitudes towards microteaching. Jerich (1989) conducted his study by using clinical control model for microteaching tests. At the end of the study, pre-service teachers mentioned the importance of overweening the forms, investigating the video and discussing the effectiveness of the different teaching strategies with the teacher. Gonzales (1993) conducted a study in Massachusetts University, in order to develop the critical thinking of the students that have learning disabilities. In the study, all the developmental stages of thinking were investigated. A comparison between traditional teaching method and microteaching method was done. The findings of the study indicated that experimental groups students has %69 success in developing the basic and complex thinking skills but there is not any increase in the success of the control group students was observed. In the study conducted by Wilkinson (1994), the effect of teachers' comments was investigated. The teacher showed pre-service teachers the microteaching lesson cassettes; they criticized and read all the material. As a result, when they read the comments about their teachings, they reflected them to their lessons.

Nowadays the usage of videotape to record students' lectures and project presentations during courses and then to display these to students after applications, students' Internet usage to search their project topics and students' presentation of their projects as a power-point in electronic setting are examples of technology usage in microteaching. Over the past decades education has traditionally meant bringing students to sources of knowledge, but the time has come to bring sources of knowledge to the students (Barley, 1999). Web technology is only one alternative among the wide range of available media for helping people learn (Boisvert, 2000).

Web-based learning is a method of computer supported teaching. It is a learning model that supports individual learning. Web-based learning technology allows the testing and tracking of students' progress (Hawkins, 1997). It is a learning model that supports individual learning. Web-based learning technology allows the testing and tracking of students' progress (Hawkins, 1997). In microteaching applications, students made use of Web resources to search in various chemistry topics. They used different Internet resources and prepared projects related to chemistry topics. According to Moursund, (1999) the project-based learning model is a basis teaching model of computer based education applications that emphasizes technology usage as a tool. It accepts the main steps of the project preparation process were as follows:

1. Determining the goals
2. Determining and defining the subject to be studied
3. Building the teams (groups of 5)
4. Determining the characteristics of the final report and the presentation
5. Drafting a timeframe
6. Deciding on the checkpoints
7. Drafting the assessment measures and their levels of adequacy
8. Collecting data
9. Gathering and reporting data
10. Submitting and presenting the project (Moursund, D. (1999).

Barak and Dori (2005), in their study in which they wanted to enhance achievement of university chemistry students with the information-assisted project-based learning have been contributed to students' investigation of real life problems in a scientific manner as a student centered. In this study, while the students who were in the experimental group have taken responsibility for the individual information technology projects, the students who were in the control group have solved traditional problems. The projects have included the demonstration of molecular models with computer, the

explanation of some scientific events and the researches about chemistry theories. It has been found that the performances of students who participated to project-based learning applications in posttest and their final achievement were higher than the students' of the control group. Namely, the project-based learning which was enriched with information technologies has enhanced the freshman students' understanding of chemical concepts, theories and molecule structures. Toolin (2004), in his study in which the project-based learning approach were applied, the efforts of 6 high school and secondary school teachers who applied innovative teaching methods and strategies have been explained. Especially the factors which affected the application of project-based learning approach in science teaching and learning have been examined.

Lou (2004), in his study that was about the solving of complex problems between collaborative groups in project-based online lectures, has examined the interaction between collaborative groups. The groups that consisted of 3-4 students have been formed. After the mini online lectures that hold 2 weeks, classmates have divided into groups. Data has been obtained from online lecture dialogs and project performances. The results have showed that the collaboration become impressive in the design of online lectures, the individual student success, group project performance.

Land and Grene (2000), in their study that was about project-based learning in www, the students' operation of research and integration of the knowledge resources in the introductory education technology in the telecommunication unit has examined. 9 pre service teachers have participated to this study. They have been asked to prepare projects and integrate Internet to curriculum. Students have searched for their projects during 4 weeks in computer laboratories. It has searched that at which dimension students integrated www into their projects. As a data collection tools, loud thinking protocols, videotapes, project documents and questionnaires have used. At the end of the study, students have prepared projects with the usage of new technology.

THE AIM OF THE STUDY

The aims of the study are given below:

- Determining the effect of microteaching method on students' attitudes towards chemistry course in web based project assisted applications,
- Determining the relationship between students' attitudes towards chemistry course and students' performance,
- Investigating students' performance in microteaching method.

METHOD AND PROCEDURES

In the extent of the study, web based project assisted applications were conducted and microteaching method was used with 42 students attending to Hacettepe University, Faculty of Education, Department of Chemistry Education. Prior to the applications, students filled Attitude Scale towards Chemistry as pre test. Students worked in teams of 3-4 and each team prepared a project related to a chemistry subject which they chose. Totally 11 web based projects were prepared. Some of the Project names are given below:

- What is pesticide? Why do people use pesticides? What are the dangerous effects of pesticides on the environment? How can these dangerous effects be eliminated?
- What are the dangerous effects of nuclear stations on the environment? Compare their advantages and disadvantages.
- What are the damages of asbestos on the living organisms and the environment? How can these damages be prevented?
- What are the recyclable and no recyclable wastes? What are the effects of these wastes on the environment?

When the teams completed their study, they presented their projects by using power point program. Students' project presentations were videotaped. After all the presentations completed, students

watched the videotapes and discussed the presentations. The researchers evaluated the projects with “Project Sufficiency Form” and the students evaluated their teammates with “Microteaching Assessment Form”. At the end of the applications, Attitude Scale towards Chemistry was administered as post test. Students’ scores of Project Sufficiency Form were accepted as their project performance. Students’ course performance was the average score of their final grades and Project Sufficiency Form score. Pre test and post test results of Attitude Scale towards Chemistry were compared with paired sample t-test and a statistically significant difference in favor of the post test was determined. The relationship between students’ attitudes and their performance was investigated by regression analysis.

The Subjects

The study was conducted with 42 students that were attending 4th class of Hacettepe University, Faculty of Education, and Department of Chemistry Education in the 2006-2007 spring terms.

Instruments

Microteaching Assessment Form

Microteaching Assessment Form which developed by Baştürk and Kızılkaya (2002) was expanded by adding new items by us (Ural et. all, 2006). The form is consisted of 2 main parts. The items (13 items) in the lecture stage are related to the qualities of the product (i.e. the sufficiency level of the used materials, how interesting are the given examples). Lecture stage is evaluated by a scale with three options: “Yes”, “Partially” and “No”. The items in the presentation stage (13 items) are related to presentation skills. The presentation stage is evaluated by a scale with three options: “Good”, “Satisfactory” and “should pay attention”. Microteaching Assessment Form is given in App. A.

Attitude Scale towards Chemistry

Attitude Scale towards Chemistry is developed by Morgil and others (2002) to assess students’ attitudes towards chemistry course. It consists of 21 items and it is a five point likert type scale. The Alpha reliability coefficient of the scale is found to be 0, 82. Attitude Scale towards Chemistry is given in App. B.

Project Sufficiency Form

After students completed their Project study, their projects were evaluated by us with Project Sufficiency Form. This form consists of 7 parts (Yavuz et all.,2005): Motivation Process, Project Question and Determination of Target and Behaviors, Planning Process, Collection of Knowledge, Organization of Knowledge, Written Report, Presentation (Poster or Electronic). Project Sufficiency Form is given in App. C.

RESULTS

The pre- and post results of Attitude Scale towards Chemistry was compared using paired samples t-test to determine the effect of microteaching method on students’ attitudes towards chemistry. The results were displayed in Table 1.

Table 1. Paired Samples t-test for the Pre- and Post Results of Attitude Scale towards Chemistry

	X	n	s	t	p
Pretest	2,86	42	0,7046	-5,997	0,000
Posttest	3,51				

When students’ pre- and post test results was examined, a significant difference was found in favor of post-test ($p < .05$). While students mean scores related to Attitude Scale towards Chemistry were 2,86 before the microteaching applications, they increased to 3,51 after the applications. Finally, students’ attitudes towards chemistry increased after microteaching applications. Obtained evaluation results from Project Sufficiency Form and students’ final grades were accepted as a performance.

Regression analyze was conducted to examine the effect of students' attitudes towards chemistry on performance and the results were displayed in Table 2.

Table 2. The Explanation of the Student Performance Dependent Variable by Attitude towards Chemistry Independent Variable

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,467 ^a	,218	,198	6,10608

a Predictors: (Constant): Attitude towards chemistry

Table 3. The Results Related to Student Performance Dependent Variable

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	414,918	1	414,918	11,129	,002
	Residual	1491,368	40	37,284		
	Total	1906,286	41			

a Predictors: (Constant): Attitude towards chemistry

b Dependent Variable: Student performance

In Table 2, it is shown that % 28 of performance (dependent variable) is explained from attitude towards chemistry (independent variable) [$R^2=$, 218]. In Table 3 displayed that regression analyze which conducted to determine the relation between performance and attitude towards chemistry is a significant as a whole ($p<.05$). When the analyze results was examined, it was determined that attitude towards chemistry is a significant predictor of performance ($F=11,129$, sig., 002). Finally, students that have more positive attitudes towards chemistry have greater performance than other students.

Students evaluated microteaching method in the extent of Web-based, Project-assisted applications. With this aim, Microteaching Assessment Form which was developed by Ural and the others (2006) was used. The form is consisted of two sections. The first section (lecture stage) is consisted of 13 items which are related to the characteristics of created product such as sufficiency of used material, interesting of given examples. The second section is consisted of 13 items which are related to presentation skills. Students filled Microteaching Assessment Form given by researchers and the results was given in Table 4.

Table 4 displays frequencies of student evaluations in microteaching form. As shown in Table 4, 76 % of the students expressed that they accessed resources related to topics, 74 % of the students benefited from visual tools, 66 % of the students gave interesting examples in lecture stage. 69 % of the students could choose appropriate experiments related to the subject and 74 % of the students realized project design. According to 23 % of the students the most important difficulty in this stage was that adequate time was not given to the listeners to take note during presentation. 23 % of the students expressed that it was not benefited from questions adequately in the lecture stage. It was observed that students found presentation stage as satisfactory. But 41 % of the students thought that their classmates could not eye contact with the audience successfully during the presentation. It was seen that 25 % of the students could not control their emotion and they reflected this situation with their gestures and mimics.

Especially according to students' views in microteaching assessment form, microteaching method was applied successfully in courses. In addition, it was thought that microteaching method had positive

effect on students and increased students' motivation towards courses. This situation is evidenced by a significant increase in favor of post test in attitude scale towards chemistry.

DISCUSSION

The findings suggest that in teacher training new methods which increase students' motivation and interest and their active participation should be used. One of these methods is microteaching method. This method should be conducted carefully since it requires using language fluently, expressing ideas clearly, speaking well, using eye contact, using jest and mimics, motivating students and effective time management. Students participated in microteaching activities actively and expressed their ideas and discussed them with their classmates. Students' presentations were videotaped and students had the opportunity to watch the records again. That opportunity helped them to develop their teaching abilities. These findings confirm the findings of Kupper's study (2001). Kupper determined that: students like microteaching applications, learn teaching skills, increase their confidences, develop their teaching skills, get feed back about their learning and evaluate themselves by watching video records. Furthermore, students developed some strategies and ideas about their future lectures by observing their classmates presentations. By this way, students have the opportunity to test their teaching skills and teaching strategies in a safer environment. Students have opportunity to share their teaching skills and ideas, they develop self awareness. Additionally, this method provides students an opportunity to analysis themselves (Higgins and Nichol, 2003).

In web based project assisted learning activities which conducted in the extent of microteaching applications, students have a significant voice in selecting the content areas and nature of the projects that they do. There is considerable focus on students understanding what it is they are doing, why it is important, and how they will be assessed. All of these learner-centered characteristics of project based learning contribute to learner motivation and active engagement. A high level of intrinsic motivation and active engagement are essential to the success of a project based learning lesson. Project based learning:

- It is learner centered and intrinsically motivating.
- It encourages collaboration and cooperative learning.
- It requires students to produce a product, presentation, or performance.
- It allows students to make incremental and continual improvement in their product, presentation, or performance.
- It is designed so that students are actively engaged in "doing" things rather than in "learning about" something.
- It is challenging, focusing on higher-order knowledge and skills (Dave Moursund, <http://darkwing.uoregon.edu>, Updated 9/30/05).

Table 4. Data Obtained from Microteaching Evaluation Form

Lecture Stage	Yes (%)	Partially (%)	No (%)
Does he have enough knowledge related with the subject?	64,1	35,89	0
Can he/she reach the requested document and material?	76,92	20,51	2,56
Is the beginning of the lesson interesting?	66,66	33,33	0
Are the impressed arguments clear?	66,66	30,76	2,56
Can he/she choose the suitable experiment for the subject?	69,23	23,07	7,69
Can he/she design the experimental mechanism suitable?	74,35	17,94	7,69
Can he/she apply the experiments correctly?	58,97	33,33	7,69
Can he/she give the opportunity to take note to the listener?	20,51	56,41	23,07
Can benefit from the questions are drawn?	46,15	30,76	23,07
Can he/she use visual tools?	74,35	25,64	0
Are interesting examples given?	66,66	28,20	5,12
Is summarization made?	51,28	38,46	7,69
Is the time effectively planned?	46,15	35,89	17,94
Presentation Stage	Good	Satisfactory	Pay attention
Violence of the volume, change, speaking speed	30,76	51,28	17,94
Usage of standstill	28,20	66,66	5,12
Usage of Language, fluency in the language	23,07	58,97	17,94
Expression of the thoughts	25,64	56,41	17,94
Discoursing	20,51	53,84	25,64
Self respect	28,20	66,66	5,12
Eye contact with the audience	20,81	38,46	41,02
Jest and mimics	17,94	56,41	25,64
Facial Expression	25,64	56,41	17,94
Visual tools	61,53	33,33	5,12
Excitement	30,76	53,84	15,38
Motivation of the teaching	30,76	51,28	17,94
Using the presentation time effectively	25,64	51,28	23,07

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Appendix A: Microteaching Assessment Form

Lecture Stage	Yes (%)	Partially (%)	No (%)
Does he have enough knowledge related with the subject?			
Can he/she reach the requested document and material?			
Is the beginning of the lesson interesting?			
Are the impressed arguments clear?			
Can he/she choose the suitable experiment for the subject?			
Can he/she design the experimental mechanism suitable?			
Can he/she apply the experiments correctly?			
Can he/she give the opportunity to take note to the listener?			
Can benefit from the questions are drawn?			
Can he/she use visual tools?			
Are interesting examples given?			
Is summarization made?			
Is the time effectively planned?			
Presentation Stage	Good (%)	Satisfactory (%)	Should pay attention (%)
Violence of the volume, change, speaking speed			
Usage of standstill			
Usage of Language, fluency in the language			
Expression of the thoughts			
Discoursing			
Self respect			
Eyes contact with the audience			
Jest and mimics			
Facial Expression			
Visual tools			
Excitement			
Motivation of the teaching			
Using the presentation time effectively			

Appendix B: Attitude Scale towards Chemistry

Attitude items	Strongly agree	Agree	Undecided	Disagree	Strongly disagree
1. To get a qualified chemistry education is important for me					
2. It is not important from e how the chemistry education is given.					
3. In my opinion understanding chemistry course is not essential.					
4. In my opinion just memorizing is adequate for learning chemistry.					
5. Using teaching technologies in chemistry education affects my achievement.					
6. I don't take care of any other courses except chemistry course at the school.					
7. Text books are not adequate for learning chemistry course.					
8. I am interested in chemistry subjects.					
9. I would like to follow new innovations in chemistry.					
10. I'm not interested in the stories about chemistry.					
11. It is not important for me to be successful in chemistry course.					
12. Making experiments is the most important learning technique in chemistry education.					
13. Making experiments is unnecessary in chemistry education.					
14. The teacher should take care of giving examples in chemistry course.					
15. I never wonder chemistry subjects.					
16. In chemistry courses students should have opportunity to participate in the lecture more actively.					
17. I like teacher's talking about scientists.					
18. I'm not interested in chemistry since in the future I won't study in chemistry field.					
19. Chemistry help to think logically related to the cases which develop scientific thinking.					
20. I'm not interested in chemistry since I think that there is not many employment opportunities in this field.					
21. I don't want to work in chemistry field.					

Appendix C: Project Sufficiency Form

Motivation Process

Scores	Procedures
4 ()	There was an interest in project based chemistry education.
3 ()	Notes were taken that were explanations about project based chemistry education.
4 ()	Questions were asked during the explanation of the topic.
3 ()	Information was received from the lecturer in complicated situations.

Project Question and Determination of Target and Behaviors

Scores	Procedures
4 ()	Content of the project question were thought of and discussed.
4 ()	Project question was determined with shared decisions.
4 ()	Target and behaviors were determined as appropriate to the project question.
4 ()	Targets and behaviors were prepared to complete each other.

Planning Process

Scores	Procedures
4 ()	Study questions were successfully discussed.
3 ()	Division of tasks was successfully made.
3 ()	Information resources were determined.
4 ()	The time designated to collect information was planned in detail.

Collection of Knowledge

Scores	Procedures
4 ()	Most of the information resources were obtained.
3 ()	Related information was collected.
4 ()	Needed information was selected.
3 ()	Materials such as pictures, photos and clipart were collected.

Organization of Knowledge

Scores	Procedures
4 ()	How knowledge will be organized according to the questions was thought of and planned.
3 ()	Knowledge and supported materials were combined as appropriate to the plan.
4 ()	Knowledge was written again with self expression.
3 ()	Opinions of other groups were recorded about whether the study was understood.

Written Report

Scores	Procedures
3 ()	In the report, spelling and writing mistakes were checked.
4 ()	Wholeness was provided between written and visual elements.
3 ()	Connections were established between transition parts.
4 ()	Bibliography was prepared.

Presentation (Poster or Electronic)

Scores	Procedures
3 ()	Summary was made from the report.
4 ()	Summary reflected the report completely.
3 ()	Presentation was supported by verbal explanations.
4 ()	Time of the presentation was effectively spent.