DEVELOPING A TECHNOLOGY ATTITUDE SCALE FOR PRE-SERVICE CHEMISTRY TEACHERS

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ABSTRACT
Technological tools, which meet the needs of the society, have become more addictive for people with the rapid development of technology. These tools have also been used in the field of education and improved through the Internet where there is continuous information exchange. Educators needed the attitudes of the students towards technological tools, especially the Internet, and have developed scales in various structures. The aim of this study is to develop a "the scale of attitude towards technology" in order to assess the attitudes of pre-service chemistry teachers towards technological tools. In the light of the examined data, a 5-point Likert type scale consisting of 50 items was developed and administered to 162 students, who formed the sampling. At the end of the analysis, a scale with a reliability coefficient of 0,8668 consisting of 19 items and 5 subscales called "not using technological tools in education, using technological tools in education, the effects of technology in educational life, teaching how to use technological tools and evaluating technological tools."
Keywords: Technology attitude scale, attitude towards computer assisted instruction, attitude towards internet

ÖZET
Toplumun ihtiyacı olan gereksinimlerini karşılayan teknolojik araç-gereçler, teknolojinin hızlı ilerlemesiyle insanları kendilerine daha da bağlamaktadır. Bu araçlar yıllar boyunca eğitim alanında da kullanılmış ve sürekli bilgi alış-verişinin sağlandığı internet ortamıyla daha da gelişmiştir. Eğitimciler tarafından öğrencilerin teknolojik araçlara, özellikle de internete karşı tutumlarına ihtiyaç duyulmuş ve çok farklı yapılarda ölçekler geliştirilmiştir. Bu çalışmanın amacı hizmet öncesindeki kimya öğretmenlerinin teknolojik araçlara karşı tutumlarını değerlendiren "teknoloji tutum ölçeği" nin geliştirilmesidir. İncelenen kaynaklar ışığında 50 maddelik 5'li likert tipi ölçek oluşturulmuş, örneklem olarak seçilen 162 öğrenciye uygulanmıştır. Yapılan analizler sonucunda "teknolojik araçların eğitim alanında kullanılmama durumu, teknolojik araçların eğitim alanında kullanılma durumu, teknolojinin eğitim yaşamına etkileri, teknolojik araçların kullanımının öğretilmesi ve teknolojik araçların değerlendirilmesi" isimli 5 alt başlık içeren ve 19 maddeden oluşan, güvenirlik katsayısı 0,8668 olan ölçek geliştirilmiştir.
Anahtar Kelimeler: Teknoloji tutum ölçeği, bilgisayar destekli öğretime karşı tutum, internete karşı tutum

INTRODUCTION

The developing technology has constructed a bridge between science and tools that meet the human needs. Improving knowledge has created the life facilitators with the help of technology and technology has affected all aspects of human life (İşman and Dabaj, 2004). Technological tools are also used in the field of education. Therefore, there as been a need for determining the student attitudes towards the technological tools that are used in education. Educators have developed various scales in order to asses the attitudes of the students towards the Internet (Tsai, Lin and Tsai, 2001). There has been a lot of research on this issue. In a study where the students' attitudes towards the Internet was assessed, 173 students were randomly chosen among the 2003 fall students of East Mediterranean University and were administered a 5-point Likert type scale consisting of 30 items, 7 of which were about personal details and 23 of which were about attitudes towards the Internet. According to the results, the students who had computers at home thought that the friendships establish on the Internet were temporary and the contents in foreign languages did not make an obstacle, in opposition to the ones who did not have computers at home (İşman and Dabaj, 2004). The aim of the study, where Becker and Maunsaiyat (2002) examined the technological concepts and attitudes of Thai students, was to develop the Technological Concepts and Attitudes Scale through interpreting the American Technology Attitude Scale and calculating its reliability. This scale was administered in order to determine the technological concepts and attitudes of 12-15-year-old secondary school students near Bangkok. It was also examined by Thai teachers and found to be useful for the secondary school Thai students with respect to program planning, curriculum development and application. Differences were found between the American and Thai students in their technological attitudes. These differences were thought to stem from the differences between the educational systems and cultures and the teacher-centered method used by the Thai teachers. In another study where a scale was developed in order to assess the attitudes of high school students towards technology, new items were added to the computer attitude scale suggested by Selwyn for ages 16-19 and an Internet Attitude Scale of 18 items was created. The scale consisted of four subscales: perceived usefulness, affection, perceived control and behavior. The influences of gender and Internet experience on attitudes and their relationship were examined. Seven hundred and fifty-three Thai high school students who participated at the study did not show any statistical difference in their ideas

about usefulness despite their different gender and Internet experiences. However, male students were found to have more positive feelings, less anxiety and more self confidence than female students. The students with more Internet experience were confirmed to have more positive feelings than the ones with no experience (Tsai, Lin and Tsai, 2001). In a study where the attitudes of children towards technology were analyzed, a scale was developed after the oral research and was administered to 574 students. At the end of the analysis a scale with two factors was created: interests/aptitudes and alternative preferences. The scores of primary and secondary school children for these two subscales were compared and significant differences were found. Additionally, attitude differed according to the gender (Frantom, Green and Hoffman, 2002). In the study that was conducted in order to assess the reliability of 14 previously made computer attitude scales, included 621 teachers from Texas, Florida, New York and California in 1995-96. There were 284 items in 14 scales with 32 subscales and was named as Teachers' Computer Attitude Scale. These scales were prepared in 10 years. There were some problems at the beginning but the original versions were found to be reliable (Christensen and Knezek, 2000). In the study where the influence of gender effect on the computer usage and attitudes of the students from the ubiquitous computing campus, all students at the social sciences university were given laptop computers and a technology program was administered. All students at this university used these computers that involved the activities, in their social and academic life at the campus. The male and female students were examined with respect to their experiences, computational skills and attitudes in their four-year technologically rich environment. In 2000, reports on the computer usage and attitudes of 800 students from the ubiquitous computing campus were analyzed and the collected data showed that the students used the computers in different ways: 97 % for word processing, 98 % of them for e-mail for pleasure, 73 % of them for e-mail for classes, 50 % of them for web resources. At the end of the analysis, the categories of tool, communication, resource, entertainment and total usage were determined. When the t-test was applied to these categories on male and female students; male students were found to use the computers for resources, entertainment and total usage and no significant difference was found between the female and male students' computer usage as a tool and for communication. The results of the attitude analysis showed that 73 % loved, 23 % liked, 4 % disliked and 1 % hated computers. Among the students, 48 % thought that computers had effects on campus life, 75 % considered as a facilitator for educational life and 48 % thought it helped their social lives (McCoy, Heafner, Burdick and Nagle, 2001). Tanguma, Martin and Crawford (2002), in their study called the integration of higher education and technology in learning environment, examined the technology using models in classrooms with a program prepared by 26 lecturers form a southeastern university. It was found that they used hardware and software, made effective applications using technology (scanner, digital camera, and voice recorders), integrated technology (video conference) and the Internet (for lesson planning) in their classrooms. In this study where the technological views of college students were investigated, possible risks caused by the increasing tendency towards e-mail, instant messages and cellular phones. 40 students form Pennsylvania Social Sciences College between the ages 17 and 29 were chosen as the sampling. The usage of cellular phones and messages and their affects on the working and daily programs were evaluated. Attitudes towards the comfort that e-mail and technology provided were examined. The conscientiousness and agreeableness dimensions of the scale produced significant results. Differences were found between the e-mail and cellular phone usage of the interpersonal and intrapersonal individuals. Significant results were determined in communication characteristics and behavior according to the gender effect (Vicario, Henniger, Austin and Chamblies, 2002). Another study aimed to determine the attitudes of the primary school children towards technology and computer experiences and their relationships. 124 students from a public school in Antalya participated in the study. In the end, although the students were indecisive about the usage of technology, they expressed positive feelings toward technology and its applications. No significant difference was found between the computer experiences basic attitudes of the students towards technology (Akbaba, 2001). In a study, which aimed to develop a questionnaire on assessment of the effects of computers on education, the effects of technology on social sciences education was evaluated in a non-technical private university in the USA. The answers to the questionnaire were collected via e-mail for four academic years. The questionnaire consisted of 50 attitude items in 5-point Likert-type Scale. At the end of post hoc analysis, taking the 25 items of the questionnaire into consideration, a scale with 4 factors was developed (Mitra, 2001). Duggan et.al. (1999) developed a scale in order to determine the students' attitudes towards the usage of the Internet in education and the students' attitudes were evaluated using some forms of the scale. The Thurstone equal appearing interval scale and Likert summated rating scale were the two different forms in the scale to be used. This form was administered to 188 students and with the very decisive Likert format consisting of 18 items; an "Attitude scale towards the usage of the Internet in education" was developed. At Florida College University, in 1997, at the beginning and end of the computers in technology education classes, variables of the effects of the pre-service teachers' attitudes towards studying and learning on computers were investigated. The variables in this study were attitude towards computers, computer anxiety, confidence in computer, computer tendency, and computer usefulness and student perceptions. At the end of the class, the scale of attitude towards computers was administered to 22 students as pre and posttests. It was found at the end that the students' attitudes turned out to be more confident and positive after the lessons were completed

(Gunter, Gunter and Wiens, 1998). According to Selwyn (1997), both educators and researchers needed the attitudes of 16-19-year old students' attitudes towards using computers in education and their relationships. Therefore, Selwyn developed a scale in order to determine the attitudes of students towards information technology and computers. 49 items of the pilot scale were administered to 266 students. A scale of 21 items was constructed after the factor analysis. The reliability coefficient of the scale was found to be 0,90 and test-retest reliability was found to be 0,93. The structural validity was found significant at $p<0,001$ level. In a study where the attitudes of teachers towards technology were psychometrically evaluated, a technological attitude scale was developed in order to evaluate the attitudes of teachers towards using technology as a teaching tool in the classroom. The reliability and validity of the scale was calculated through the data collected form 86 foreign language teachers (McFarlane, Hoffman, Green, 1997). Metu (1994), in his MS dissertation, made a research on the level of computational attitudes of Nigerian teachers towards their computer knowledge and skills. There were positive and negative attitude items in the scale. In the summer program of Alva Ikoku College, a Likert-type questionnaire was administered to 56 teachers. The teachers with no or little computational knowledge or skills were found to have more positive attitudes towards computer education. According to the research on Israelite students' attitudes towards computers and relationships between their personalities, the Eysenck model of personality explained the individual differences with the concepts of neuroticism, extraversion and psychoticism. Upon the analysis of the data collected form 298 female students, the ones with high psychoticism and extraversion were found to have more positive attitudes towards computers. The relationship of neuroticism scores was found to be statistically insignificant (Francis, Katz and Evans, 1996). In another study where the attitude towards computers was examined, the relationship between age, education and gender was stressed. An 5-point Likert-type scale was developed and the direct effects of using computers in education were determined (Morris, 1988-89). The study, conducted over 60 college students from the South Illinois University, focused on the attitudes of pre-service teachers towards using computers. Age, previous computer experience and computational attitudes (anxiety, confidence, tendency) were chosen as variables and their relationships were investigated (Koohang, 1987). The effects of video, computer-assisted education and interactive video applications on learning performance and attitude were evaluated in a study where the pretest results were used for the randomly placement of 134 students according to their high or low levels of previous experience in 3 treatment groups. The analysis focused on achievement, gender and previous achievement levels (low, medium, high). The performance assessment means of these three treatment groups (video, computer-assisted instruction and interactive video) were 64,98 %; 73,54 % and 70,48 %. The results of the attitude scale were 75,07 %; 74,26 % and 82,87 %. The computer-assisted instruction was found to be the most effective teaching system and there was no need for additional tools like interactive videos. However, when interactive video education was compared to the computer-assisted education and video, it was found to have significant effects on the attitudes of less talented students (Dalton and Hannafin, 1986). In a study where the technological conceptions and attitudes of 13-year-old male and female students were examined, firstly 12 students were interviewed on what technology had taught them and how important it had been for them. The other 48 students were asked 10 open-ended questions on their opinions on technology. A Likert-type questionnaire of 80 questions was developed after the evaluations. The questionnaire was administered to 3000 13-year-old students form different schools in different districts of the Netherlands. The collected data were analyzed and 12 factors were determined. Significant results were found between the female and male students. Students thought that technology covered a wide range of important but not very difficult subjects. Both female and male students found to have thoughts that, female students were more talented in the field of technology however, female students appeared to have less interest in technology than male students. Page (1979) developed a Likert-type scale of 40 items in order to evaluate the attitudes of 13-18-year-old students towards science and technology. This scale consisted of four subscales, namely, technology, technical education, its industrial position and attitude towards technology. In another study, in order to assess the stereotypes of attitude towards technology, the mechanization scale was thought to be modified and administered to 89 students each of who belong to a private occupational group. The answers to the questionnaire were evaluated according to gender and target occupational group after the target occupational group was determined (Goldman and Kaplan, 1973).

THE PURPOSE OF THE STUDY

The advancements in science and technology result in developments in education field as in every field. These advancements require the utilization of various technologies in education. However, it is important to examine the appropriateness of these educational technologies to the subject. First it is necessary to determine the students' interests and attitudes towards to technological tools and then it is crucial to study how practical, applicable, and economic these technological tools are. Therefore, this study aims to develop an attitude scale in order to investigate students' attitudes towards technological tools. According to the data gathered by this scale, the usability, feasibility, and financially viability of the educational technologies can be determined more effectively. These tools have also been used in the field of education and have improved through the Internet where there is continuous information exchange. Educators have needed to find out the attitudes of the students

towards technological tools, especially the Internet, and scales of various types have been developed. The purpose of this study is to develop the "the scale of attitude towards technology" in order to evaluate the attitudes of the pre-service chemistry teachers towards technological tools.

EXPERIMENTAL DETAILS

THE SUBJECT

A total of 162 students from Hacettepe University, Faculty of Education, Department of Chemistry Education participated in the study during the 2003-2004 Spring semester. Of the 162 students, 46 were from the 1st grade, 36 were from the 2nd grade, 20 were from the 3rd grade, 23 were from the 4th grade and 37 were from the 5th grade.

THE TEST INSTRUMENT

A scale of attitude was thought to be developed as a data-collecting tool in order to evaluate the interest and tendencies towards the usage of technological tools by the pre-service chemistry teachers.

THE SCALE OF ATTITUDE TOWARDS TECHNOLOGY

In order to develop a valid and reliable assessment tool to be used for the assessment of the attitudes of pre-service chemistry teachers towards technology, a pilot attitude scale of 50 attitude items was prepared. For the preparation of the attitude items, first, various resources were examined in order to determine the concepts that involve attitudes towards technological tools. Next, the field expert created positive and negative attitude items with the content validity. Students' views about the items were assessed through the 5-point Likert-type scale in the form of "strongly agree, agree, undecided, disagree and strongly disagree". The pilot attitude scale is displayed on Table 1.

Table-1: The Pilot Scale of Attitude towards Technology

Dear Student, In this scale, purpose is to determine pre-service chemistry teachers' attitude towards technology. There are no right or wrong answers in this scale. Please, mark the blank that represent your stance toward each item in the scale. Thanks for your contribution.	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
1. Daily and yearly plans should be prepared by teachers using computers.					
2. Teachers do not need to use computers for preparation.					
3. Lessons should often include computer-assisted instruction.					
4. Technological tools do not need to be used in instruction.					
5. Students should do their homework on computers using the Internet.					
6. Using computers do not have any benefits for students in education.					
7. Teachers should receive regular in-service training on new technologies.					
8. Students should get advance information on the usage of new technologies.					
9. The usage of new technologies in teacher training should be increased.					
10. Learning is more permanent through television since it is both visual and auditory.					
11. Using television with printed materials has no effects on education.					
12. Through distance learning via television a wide range of people could be reached.					
13. Because the videotapes could be watched again, students could get feedback.					
14. Recording some parts of the lesson on videotapes could provide the students the opportunity to see their mistakes.					
15. Computer-assisted education should be teacher-centered.					
16. A minimum level of computer knowledge is enough to reach knowledge via the Internet.					
17. On the Internet, one could reach unlimited information on any subject.					
18. Some experiments that are difficult or dangerous to do could be taught through computer-assisted instruction.					
19. Foreign languages could be practiced through the computers or the Internet.					
20. Computer-assisted instruction increases students' achievement.					
21. Using technological tools does not affect students' motivation.					
22. E-mail is only for communication; it cannot be used in education.					
23. OHP, slides and projection should not be preferred as they take too much time to be					

used.					
24. Technological tools could be used for practice or revision.					
25. Advanced knowledge is needed in order to be able to use computers.					
26. Technological tools could only succeed when they address all the sense organs.					
27. Students should receive basic education on computer literacy.					
28. Teaching could reach its goal only together with technology.					
29. Teaching abstract concepts could be more concrete through using technology.					
30. Using the Internet in the learning process is a waste of time.					
31. A university students must be able to use certain software such as word and excel.					
32. Being given homework that requires computer usage puts me in stress.					
33. If I were to give a seminar, I would prefer using OHP or PowerPoint to using chalk and board.					
34. I believe that the information technology usage is not adequate in Turkey.					
35. One does not have to use technological facilities in order to be successful in life.					
36. I believe that using various appropriate technological environments could avoid waste of time in education and teaching process.					
37. In order to use the technological facilities, one should know at least one foreign language.					
38. Technological facilities have a positive effect on productive studying and learning.					
39. Using technology would facilitate the understanding of difficult subjects.					
40. Using current technologies would promote the improvement of new ones.					
41. While determining the aims of a lesson plan, the technological age in education should be considered.					
42. Using technology wastes the thinking potential of a human away.					
43. Turkey should have a technology policy.					
44. Using technology in an ethical environment should be a part of national aims.					
45. In order to be able to graduate from the university, the ability to "use the technological materials of the field" should be rated.					
46. I believe that academic staff is inadequate in using technology.					
47. Technological changes should be considered when experiencing periods of change.					
48. A life full of technology may also affect an individual in a negative way.					
49. When technology is mentioned, the first things I think of are using computers and multimedia.					
50. When technology is mentioned, the first things I think of are using tools and fixing them.					

FINDINGS

The 5-point Likert-type scale, which was prepared by the field expert, was given administered to 162 students and data were collected. The number of subjects (162) is enough for the factor analysis. Factor analysis was made on the collected data. At the end of the first analysis, a scale of 50 items and 15 factors was observed to have emerged. After the evaluation of the factor analysis results, the items with factor loading below 0,40 were decided to be omitted from the analysis. Attention was paid to the difference between the factor loading values and loading values taken from the other factors to be 0,10. Considering these values, some items were removed form the analysis and a second analysis was made. The results are displayed on Table 2.

Table-2: The Factor Analysis Results of the Attitude Scale of 19 Items

Items	Factor Loading Value	Communalities	Item Total Correlation
22	0,465	0,621	0,3889
23	0,475	0,548	0,4190
30	0,710	0,686	0,6497
21	0,659	0,573	0,5968
4	0,640	0,486	0,5828
14	0,496	0,626	0,4029
13	0,610	0,632	0,5217
24	0,432	0,484	0,3365
27	0,683	0,542	0,6134
40	0,618	0,690	0,5358
38	0,744	0,676	0,6791
39	0,733	0,665	0,6670

35	0,412	0,416	0,3528
1	0,441	0,663	0,3638
3	0,608	0,517	0,5375
8	0,690	0,635	0,6035
9	0,690	0,682	0,6142
26	0,481	0,670	0,2431
45	0,471	0,706	0,4247
Reliability Coefficient (Alpha)= 0,8668			

At the end of the second factor analysis, the first factor loading values for 19 items were found to be above 0,400. Additionally, no values were found to emerge that is close to a item's first factor loading value. The alpha internal consistence coefficient that was calculated for the reliability of the scale of attitudes towards technology, was found to be 0,8668. Besides, the total correlations of 19 items were calculated for the item differentiation and difficulty, and they were found to be changing between 0,2431 and 0,6791. Table 3 displays the total variance results of the attitude scale at the end of the factor analysis, before and after rotation.

Table-3: The Component Matrix Values of the Attitude Scale Before and After Rotation

Total Variance Explained									
Component	**Initial Eigen-values**			**Extraction Sums of Squared Loadings**			**Rotation Sums of Squared Loadings**		
	Total	**% Variance**	**Cumulative**	**Total**	**% Variance**	**Cumulative**	**Total**	**% Variance**	**Cumulative**
1	6,476	34,082	34,082	6,476	34,082	34,082	2,890	15,211	15,211
2	1,600	8,422	42,503	1,600	8,422	42,503	2,650	13,946	29,156
3	1,381	7,266	49,769	1,381	7,266	49,769	2,408	12,673	41,829
4	1,063	5,594	55,364	1,063	5,594	55,364	2,116	11,137	52,965
5	1,002	5,274	60,638	1,002	5,274	60,638	1,458	7,673	60,638

When the total variance explained and the communality tables were examined, it could be seen that the initial values of 19 items were cumulated under 5 factors bigger than 1. The variance explained by these 5 factors was 60,638 %. The 5 defined factors according to the items had a common variance between 0,416 and 0,706. Therefore, the five factors that emerged as important factors in the analysis, together explained most of the total variance in the items and the scale. The first factor of the constructed attitude scale explained the 15,211 %; the second, 13,946 %; the third, 12,673 %; the forth, 11,137 % and the fifth, 7,673 % of the total variance of the scale. The common variance that the five factors explained on the items was 60,638 %. The component matrix values before and after the rotation are shown on Table 4.

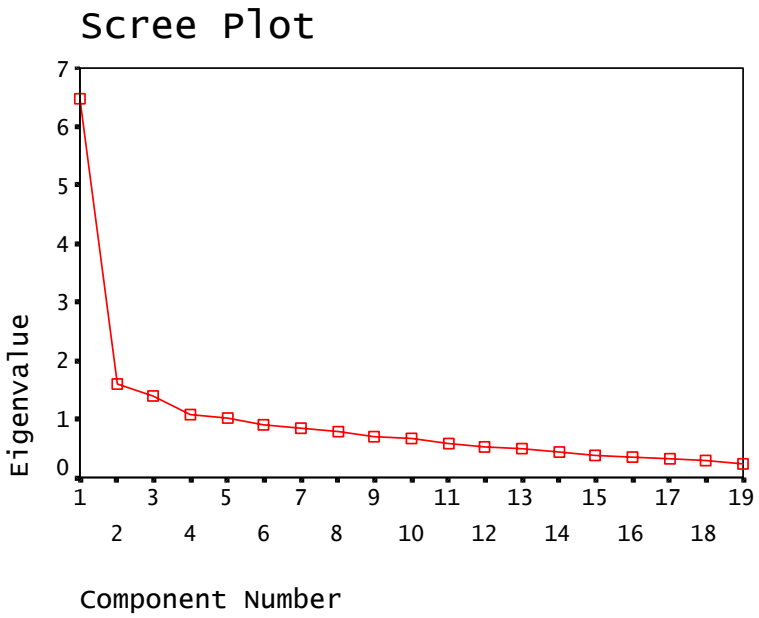
Table-4: The Component Matrix Values of the Attitude Scale before and After Rotation

	Component Matrix	**Rotated Component Matrix**				
Items	**1**	**1**	**2**	**3**	**4**	**5**
22	0,465	0,775				
23	0,475	0,690				
30	0,710	0,688				
21	0,659	0,629				
4	0,640	0,528				
14	0,496		0,763			
13	0,610		0,738			
24	0,432		0,664			
27	0,683		0,543			
40	0,618			0,753		
38	0,744			0,651		
39	0,733			0,627		
35	0,412			0,590		
1	0,441				0,760	
3	0,608				0,595	
8	0,690				0,591	
9	0,690				0,551	
26	0,481					0,784
45	0,471					0,645

The component matrix table showed that the first factor loading values of all 19 items were bigger than 0,400. Another proof of the existence of a general factor was that he variance caused by the first factor loading value before rotation was 34,082 %. When the rotated component matrix results were examined, which provided an easier definition of 5 factors with respect to their items, the 22nd, 23rd, 30th, 21st and 4th items were found to be in the first; the 14th, 13th, 24th and 27th, in the second; 40th, 38th, 39th and 35th, in the third; 1st, 3rd, 8th, 9th, in the forth; and 26th and 45th were found to be in the fifth factor.

Factors were tried to be named according to the content of the items. The items in the first factor were called "Not using technological tools in education", the ones in the second factor were called "Using technological tools in education", the ones in the third factor were called "The effects of technology on educational life", the ones in the forth factor were called "Teaching how to use the technological tools", and the ones in the fifth factor were named as "Evaluating technological tools". The line graph is given in Graph-1.

Graph-1: *The Line Graph of Attitude Scale Consisting of 19 Items*



In the analysis the important factor number was defined to be 5 according to the initial value. This situation could be clearly seen in the line graph drawn according to the initial value. In Graph-1, a high curved decrease was observed after the first factor. This situation showed that the scale could have a general factor. Besides, after the 2nd, 3rd, 4th and 5th factors, a less curved decrease could be observed; therefore, it could be thought that the scale has five factors. The sixth and higher factors displayed a horizontal direction and no important decrease tendency was observed. In other words, the contributions of the 6th and higher factors to the variance were close to each other.

RESULTS AND DISCUSSION

The demand for technology is increasing with its rapid development. As the technological tools start to be commonly used in education, the thoughts, tendencies and attitudes of the students' towards these tools is needed to be determined (İşman and Dabaj, 2004; Tsai, Lin and Tsai, 2001; Becker and Maunsaiyat, 2002; Tsai, Lin and Tsai, 2001; Christensen and Knezek, 2000; McCoy, Heafner, Burdick and Nagle, 2001; Tanguma, Martin and Crawford, 2002; Vicario, Henniger, Austin and Chamblies, 2002; Akbaba, 2001; Mitra, 2001; Gunter, Gunter and Wiens, 1998; Selwyn, 1997; and such studies). At the end of this study, a scale of attitude towards technology consisting of 19 items and 5 factors with a 0,8668 reliability coefficient and a convenient item difficulty level, in order to determine the attitudes of pre-service chemistry teachers towards technology (See Appendix-1). By using this scale, the attitudes of university students towards using or not using technology in education, the effects of technology in their educational lives, their anxiety and worries about technological tools and their perceptions on reasons for using technological tools could be determined. By reflecting the students' beliefs about technology, this scale could be very helpful in lesson planning and preparation for the educators who would use technological tools in education.

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Appendix-1: ***The Scale of Attitude towards Technology***

Dear Student, In this scale, purpose is to determine pre-service chemistry teachers' attitude towards technology. There are no right or wrong answers in this scale. Please, mark the blank that represent your stance toward each item in the scale. Thanks for your contribution	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
Not Using Technological Tools In Education					
1. E-mail is only for communication; it cannot be used in education.					
2. OHP, slides and projection should not be preferred as they take too much time to be used.					
3. Using the Internet in the learning process is a waste of time.					
4. Using technological tools does not affect students' motivation.					
5. Technological tools do not need to be used in instruction.					
Using Technological Tools In Education					
6. Recording some parts of the lesson on videotapes could provide the students the opportunity to see their mistakes.					
7. Because the videotapes could be watched again, students could get feedback.					
8. Technological tools could be used for practice or revision.					
9. Students should receive basic education on computer literacy.					
The Effects Of Technology In Educational Life					
10. Using current technologies would promote the improvement of new ones.					
11. Technological facilities have a positive effect on productive studying and learning.					
12. Using technology would facilitate the understanding of difficult subjects.					
13. One does not have to use technological facilities in order to be successful in life.					
Teaching How To Use Technological Tools					
14. Daily and yearly plans should be prepared by teachers using computers.					
15. Lessons should often include computer-assisted instruction.					
16. Students should get advance information on the usage of new technologies.					
17. The usage of new technologies in teacher training should be increased.					
Evaluating Technological Tools					
18. Technological tools could only succeed when they address all the sense organs.					
19. In order to be able to graduate from the university, the ability to "use the technological materials of the field" should be rated.					