# Educational Technology Standards Scale (ETSS): A Study of Reliability and Validity for Turkish Preservice Teachers

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**_Abstract_**

*This study aims to develop a scale, the Educational Technology Standards Scale (ETSS), to determine how effectively and appropriately preservice teachers use educational technologies. For the development of the scale, the internationally approved NETS•T standards from 2000 were used. These NETS•T standards were used for determining what proficiencies teachers should have for the use of education technologies. A total of 460 senior-class preservice teachers (189 male and 271 female) from six departments in the Education Faculty of Selçuk University in Turkey participated in this scale-development study in the academic year of 2005–2006. As a result of the analyses, six factors took place in the 41-item scale. In general, the ETSS (at the international level) reveals the general situation of the education given about educational technologies in the education faculties of universities in Turkey. In particular, the scale (at the national level) helps universities in Turkey evaluate themselves for their education about educational technologies. Therefore, the results of the study are expected to contribute to the field of teacher training. (Keywords: NETS•T, educational technology standards, preservice teachers, educational technology)*

## Introduction

In the 1990s, technologies like multimedia computers, DVDs, CD-ROMs, projectors and the Internet were used less than expected in educational settings (Monroe & Tolman, 2004). The most important reason for this was the rate of individual adoption, and the program Preparing Tomorrow's Teachers to Use Technology (PT3) was put into practice to help people benefit from education technologies in the United States of America (Stuve & Cassady, 2005). Overall, researchers observed that with the help of this program, teachers' use of educational technologies increased, but not all teachers benefited from educational technologies adequately. For this reason, standards of educational technology use were developed so that teachers could make the best use of these technologies. Today, a number of countries have developed their own standards of educational technology use.

In Turkey, there are several important investments in educational technology use, yet there are no standards that help determine how educational technologies are being used. On the other hand, teacher candidates in education faculties do receive training on educational technology use.

## Developing the Educational Technology Standards Scale (ETSS)

In the process of developing the Educational Technology Standards Scale, the National Educational Technology Standards for Teachers (NETS•T) standards from 2000 were used. Besides the NETS•T, other standards are developed at the international level, such as IEEE, ISO, European CEN/ISSS, and Prometeus (Campbell, 2004). There were several factors that made the researchers of this study choose the NETS•T, a project executed by International Society for Technology in Education (ISTE), including the following:

- ISTE defines such standards more specifically as NETS for Student (NETS•S), Administrators (NETS•A), and Teachers (NETS•T) (Stuve & Cassady, 2005; International Society for Technology in Education, 2006).
- Developed for the first time in 1993, NETS was updated parallel to the developing technology (in 1997 and 2000) (International Society for Technology in Education, 2006).
- NETS•T was adapted to the different states in the United States of America due to the federal structure in the country and thus has a flexible structure to be approved by all countries in the world.
- Thanks to its flexible structure, NETS•T constitutes the basis of educational technology standards of numerous countries, such as Australia, China, Ireland, Latin America, and England (United Nations Educational, Scientific, and Cultural Organization, 2002)
- Teacher training education in Turkey has a structure parallel to NETS•T standards.

Because of these factors, the NETS•T's six subcategories and 23 subindicators were used in this scale-development study (International Society for Technology in Education, 2006). These categories are shown in Table 1 (page 136).

## General Situation Regarding Educational Technology in Turkey

Two factors are thought to influence the teacher candidates' use of educational technologies: the substructure system of Turkey's Ministry of National Education (MNE) that employs teachers, and the undergraduate education that teachers take during their university education.

The substructure system of the Ministry of National Education. In 1984, MNE in Turkey first started to equip schools with computers, yet the common use of computers was only made possible in two phases. In 1998, MNE took a loan of US$600 million from the World Bank and invested the money on the two-phase currently applied National Basic Education Program (Akbaba-Altun, 2006). When Phase I was finished in 2003, Phase II was put into practice (Ministry of National Education, 2005).

In the first phase, 3,188 educational technology classes were established in 2,802 elementary schools (K–8) by MNE, and these classes were equipped with computers, printers, scanners, TVs, video players, multimedia software, and projectors. Moreover, a total of 56,605 computers were distributed to 26,244 elementary schools in rural areas, and 25,000 elementary school teachers participated in inservice training

**Table 1: The ISTE National Educational Technology Standards for Teachers (NETS-T, 2006)**

| |
|---|
| I. Technology Operations and Concepts |
| II. Planning and Designing Learning Environments and Experiences |
| III. Teaching, Learning, and the Curriculum |
| IV. Assessment and Evaluation |
| V. Productivity and Professional Practice |
| VI. Social, Ethical, Legal, and Human Issues |

*Note: For a detailed version of the table, visit http://cnets.iste.org/Teachers/pdf/page09.pdf*

programs regarding computer literacy organized by MNE. In addition, MNE provided 3,000 educators, who received education on computer literacy, active learning, and teaching strategies, with 1,630 laptop computers, and trained 2,308 computer coordinators. Moreover, MNE sent overhead projectors to 18,517 schools. Also, 15,928 primary school teachers received training via computer education programs organized by contracted companies that also provided hardware and software services (Akbaba-Altun, 2006).

Following the first phase, Turkey and the World Bank made a loan agreement for the second phase on June 26, 2002. This agreement broadened the goals of the first phase. The second phase included preschool education and special education programs. The following items were included in the basic education program in the second phase (Ministry of National Education, 2005):

- Educational Web site
- Information and communication technology devices for more than 3,000 elementary schools
- Educational materials for an additional 4,000 elementary schools
- Training for more teachers and school directors
- Support for execution of programs
- Support for studies on program development and evaluation

As a result of both programs, a majority of schools in Turkey have been equipped with computers, and the appointment of computer teachers has allowed computer laboratories to be used more effectively. Moreover, the MNE organizes in-service training courses for a number of teachers in cooperation with the Provincial Directorate of National Education (Ministry of National Education, 2005).

The MNE makes important investments for a wider use of educational technologies in schools, and teacher candidates have several opportunities to access educational technologies.

## Trainings Given on Educational Technologies in Teacher Training Programs

Although different institutions execute teacher training programs in Turkey, university education faculties became the only authority by law in 1982. The Council of Higher Education (YOK) was authorized as the only center for the inspection and organization of education faculties. Furthermore, the 1998 Council of Higher Education of the Republic of Turkey report Rearrangement of Teacher Training Programs in Education Faculties stresses this situation and determines the qualities that teachers should have and the courses that they should take (Council of Higher Education of the Republic of Turkey, 1998). In this respect, all teacher candidates in Turkey should study in three different areas, such as knowledge of the teaching profession, general knowledge about other areas, and field knowledge. Depending on their departments, teacher candidates are supposed to achieve a 140-credit training program that includes 80 credits of field knowledge, 35 credits of professional knowledge, and 25 credits of general knowledge (Council of Higher Education of the Republic of Turkey, 1998).

Particularly the trainings on the teaching profession and general knowledge in other areas provide teacher candidates with the NETS•T standards seen in Table 1. For instance, the courses regarding training on the teaching profession include Introduction to Educational Sciences; Guidance, Sociology; Class Management; Instructional Planning; Special Teaching Methods; and Evaluation, Measurement; and Assessment. Furthermore, among the general knowledge courses are Computer I and Computer II. These courses significantly help teacher candidates acquire the basic skills to use information and communication technologies (Şumuer, Doğusoy, &Yıldırım, 2006; Tınmaz, 2004).

Instructional Technologies and Material Development, a teacher training course taught to 3rd-year students, is of special importance. In this course, teacher candidates are taught how to use educational technologies during their teaching careers. This is explained in the Teacher Training Programs of Education Faculties as follows (Council of Higher Education of the Republic of Turkey, 1998):

> A compulsory computer course is included in all teacher training programs. The goal of this course is to help teacher candidates gain the basic skills in computer use and know more about information technologies. Instructional Technologies and Material Development, one of the courses in the teacher training program, is like the extension of the basic computer course and includes the application of developing technologies into the teaching environment. With the help of these courses that promote the use of developing information technologies in schools and the development of various instructional materials, teacher candidates are intended to learn about such technologies as computers, the internet, multi-media, television and video sets, and projectors and to use them in teaching. In this way, future teachers are expected to know more about technology and to do their job effectively. (p. 5)

It is clear that teacher candidates learn a lot about teaching with the help of the general knowledge and teaching profession courses before they take the course of Instructional Technologies and Material Development. With this course, teacher candidates find the opportunity to gather all the information they have obtained so that they can use technology effectively (Gunduz and Odabaşı, 2004). At the end of their education (fourth level), with the course of School Practicum, teacher candidates have the opportunity to apply their knowledge in the classroom environment.

As summarized above, in the process of university education, the courses teacher candidates in Turkey take help them meet the educational technology standards.

## Open Source and Open Access

With the spread of the Internet, reaching and sharing information has reached a new dimension. Every person can now access information and contribute to science by adding and sharing new things. Two important concepts regarding using and sharing scientific information via the Internet are open access and open source.

With help of open access, people can reach digital publications (usually peer-reviewed journal articles) without any payment (Todd, 2007). For open-access publications, everybody has the right to copy, distribute, and display a published article as well as to use it for his or her own studies. However, the user is supposed to reference the author of the article cited and provide information in his or her own study about any license requirements (BioMedCentral, 2009). Open access has an important function of providing all people with the opportunity to reach information by overcoming the obstacles that occur due to copyrights and license agreement as well as the use of hardware and software. However, open access does not apply to military studies, discoveries that are likely to require a license, and publications such as books that will require copyright payment (Suber, 2007).

In open access, the primary goal is to present scientific articles to people free of charge. However, this does not imply that the service provided is cost-free, but that the cost is not reflected to the user. Important costs for journal publications should be recovered through subscriptions or through the support of various institutions.

The concept of open source is similar to open access. The goal in open source is to share information free of charge. However, people can reach and use information found in a certain place (e.g., journal articles, pieces of software) and can contribute to the improvement of the information by rearranging it. In other words, the difference between open access and open source results from the fact that information in open source is mutable. The basic advantage of such an enterprise can be expressed as "None of us is as smart as all of us" (Todd, 2007). The contributions of a number of people to the scientific information about a certain subject, thanks to their own viewpoints and fields knowledge, make it possible to carry out a great variety of better quality studies compared to individual research.

ISTE expresses its vision as:

> ISTE is the trusted source for professional development, knowledge generation, advocacy, and leadership for innovation. A nonprofit membership organization, ISTE provides leadership and service to improve teaching, learning, and school leadership by advancing the effective use of technology in PK–12 and teacher education. Home of the National Educational Technology Standards (NETS), the Center for Applied Research in Educational Technology (CARET), and the National Educational Computing Conference (NECC), ISTE represents more than 100,000 professionals worldwide. We support our members with information, networking opportunities, and guidance as they face the challenge of transforming education.

ISTE is a nonprofit institution that helps share information about educational technology and provides new information based on the studies carried out by the scientific society (International Society for Technology in Education, 2009). Therefore, with its projects (NETS, NECC, CARET), the institution is an important example for both open access and open source.

## Purpose

Several studies on different scales have been developed with the use of NETS•T standards (Advanced Learning Technologies in Education Consortia, 2004; Oh & French, 2006). However, these scales were developed for the United States, and several critics question their validity (Stuve & Cassady, 2005). Conversely, Oner (1997) and Bas (2003) claim that a scale developed in a specific culture should not be used in another. Considering the cultural differences of the educational system in Turkey, the development of a new scale was necessary. Therefore, the goal of this study was to develop a scale that would evaluate universities' educational preparation of teacher candidates in regards to their educational technology use in terms of standards.

## Significance of the Study

Although Turkey has no teacher standards for educational technology, teacher candidates in universities that prepare teachers are given intensive training on educational technology. The primary purpose of the current study, which is based on the NETS•T standards that were developed by ISTE for the evaluation of this training and adapted by a number of countries for use, is to reveal the general state of teacher training in Turkey.

**Table 2: Profile of the Participants**

| Gender | Frequency | Percent (%) |
|---|---|---|
| Male | 189 | 41.1 |
| Female | 271 | 58.9 |
| Departments | | |
| Computer and Instructional Technologies | 44 | 9.6 |
| Foreign Language Education | 67 | 14.6 |
| Mathematics and Primary School | 113 | 24.6 |
| Fine Arts | 37 | 8.0 |
| Primary School Education | 148 | 32.2 |
| Social Studies | 51 | 11.1 |
| Total | 460 | 100.0 |

The study was also important because the scale will enable universities in Turkey to evaluate the training they give on educational technology so that they can take the necessary steps to overcome the problems they face during the training they give on educational technology. Finally, the study was of great significance because the standards developed by ISTE in 2000 for the international scale reveal cultural differences. In addition, the study, which is an open-source contribution to information, represents the general situation in a specific culture in terms of ISTE's formation of new NETS•T standards on an international basis.

## Method

### *Participants*

The subjects of the study were 460 senior students attending the Education Faculty Program of Selcuk University in Turkey during the fall term of 2005–2006. Selcuk University is one of the oldest universities in Turkey and admits students from all over the country. Moreover, Selcuk University accommodates almost all of the departments found in education faculties in Turkey, which makes it possible to extrapolate the situation to all the education faculties in the country. The total number of senior students attending the Education Faculty Program of Selcuk University was 661. However, for such reasons as absenteeism on the day of the application or reluctance to participate in the study, some of the students did not receive the questionnaire. Of the 460 students who received the questionnaire, approximately 70% returned them. As for participants' gender, 189 students were male and 271 were female (see Table 2). The researchers selected senior students because they felt these students were ready to be evaluated using the NETS•T standards.

### *Procedure*

The ETSS aims to determine the teacher proficiencies that are in line with NETS•T standards and consists of two parts: One part was related to the demographic background of participants (gender, department), and the other included proficiency indicators using a 5-point Likert scale. The first part of the scale gathered information about the goal of the scale, the estimated completion time, contact, and acknowledgment. The study's significance level was 0.05.

The researchers followed all steps necessary for the development of a measurement scale in the study. Although different sources claim that the number of these steps varies with respect to the details of the actions to be taken, the process of developing this scale included five main phases (Hinkin, 1995; Scaledevstat, n.d.):

- Item pool phase
- Expert view phase
- Pilot experiment phase
- Factor analysis phase

**Table 3: ETSS Results of the Factor Analysis: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 15.369 | 37.484 | 37.484 | 15.369 | 37.484 | 37.484 | 6.287 | 15.334 | 15.334 |
| 2 | 2.446 | 5.967 | 43.451 | 2.446 | 5.967 | 43.451 | 4.607 | 11.236 | 26.570 |
| 3 | 2.003 | 4.886 | 48.337 | 2.003 | 4.886 | 48.337 | 3.617 | 8.822 | 35.392 |
| 4 | 1.647 | 4.017 | 52.354 | 1.647 | 4.017 | 52.354 | 3.447 | 8.407 | 43.799 |
| 5 | 1.218 | 2.971 | 55.324 | 1.218 | 2.971 | 55.324 | 3.416 | 8.331 | 52.130 |
| 6 | 1.094 | 2.668 | 57.993 | 1.094 | 2.668 | 57.993 | 2.404 | 5.863 | 57.993 |

** Extraction method: principal component analysis.*

- Reliability calculation phase

In the process of developing the ETSS, the researchers took the following actions in each of the phases:

***Item pool phase.*** While reviewing the related literature, the researchers examined the NETS•T indicators (23 items) prepared by ISTE for item writing. These indicators tell teachers what they should do for each group of standards (International Society for Technology in Education, 2006). There were two parts in the ETSS. The first part included personal information about the gender and the students' departments of study. The second part was made up of an item pool related to the NETS•T items. This second part included items for six subfactors of NETS•T standards, for a total of 23 items in these subfactors. Consequently, 69 items were gathered in the pool.

***Expert view phase.*** In the next step, the researchers consulted experts from Anadolu University for their views about content validity. These experts were nine instructors who specialized in the areas of educational technology, curriculum, measurement and evaluation, professional development and ethics, and scale development. We made a few revisions based on their recommendations. As a result of these revisions, 68 items were left to be used for the analyses of validity and reliability. ETSS was formed as a 5-point Likert scale. (Strongly disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, and Strongly agree = 5)

***Pilot experiment phase.*** In this phase, we made copies of the scale to distribute to the students. In the phase of data collection, the researchers told the students how to fill out the questionnaire. Those who did not want to participate in the study did not receive the questionnaire.

***Factor analysis phase.*** The researchers coded the data we obtained. We excluded from the study data related to the students who entered false codes in the coding step (such as rating all responses as 1 or 5). Following this, we ran confirmatory factor analysis (CFA).

To determine all of the items included in the scale and reveal the factor structure, we ran principal component analysis and varimax rotation. In this process, we took certain criteria into consideration, such as the fact that the value of the item total correlation index should be over 0.3; the factor loadings should be 0.4 or above; and the interfactor loadings should be at least 0.1 (Hair et al., 1998; Namlu & Odabasi, 2007). While developing the ETSS, we took the item total correlation index value for Varimax rotation as 0.4 or above so that the interfactor discrimination could be more evident.

To run the principal component analysis on the 68-item ETSS, it was necessary to check whether the data were appropriate for the factor analysis. There are different ways to do this. One is to look at the result of Bartlett's Test of Sphericity. In case of a statistically significant difference, factor analysis is run (Stewart, 1981). In the present study, when we examined the results of Bartlett's Test of Sphericity test (chi-square = 9990.943; df = 820; $p < .000$), we observed that the data were appropriate for the factor analysis. Similarly, we checked the appropriateness of the research data for the factor analysis with the value of Kaiser-Meyer-Olkin (KMO), which is another method for checking data appropriateness to factor analysis. These values help interpret the appropriateness of factor analysis. We observed in the present study that the research data are appropriate for the factor analysis because the KMO value (0.963) meets Kaiser's (1974) requirement.

After this, we applied a principal component analysis. The purpose of this was to determine the number of factors by using variations that were exposed to factor analysis. The number of factors was determined by total variance percentage that was explained by each factor. Total variance is the total of variance that belongs to each variable. Because variable variances are equal to 1, factors whose variances are below 1 are not taken into consideration. In short, the number of factors to be included in the model is equal to the number of factors whose eigenvalues are over 1 (eigenvalue >1) (Morrison, 1990).

The first principal component analysis determined 10 factors whose eigenvalues were 1 or above. These factors explained 59.486% of total variance. However, all of these steps were repeated five times until the requirements of the principal component analysis and of varimax rotation explained above were met. More than one item was excluded from the scale after each analysis. At the end of the last analysis, there were not any items left to be excluded. After the fifth repetition, a total of six factors whose eigenvalues exceeded 1 were determined, and the ETSS was finalized.

Among the six factors determined, there were 41 items. In other words, 27 items were excluded from the 68-item scale. The six factors determined as a result of the last analysis explained 57.993% of total variance. While the first component had an eigenvalue of 15.369 and explained 37.484% of total variance, the sixth component had an eigenvalue of 1.094 and explained 2.668% of total variance. In Table 3, the distribution of each factor determined is shown in total variance of 57.993%.

To determine which item will be found in a factor, with the help of factor loadings of the items, we applied varimax rotation. The varimax method helps determine the limited number of factors with higher loadings and the abundant number of factors with zero (or lower) loadings (Ferguson & Cox, 1993). This determines the items that constitute a factor. Therefore, the items that form a factor are examined, and the factor is named.

***Reliability calculation phase.*** To calculate the reliability of the ETSS, Cronbach alpha was used. With this calculation, the values of Cronbach alpha for the six factors in the scale were between .919 and .801. The value of Cronbach alpha calculated for the whole scale was .957. The value of Cronbach alpha calculated for the evaluation of the reliability of a scale is suggested to be .70 or above. (Hair et al., 1995; Namlu & Odabaşı, 2007) Therefore, the ETSS can be said to be reliable since it has a Cronbach alpha value of .957. The reliability values for each factor are seen in Table 4 (pages 140–141).

## Results

According to the results of the factor analysis, the researchers summarized the Educational Technology Standards Determination Scale under six titles similar to NETS•T from 2000. Based on the NETS•T standards, the titles of the factors in the ETSS were determined to be Technology Operations and Concepts (Factor 1); Planning and Designing Learning Environments and Experiences (Factor 2); Assessment and Evaluation (Factor 3); Productivity and Professional Practice (Factor 4); Social, Ethical, Legal, and Human Issues (Factor 5); and Planning of Teaching According to Individual Differences and Special Needs (Factor 6). This last factor is new, and the factor of "Teaching, Learning, and the Curriculum" in NETS•T does not exist in the ETSS.

When we examined the results in Table 4, we observed that the item "I can benefit from Internet services to support the learning process during the education program (item 38)," had the highest mean in the scale with a mean of 4.12. However, the item "With the help of technology, I can design learning environments for those who need special education due to their loss of hearing or their defect of vision (item 15)" had the lowest mean in the scale with a mean of 3.33.

## Discussion

This study considers the perceptions of preservice teachers who are senior students at university level and aims to develop a scale for teachers' standards of educational technology. This scale will help observe to what extent Turkish university courses related to educational technologies are parallel to global standards. The ETSS has six factors. Although five of the six factors were the same as the NETS•T standards from 2000 via which the scale was developed, the ETSS includes one new factor. The items of each factor, like those in NETS•T, can be summarized as follows:

1. ***Technology operations and concepts (NETS I).*** The first factor in the ETSS consisted of items related to the knowledge of teachers about any kinds of technology, especially about computers, and related to their effective use of technology.
2. ***Planning and designing learning environments and experiences (NETS II).*** The second factor included items related to using technology to support individual learning, following the recent research and current developments, and related to applying these developments in their own classes after checking the appropriateness of them to their own teaching environments.
3. ***Assessment and evaluation (NETS IV).*** The third factor was was made up of items such as applying different measurement and evaluation strategies with the help of technology and processing and reporting data for the purpose of evaluation.
4. ***Productivity and professional practice (NETS V).*** The fourth factor comprised items related to teachers use computer technologies, especially the Internet-based technologies, to become better teachers.
5. ***Social, ethical, legal, and human issues (NETS VI).*** The fifth factor covered items related to health and safety issues caused by computer use and those related to copyright issues (Caufman, 2006).
6. ***Planning of teaching according to individual differences and special needs (new factor).*** The last factor does not exist in NETS•T (International Society for Technology in Education, 2006). This new factor included items related to the planning of special education activities for students who need special attention and those related to equal use of technology. The basic education law for teachers also requires them to provide students with equal educational opportunities and to be responsible for students who are in need of special education (Ministry of National Education, 1973). Furthermore, they also receive education on these issues during their university education (Council of Higher Education of the Republic of Turkey, 1998). Moreover, all students become knowledgable about being a member in social life with the help of the course Member of Social Life, which is part of the Turkish Education System. In other words, this factor can be said to reflect the sentiment of Turkish people and their culture.

Although the items of the third factor of NETS•T, which was Teaching, Learning, and the Curriculum (NETS III), were included in the ETSS, these items were excluded from the scale following factor analysis. This is quite a significant finding. Among the items of this factor was the planning of technology-enhanced experiences including student-related and content-related technology standards, as well as the development of students' upper-level thinking skills and creativity with the help of educational software. However, the participants of the study did not receive any education that covers these items (Council of Higher Education of the Republic of Turkey, 1998). Therefore, it is quite natural that the items that comprise this factor do not exist in the scale.

## Conclusion

Based on the scale developed, it could be stated that teacher candidates in universities in Turkey acquire the ability of educational technology use in a way appropriate to the globally approved NETS•T standards. However, as a consequence of the cultural difference resulting from the education in Turkey as compared to the United States, the items did not exist within the factor (item number 3) Teaching, Learning, and the Curriculum of NETS•T. On the other hand, a new factor was determined in the scale. The factors found in the ETSS are as follows:

1. Technology operations and concepts
2. Planning and designing learning environments and experiences
3. Assessment and evaluation
4. Productivity and professional practice
5. Social, Ethical, Legal, and Human Issues
6. Planning of Teaching According to Individual Differences and Special Needs

Universities in Turkey can evaluate the education delivered by their education faculties with the help of this scale. Moreover, it will also greatly contribute to the establishment of educational technology standards for teachers, which do not exist in Turkey at this time. Hence, the NETS•T standards will be adapted to Turkey. A critical look at the NETS•T standards that were released in 2008 would be important at this time, as well. In addition, further research can be carried out on this adaptation process.


## Acknowledgments

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**Table 4: Means, Standard Deviations, Item Total, and Component and Rotation Loadings**

| | Items and Factors | Mean | SD | Item Total | Component Factor Load | Varimax Factor Load |
|---|---|---|---|---|---|---|
| Factor 1. Technology Operations and Concepts (α=0.834) | | | | | | |
| 1 | I can explain how technological devices operate. | 3.51 | 0.949 | 0.605 | 0.517 | 0.759 |
| 2 | I can use technological devices in different ways. | 3.51 | 0.906 | 0.662 | 0.582 | 0.725 |
| 3 | I can define the technological devices found in our faculty. | 3.42 | 1.029 | 0.540 | 0.445 | 0.630 |
| 6 | I can do basic things regarding computer technologies. | 3.79 | 0.961 | 0.584 | 0.574 | 0.589 |
| 5 | I can explain general concepts related to computer technology. | 3.62 | 0.973 | 0.559 | 0.573 | 0.568 |
| 9 | I can use technological devices effectively. | 3.61 | 0.865 | 0.611 | 0.658 | 0.554 |
| Factor 2: Planning and Designing Learning Environments and Experiences (α=0.886) | | | | | | |
| 22 | I can choose the technology appropriate to the teaching process by evaluating the present technological sources. | 3.85 | 0.895 | 0.617 | 0.633 | 0.683 |
| 23 | I can state whether the electronic sources are suitable for the planning of learning activities. | 3.77 | 0.859 | 0.591 | 0.617 | 0.670 |
| 20 | I can inform students about the benefits of using different technological devices in the process of teaching. | 3.88 | 0.904 | 0.650 | 0.707 | 0.640 |
| 18 | I can use sources on the Internet in order to prepare different learning activities and teaching strategies. | 4.11 | 0.866 | 0.588 | 0.621 | 0.624 |
| 17 | I can make use of research findings about technology use for the planning of educational environments. | 3.75 | 0.891 | 0.627 | 0.663 | 0.599 |
| 25 | I can determine whether technological sources are suitable for student use. | 3.83 | 0.830 | 0.637 | 0.627 | 0.585 |
| 21 | I can explain how technological sources should be used to increase the effectiveness of education. | 3.80 | 0.867 | 0.600 | 0.685 | 0.581 |
| 19 | I can shape the teaching process in line with new educational technologies. | 3.67 | 0.910 | 0.467 | 0.575 | 0.547 |
| Factor 3: Assessment and Evaluation (α=0.833) | | | | | | |
| 44 | In order to assess students in different respects, I can form an evaluation procedure that consists of various measurement techniques. | 3.64 | 0.855 | 0.587 | 0.545 | 0.666 |
| 28 | I can plan teaching strategies that require the use of different technological sources. | 3.72 | 0.889 | 0.626 | 0.651 | 0.609 |
| 29 | I can plan learning activities based on technology use in order for students to yield creative products | 3.70 | 0.895 | 0.540 | 0.632 | 0.569 |
| 45 | I can follow technology-based measurement and evaluation strategies which will help evaluate the performance of students via such tools as portfolio and e-mail. | 3.77 | 0.952 | 0.546 | 0.639 | 0.551 |
| 30 | I can use technology for the purpose of developing appropriate strategies to solve the real life problems. | 3.53 | 0.884 | 0.499 | 0.553 | 0.522 |
| 47 | I can use technological tools to process and report all kinds of data related to the teaching process. | 3.74 | 0.825 | 0.495 | 0.631 | 0.510 |
| 46 | I can help students find their own measurement tools to evaluate their own learning processes. | 3.63 | 0.847 | 0.443 | 0.520 | 0.479 |
| Factor 4: Productivity and Professional Practice (α=0.919) | | | | | | |
| 52 | To become a more effective teacher, I can find information on the Internet. | 4.08 | 0.922 | 0.700 | 0.634 | 0.781 |
| 53 | I can share ideas with experts and colleagues on an online basis to develop my teaching skills. | 4.02 | 0.920 | 0.599 | 0.611 | 0.730 |
| 55 | To become a more effective teacher, I can evaluate myself in terms of my improvement in technology use. | 3.92 | 0.863 | 0.638 | 0.635 | 0.669 |
| 56 | To become a more productive teacher, I can use software (such as Microsoft Word, Excel, PowerPoint) that will increase the quality of instructional applications. | 4.03 | 0.938 | 0.648 | 0.691 | 0.659 |
| 54 | I can explain how I will benefit from technology to keep lifelong learning. | 3.78 | 0.877 | 0.620 | 0.655 | 0.643 |
| 58 | In order to have cooperation among my students, their parents, and my colleagues, I can use such communication tools as e-mail, forums, and discussion groups. | 3.88 | 0.933 | 0.615 | 0.667 | 0.617 |
| 51 | To become a more effective teacher, I always develop myself in terms of new technological tools. | 3.93 | 0.876 | 0.570 | 0.665 | 0.595 |
| 38 | I can benefit from Internet services to support the learning process during the education program. | 4.12 | 0.877 | 0.634 | 0.597 | 0.595 |
| 57 | I can use technology in my own teaching process by observing how it is used in the teaching process. | 3.87 | 0.856 | 0.638 | 0.668 | 0.589 |
| 62 | I can explain the effects of the use of such electronic environments as computers and the Internet on social life. | 3.89 | 0.866 | 0.601 | 0.679 | 0.577 |
| 59 | In order to increase student learning, I can use technological sources for the establishment of communication with parents. | 3.90 | 0.837 | 0.565 | 0.644 | 0.542 |
| 48 | I can use technological devices to send the results of any evaluation of the teaching process to students and their parents. | 3.88 | 0.882 | 0.512 | 0.620 | 0.529 |

**Table 4 (Continued): Means, Standard Deviations, Item Total, and Component and Rotation Loadings**

| | | | | | | |
|---|---|---|---|---|---|---|
| Factor 5: Social, Ethical, Legal, and Human Issues (α=0.843) | | | | | | |
| 61 | I can state the legal issues about technology use. | 3.56 | 0.965 | 0.613 | 0.507 | 0.733 |
| 63 | I can explain the important issues related to the copyright of any technological system. | 3.51 | 1.009 | 0.626 | 0.536 | 0.730 |
| 68 | I can explain the issues related to the equal use of technology. | 3.56 | 0.926 | 0.648 | 0.554 | 0.702 |
| 66 | I can explain the health-related issues that could be caused by technology use in schools. | 3.70 | 0.884 | 0.688 | 0.635 | 0.625 |
| 67 | I can explain the safety precautions to be taken for a safer use of technology in schools. | 3.72 | 0.877 | 0.589 | 0.658 | 0.581 |
| Factor 6: Planning of Teaching According to Individual Differences and Special Needs (α=0.801) | | | | | | |
| 14 | I can make a plan that will allow all the students to use the technological sources. | 3.45 | 0.995 | 0.710 | 0.551 | 0.770 |
| 13 | I can prepare lesson plans that will allow using technology to meet the different needs of students. | 3.49 | 0.971 | 0.684 | 0.574 | 0.720 |
| 15 | With the help of technology, I can design learning environments for those who need special education due to their loss of hearing or their defect of vision. | 3.33 | 0.963 | 0.639 | 0.563 | 0.651 |

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