sustainability

MDPI

Article

The Scale of Attitudes toward the Information Technologies and Software Course: A Scale Development Study †

Harun Şahin [1], Gülden Mediha Yeşiltepe [2,*], Ahmet Murat Ellez [3], Meriç Eraslan [4], Süleyman Karataş [5] and Serdar Özçetin [4]

1 Educational Sciences Program Curriculums and Instruction Department, Faculty of Education, Akdeniz University, Antalya 07000, Turkey
2 Republic of Turkey Ministry of National Education, Antalya 07000, Turkey
3 Educational Sciences Program Curriculums and Instruction Department, Faculty of Education, Dokuz Eylül University, İzmir 35220, Turkey
4 Department of Physical Education and Sport, Faculty of Sports Sciences, Akdeniz University, Antalya 07000, Turkey
5 Department of Educational Sciences, Educational Management, Faculty of Education, Akdeniz University, Antalya 07000, Turkey
* Correspondence: guldenyesiltepe@gmail.com; Tel.: +90-057966294
† This study was produced from the study developed for use in Gülden Mediha Yeşiltepe's doctoral thesis.

Abstract: In this study, the aim was to develop a Likert-type scale to measure students' attitudes toward the Information Technologies and Software course taught in secondary school. The developments in the field of science and technology and the changing needs of society necessitate an update to the Information Technologies and Software course curriculum and its implementation, starting from the 2021–2022 academic year. With this update, students are provided with the means to take the first step toward programming with block-based learning activities (Blockly, Scratch, Arduino, etc.). For this reason, it is thought that previously developed scales may be insufficient to measure students' attitudes toward the updated Information Technologies and Software course. The study was designed by survey method. A total of 600 students for an exploratory factor analysis and 300 different students for a confirmatory factor analysis were included in the study. As a result of conducting the exploratory factor analysis, a scale with 4 factors and 27 items was obtained. Confirmatory factor analysis was performed to confirm the obtained structure. The scale that was developed, as a result of validity and reliability studies, is thought to be a valid and reliable measurement tool that can be used to measure attitudes toward the Information Technologies and Software course.

Keywords: scale; development; attitude; information technologies; software

check for updates

Citation: Şahin, H.; Yeşiltepe, G.M.; Ellez, A.M.; Eraslan, M.; Karataş, S.; Özçetin, S. The Scale of Attitudes toward the Information Technologies and Software Course: A Scale Development Study. *Sustainability* **2023**, *15*, 4074. https://doi.org/10.3390/su15054074

Academic Editor: Antonio P. Gutierrez de Blume

Received: 2 February 2023
Revised: 19 February 2023
Accepted: 21 February 2023
Published: 23 February 2023

Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

The nature of science, which is often called a special type of knowledge, differs across societies and ages. Scientific activities that have been intertwined with technology throughout history have enabled the emergence of brand-new technological opportunities [1]. These new opportunities have transformed human life in the social, scientific, intellectual, industrial, and educational domains, thereby leading to a process of continuous change and development [2]. In fact, this rapidly developing process has led to the emergence of information societies [3]. Information societies are a structure that is dominated by individuals and institutions who have a high motivation to produce information, can interpret and process their knowledge in accordance with the times, think systematically, question the environment and themselves, and adopt lifelong learning as a principle. Thus, information societies have succeeded in reaching a high level of welfare by progressing ahead of other societies [4].

The idea that a new society should have new skills has increased the impact of information and communication technologies in all areas of life, revealing the fact that they are one of the leading tools in information processing [5]. These developments have not only affected cultural or professional fields in societies but also caused a transformation in educational systems [6]. The sustainability of this transformation in educational systems is possible with knowledge creation, technology, technological innovation, and knowledge sharing [7]. The pursuit of quality teaching requires the creation of effective learning environments and the development of lifelong learning skills. This process, which transforms education into a huge global market, compels countries to develop policies and make investments in information and communication technologies [5]. These developments have led countries to integrate information and communication technologies (ICT) in their education systems and to implement reforms that will foster social, economic, and educational transformations [8]. This is because economic growth and social development are only possible by knowing how ICT-based education reform can be used as a lever to drive these same types of development [7].

Known to few people in the 1960s, the computer was at the center of Seymour Papert's work on children's computer use and programming. As one of the creators of the first programmable robotic system for children, Papert's ideas inspired the "One Laptop per Child" initiative in the late 1980s [9]. The long-term use of ICT in schools started in the United States and England in the 1990s and then continued with EU countries in the 2000s [10]. In Turkey, computer technologies (whose effects began to be seen in the 1980s) also became a part of education in the 1990s. In this process, various strategies and policies were followed in order to minimize the deficiencies arising from regional differences in schools and institutions [11].

This rapid change in the fields of science and technology also affects the expectations of society from the individuals within them. It is expected that every individual who grows up in such a society is capable of producing knowledge and adapting this knowledge to real life, as well as being capable of solving problems and thinking critically [12]. With the Information Technologies and Software course, which was introduced to curriculums in order to meet these expectations, the aim is to train digital citizens who can use information technologies effectively, possess the ability to think computationally, produce innovative and original projects about daily life, and adopt lifelong learning as a principle [12].

In order to ensure that the knowledge creation process is in continuous development in the digital age—which is dominated by education reforms—new skills, abilities, and attitudes suitable for the new age should be included in the curriculum [7]. Students developing positive attitudes toward the Information Technologies and Software course is as important as transforming their digital competence, which is to be imparted to them through this course and, subsequently, into their behavior [12,13].

The tendency of an individual to react positively or negatively to a certain situation, event, or other people is called attitude [14]. Pickens [15] defines attitude as a combination of many complex elements. These elements include personality, beliefs, values, behaviors, and motivations. Attitudes define how we see existing situations, on the one hand, and how we behave in the face of situations, on the other. Therefore, attitudes determine our behaviors [15]. A computer attitude can be defined as an individual's general evaluation, sympathy, or antipathy toward computer technologies and computer-specific activities [16]. Accordingly, it can be said that this attitude has a directing effect on the behavior of an individual and is formed by a learning process built on experiences [17]. An attitude specific to an individual provides a holistic consistency in their feelings, thoughts, and behaviors toward a concept. Therefore, it is not possible to directly observe the attitudes of an individual [17]. Attitudes can only be measured if they can be defined [14]. Further, all attempts to measure attitude require making inferences about the attitude from certain observable situations [18].

1.1. Review of the Literature

Çelik and Gündoğdu [19] examined the effect of the animation-supported values education program, in regard to the value of informatics, on the attitudes of the 11th graders who were majoring in the field of information technologies in a vocational high school. The findings obtained in the study revealed that the students in the group where the lesson was taught with the animation-supported values education program developed a positive attitude toward the values of informatics ethics.

Özgenel, Baydar, and Çalışkan [20] tried to determine the relationship between the attitudes of secondary school students—specifically, 717 fifth, sixth, and eighth graders—toward the Information Technologies and Software course and the students' achievements within their study of the course. As a result of the study, it was determined that there is a low, significant, and positive correlation between the attitudes of secondary school students toward the course, and to their course achievement.

The existing research shows that attitudes affect not only learning outcomes but also students' beliefs and motivations toward the course lessons. Sturm and Bohndick [21] revealed the main effect of attitudes and beliefs in their study, in which they aimed to change the relationship between problem-solving performance and attitudes. The results showed that students with positive attitudes and beliefs were more successful than students with negative attitudes and beliefs. As such, it is thus important to develop positive attitudes in a course such as Information Technologies and Software, which aims to train individuals who can bring innovative solutions to daily life problems and who are conscious about lifelong learning [12]. For this reason, it is of great importance to determine the attitudes of students toward the Information Technologies and Software course, to further develop the existing positive attitudes, and to ensure that the knowledge and skills they have gained in the course are transformed into a continuous behavior [13].

There are studies conducted in previous years to determine the attitudes of secondary school students toward the courses in computer/information technologies.

Aydoğan [22] developed the attitude scale toward information technologies in order to determine to what extent elementary school eighth-grade students have accomplished the anticipated learning outcomes in information technologies. As a result of a literature review, an item pool including 61 items was constructed. The draft scale was reduced to 55 items through expert review and was administered to 293 eighth-grade students. As a result of the analyses made on the data, the attitude scale toward information technologies was constructed, which consists of 4 factors and 17 items. These factors were named as dependency on information technologies, interest in information technologies, indifference to information technologies, and anxiety about information technologies.

Işık and Rıza [13] developed a Likert-type attitude scale in order to measure the attitudes of elementary school students toward the Information Technologies and Software course. The sample of the study consisted of 216 students who had taken the Information Technologies and Software course in the past. As a result of the analysis of the students' thoughts on the Information Technologies and Software course and a literature review, the scale was formed to have 41 items, which were then reduced to 36 items by removing 5 items that were considered inappropriate as a result of expert review. As a result of the analyses, a single-factor scale consisting of 35 items and explaining 39% of the variance was obtained.

Abdullah, Ziden, Aman, and Mustafa [23] developed a survey tool for the study in which they aimed to determine the attitudes of undergraduate students toward information technologies. A 5-point Likert scale was used for all items in the questionnaire. The questionnaire was tested on a large sample (N = 300). As a result of the analyses made, an attitude questionnaire consisting of 3-dimensional 18 items toward IT was developed. These dimensions were named as per the following: affection toward IT (6 items), intentional behavior toward IT (5 items), and belief toward IT (7 items).

Palaigeorgiou, Siozos, Konstantakis, and Tsoukalas [24] aimed to develop a scale that would reveal students' attitudes toward computers in their study of 102 first-year

university students, who were studying in the Department of Computer Sciences. As a result of the study, a 5-factor scale was developed. These factors were named as per the following: confidence in previous knowledge; anxiety about using hardware; computer interaction; negative results of long-term computer use; and evaluation of positive results of computers in personal and social life.

The computer attitude scale, consisting of 4 dimensions and 40 items, was developed by [25] and was adapted into Turkish by [26], where information on construct validity was provided. The scale, which had originally four dimensions, was characterized as one-dimensional as a result of the analysis of the data obtained from the study carried out on 282 university students. It was observed that the attitudes measured in the sample in this study were not at a level that would enable the formation of these four dimensions, which were defined as computer fear, self-confidence in using the computer, liking the computer, and using the computer. The same scale was redeveloped by [27] to examine the attitudes of students studying at the second level of elementary education toward computers. As a result of the analysis of the data obtained from the pilot study conducted with 270 students, the scale was rearranged as consisting of 21 items and 4 factors, explaining 42.6% of the variance. These factors were named confidence, willingness, reluctance, and belief.

1.2. Purpose of the Study

Curriculums updated in line with the rapid change in science and technology and the changing needs of society in various countries of the world were examined. Academic studies related to curricula in national and international literature were reviewed, as were all reports, opinions, suggestions, criticisms, and expectations that were prepared by groups, academicians, and non-governmental organizations. All of these sources of data were evaluated in detail and, as a result, the Information Technologies and Software course curriculum was updated by investigating through these stages. Additionally, this update was put into effect in the 2018–2019 school year. With this update, gaining problem-solving and computational thinking skills, as well as algorithm design and block-based programming skills, has taken its place among the specific objectives of the curriculum [12]. Thus, the subject of coding was included in the Information Technologies and Software course. With the block-based learning activities (Blockly, Scratch, Arduino, etc.) included in the curriculum, students are directed to take the first step toward learning programming. Coding is an attractive experience for young learners. In addition, coding, Arduino-based applications, game-based learning, etc., are activities that provide students with exciting experiences and improve their thinking and problem-solving skills [28]. It is thought that these new experiences may cause a change in students' attitudes toward computers, information technologies, and software courses. Therefore, it is thought that the previously developed scales may be insufficient to measure the attitudes toward the Information Technologies and Software course, which has since been updated and provides the opportunity for students to have new experiences. Thus, the purpose of the current study was to develop a Likert-type scale to measure secondary school students' attitudes toward the updated Information Technologies and Software course. It is thought that this scale that is to be developed will fill the gap in the relevant literature in terms of measuring student attitudes toward the Information Technologies and Software course, specifically in regard to the curriculum which has been updated. It will also contribute to other researchers who will examine student attitudes toward the Information Technologies and Software course.

2. Materials and Methods

2.1. Study Group

The study group of the research, which was designed by survey method, consists of 900 randomly selected secondary school students taking the Information Technologies and Software course and studying at public schools in the central district of the Antalya province. A total of 600 students attending the 7th and 8th grades in the 2021–2022 school year were

included in the exploratory factor analysis. A total of 300 students, who were different from the students participating in the exploratory factor analysis but were attending the same grades in the 2021–2022 school year, were included in the confirmatory factor analysis. While developing a Likert-type scale, in order for the results to be meaningful and reliable, the size of the sample should be large enough to meet the statistical requirements and diverse enough that it can reflect the target population, preferably at least five times more than the total number of items [14,17,29].

2.2. Development of the Data Collection Tool

The stages followed in the development of the scale of attitudes toward the course of Information Technologies and Software [14,30,31] are as follows:

- Determination of the purpose of the measurement tool;
- Determination of the attitude to be measured, construction of the item pool, and item writing;
- Checking mechanics and comprehensibility;
- Seeking expert opinion and preparation of the draft form;
- Conducting the pilot study;
- Analysis of the data obtained from the pilot study (validity and reliability).

2.2.1. Determination of the Purpose of the Measurement Tool

With regard to the scale to be developed, the aim was to measure the attitudes of middle school students toward the Information Technologies and Software course.

2.2.2. Determination of the Attitude to Be Measured, Construction of the Item Pool, and Item Writing

A measurement process begins with the definition of the feature to be measured. As a result of the examination of the resources in the relevant literature, great care was taken regarding the attitude statements that were to be used, so as to include the cognitive, affective, and behavioral dimensions that should be identified in the experiences related to the field of information technologies. The resources in the related literature were reviewed in detail. Further, the scales developed in the field of information technologies and other fields for secondary school students were examined [12–14,22,25–27,32–34]. The statements regarding the attitudes to be measured were adapted according to the updated curriculum, and an item pool was created.

While writing the scale items, care was taken for them not to include factual statements. In order to prevent attitude statements from being understood in different ways by different people, care was taken to keep them simple and concise. In order to prevent scale items from being left unanswered, the attitude questions were phrased as such to ensure that positive and negative statements were included [14].

For the positive items, the response options were “strongly agree” and “agree”, for the negative items the response options were “disagree” and “strongly disagree” and for the state of being of equal distance to both of these types of options the response option “partially agree” was used.

Examples of the attitude statements are given below:

I think that I do not need to learn computers to succeed in classes.
I get bored in the Information Technologies and Software classes.
Learning to use a computer takes a lot of time.
Solving problems encountered while using a computer does not appeal to me.

2.2.3. Checking Mechanics and Comprehensibility

Each attitude statement in the scale was examined by two Turkish teachers to confirm that they are clear and comprehensible, that they do not have any spelling mistakes and ambiguity, and that necessary changes were made in terms of considering the characteristics of the target population.

2.2.4. Seeking for Expert Opinion (Content Validity) and Preparation of the Draft Form for the Pilot Study

Validity refers to the degree to which a feature to be measured with a measurement tool can be accurately measured without being confused with other features. The extent to which the items in the scale represent the observable attitude to be measured is an indicator of content validity. Expert opinions are generally sought to test the comprehensiveness of the scale [14,35]. The draft scale was submitted for the review of three information technologies and software teachers working in different schools, three academicians who are experts in the field of curriculum development, and one evaluation measurement expert. The draft scale was reorganized in line with the feedback given by the experts. It had a total of 63 items, 30 positive and 33 negative. At the beginning of the scale, a "personal information form" was added, which was to be optionally filled in.

2.2.5. Conducting the Pilot Study

The draft attitude scale, which took its final form after necessary adjustments were made in line with the expert opinions, was administered to a group of 900 students who had characteristics similar to those of the target population. In the study, for the exploratory factor analysis, 600 students who had taken the Information Technologies and Software course in previous years were included; for the confirmatory factor analysis, 300 different students were included.

Before the pilot study, the questionnaire and methodology for this study were approved by the Social and Human Sciences Scientific Research and Publication Ethics Committee of the relevant university. Additionally, written informed consent was then obtained from the Antalya Provincial Directorate of National Education. Necessary information was given to the students before the draft scale was applied; only volunteer students participated.

The data for the exploratory factor analysis were collected over a two-week period in March 2022, after the necessary permissions were obtained. The draft attitude scale was applied face to face to 600 volunteer students.

Data for confirmatory factor analysis were collected over a 1 week period in April 2022. The draft attitude scale was applied online to 300 volunteer students, due to the COVID-19 pandemic.

2.2.6. Analysis of the Data Obtained at the End of the Pilot Study

I. Item Analysis (Criterion Validity)

This is a method applied to examine the relationship of the prepared attitude statements with the attitude to be measured and their discrimination on the attitude dimension. It allows taking the necessary measures by determining the deficiencies in the attitude statements in the draft scale at the end of the analysis [14]. In order to determine the measurement power of each item that was created for a certain attitude to be measured, correlation-based item analysis was performed using the SPSS program package.

II. Factor Analysis (Construct Validity)

With factor analysis, multiple interrelated variables that measure the same construct or feature are brought together. Thus, a few significant new factors (dimensions), which are to be used in making measurements, are revealed [35]. There are two different approaches: explanatory factor analysis and confirmatory factor analysis.

The purpose of exploratory factor analysis is to find a new factor (dimension) on the basis of the relationships between the variables. With confirmatory factor analysis, a predetermined construct related to the relationship between the variables is tested and confirmed [29,35].

In order to find and define the common dimensions in the scale, exploratory factor analysis based on the principal components analysis factorization technique was applied

by using the SPSS program package. In order to test the accuracy of the obtained construct, confirmatory factor analysis was performed using the LISREL program package.

III. Reliability

In order to determine the reliability level of the finalized scale, Cronbach's Alpha coefficient, which is accepted as a measure of internal consistency, was calculated.

3. Results

3.1. Item Analysis

The correlation-based item analysis recommended by Likert as the first objective control was used to calculate the correlation between each item in the scale and the total scale score. A positive and high item-total correlation value indicates a high internal consistency of the scale. In addition, the discrimination of items with an item total correlation value of 0.30 and higher can be said to be good [35]. In line with this information, the items with negative correlation coefficients were removed from the scale at the first stage. Then, the items closest to zero were removed from the scale, with the correlation coefficient thus below 0.30. The scale score was recalculated when each item was removed from the scale. At the end of the analysis, items 13, 6, 2, 5, 4, 27, 30, 15, 16, 12, 25, 11, 26, 23, 7, 9, 29, 10, 21, 28, 8, 17, 20, 18, 3, 22, 1, 24, 14, and 19 were removed from the scale, respectively. Thus, there were 33 items left. As a result of the analysis being conducted again, Cronbach's Alpha (α) value was calculated as 0.961. The alpha coefficient shows how consistent each item in the scale is with the total scale score. The higher the Alpha coefficient of the scale, the higher its internal consistency [17,31]. The Results of the Item Analysis on the Attitude Scale towards Information Technologies and Software are given in Table 1.

Table 1. Results of the Item Analysis Conducted on the Items in the Scale of Attitudes toward Information Technologies and Software.

Item	Item–Total Correlation	New Cronbach's Alpha Value When the Item Is Deleted
I31	0.545	0.961
I32	0.617	0.960
I33	0.589	0.961
I34	0.632	0.960
I35	0.773	0.959
I36	0.753	0.959
I37	0.699	0.960
I38	0.741	0.960
I39	0.670	0.960
I40	0.685	0.960
I41	0.657	0.960
I42	0.696	0.960
I43	0.481	0.961
I44	0.640	0.960
I45	0.665	0.960
I46	0.768	0.959
I47	0.586	0.961
I48	0.682	0.960
I49	0.769	0.959
I50	0.752	0.960
I51	0.578	0.961
I52	0.731	0.960
I53	0.645	0.960
I54	0.604	0.960
I55	0.490	0.961
I56	0.635	0.960
I57	0.666	0.960

Table 1. *Cont.*

Item	Item–Total Correlation	New Cronbach's Alpha Value When the Item Is Deleted
I58	0.495	0.961
I59	0.611	0.960
I60	0.703	0.960
I61	0.613	0.960
I62	0.566	0.961
I63	0.593	0.961

3.2. Explanatory Factor Analysis

In order to test the suitability of the data set for exploratory factor analysis, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's Test of Sphericity were first performed. A KMO value close to 1 means that the sample size is excellent and that each variable in the scale can be well predicted by other variables. The results given in Table 2 show that the data are suitable for factor analysis.

Table 2. KMO and Bartlett's Test of Sphericity Results.

Kaiser–Meyer–Olkin Sampling Adequacy		**0.967**
Bartlett's Test of Sphericity	χ^2	11,472.721
	df	528
	p	0.000

After meeting the threshold for the two assumptions required for factor analysis, the results of the exploratory factor analysis continued to be evaluated. In order to decide on the number of factors, the variance values explained by the factors were examined with the scree plot. The scree plot helps to reduce the number of factors by revealing the dominant factors [29]. The downtrend in the scree plot in Figure 1 and the variance values explained by the factors in Table 3 were interpreted together. It was decided that the scale would have four factors. In this decision, the presence of four components with an initial eigenvalue greater than 1 was taken into account.

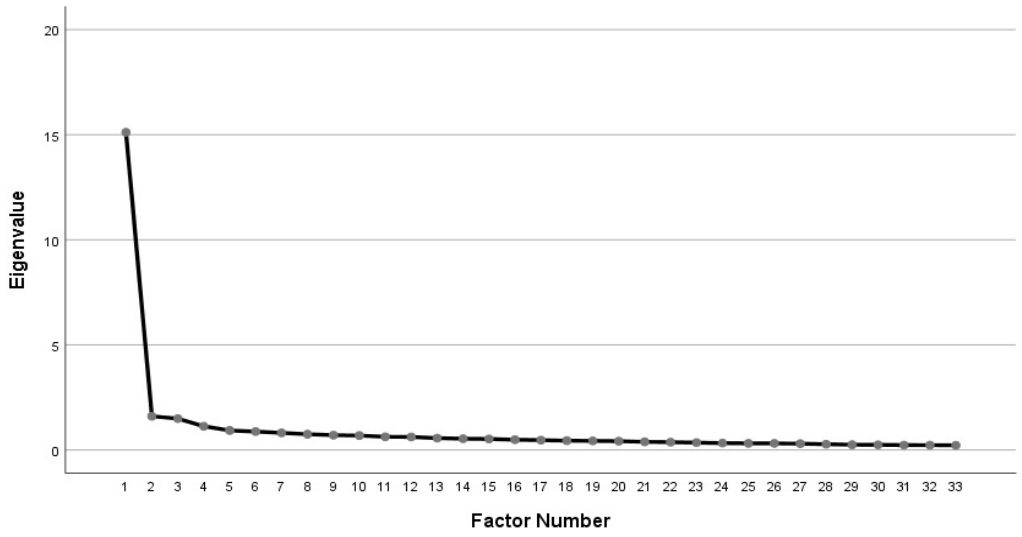


Figure 1. Scree Plot.

Table 3. Variance Values Explained by the Factors.

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)
1	15.116	45.805	45.805	14.666	44.442	44.442
2	1.604	4.860	50.665	1.143	3.464	47.905
3	1.492	4.520	55.185	1.007	3.051	50.956
4	1.125	3.410	58.595	.655	1.985	52.942

As seen in Table 3, when the contribution of each factor to the total variance is examined, it is observed that the contribution of the first factor is 45.805%, that of the second factor is 4.860%, that of the third factor is 4.520%, and that of the fourth factor is 3.410%. The total contribution of these four factors to the variance is 58.595%.

In order to determine the items that will remain in the scale, "Principal Axis Factoring" analysis and the "Promax" rotation method were used. With the principal axis factor analysis, common variance, unique variance, and error variance being analyzed separately from each other, the hidden variables explaining the relationships between observed variables are thus determined [29,36,37]. Rotation is used to interpret the factorization results in an independent, clear, meaningful, and easy manner. Promax, an oblique rotation method, is a rapid technique for revealing the constructs thought to be related to the factors [29,35].

The results obtained as a result of the factorization process were examined in terms of cross-loading and factor-loading values. Considering the size of the sample, the cut-off value for factor loading was set to 0.40. In order to obtain stable results when the cut-off value set for factor loadings is 0.40, the sample size should be around 300–400 [29]. In this connection, items with a loading value below 0.40, cross-loading items with more than one significant loading, and a difference between their loading values being less than 0.1 were determined. Item deletion was started with the item that possessed the lowest factor-loading value. After each item deletion, the analysis was repeated, and the items were re-examined in terms of factor-loading and cross-loading values. With the factor analysis, I40, I34, I61, I36, I46, and I35 were excluded from the scale, respectively. As a result of the analysis, a scale consisting of 4 factors and 27 items was obtained. The analysis results for this are presented in Tables 4 and 5.

Table 4. Results of the Exploratory Factor Analysis.

Items	Factors			
	1st Factor	2nd Factor	3rd Factor	4th Factor
I56	*0.777*			
I57	*0.730*			
I54	*0.705*			
I55	*0.675*			
I52	*0.663*			
I53	*0.624*			
I50	*0.610*			
I49	*0.593*			
I51	*0.576*			
I58	*0.416*			
I32		*0.918*		
I31		*0.910*		
I33		*0.739*		
I37		*0.476*		
I39		*0.406*		
I38		*0.405*		

Table 4. *Cont.*

Items	Factors			
	1st Factor	2nd Factor	3rd Factor	4th Factor
I62			*0.780*	
I63			*0.739*	
I60			*0.682*	
I48			*0.679*	
I59			*0.629*	
I47			*0.623*	
I41			*0.439*	
I42				*0.605*
I43				*0.563*
I44				*0.552*
I45				*0.428*

Table 5. Results of the Exploratory Factor.

Factors	Variance Percent (%)	Total Variance (%)
1st Factor: Lack of Interest in the course	44.322	44.322
2nd Factor: Lack of Willingness toward the course	5.706	50.028
3rd Factor: Lack of Self-Confidence	5.140	55.168
4th Factor: Lack of Technological Willingness	4.062	59.231

The 1st Factor has 11 items, the 2nd Factor has 6 items, the 3rd Factor has 7 items, and the 4th Factor has 4 items. The factors that emerged as a result of the factor analysis were named to include the expressions they contain, thus taking into account the relevant literature. Accordingly, the 1st factor was named "Lack of Interest in the Course", the 2nd Factor "Lack of Willingness toward the Course", the 3rd Factor "Lack of Self-Confidence", and the 4th Factor "Lack of Technological Willingness".

The rotated factor-loading values of the 10 items in the "Lack of Interest in the Course" dimension in the scale of attitudes toward the Information Technologies and Software course were found to range from 0.777 to 0.416. These results explain 44.322% of the total variance, and its contribution to the total variance is also 44.322%.

The rotated factor-loading values of the six items in the "Lack of Willingness toward the Course" dimension of the scale of attitudes toward the Information Technologies and Software course were found to range from 0.918 to 0.405. This explains 57.06% of the total variance, and its contribution to the total variance is 50.028%.

The rotated factor-loading values of the seven items in the "Lack of Self-Confidence" dimension of the scale of attitudes toward the Information Technologies and Software course were found to range from 0.780 to 0.439. This explains 5.140% of the total variance, and its contribution to the total variance is 55.168%.

The rotated factor-loading values of the four items in the "Lack of Technological Willingness" dimension of the scale of attitudes toward the Information Technologies and Software course were found to range from 0.605 to 0.428. This explains 4.062% of the total variance, and its contribution to the total variance is 59.231%. The final form of the scale is shown in Table 6.

In order to confirm the scale consisting of 4 factors and 27 items found via the exploratory factor analysis, and to test the construct validity, confirmatory factor analysis was carried out. The significance level of the t values for the variables observed with the path diagram, which was obtained by evaluating the model fit, is given in Figure 2. The path diagram of the factor-loading values and error variances of the variables is given in Figure 3. Factors, estimates of factor loadings, and standard errors are given in Table 7.

Table 6. The Scale of Attitudes toward the Course of Information Technologies and Software.

	Items	Rotated Factor-Loading Values	Adjusted Item Total Correlation
	1st Factor: Lack of Interest in the Course		
M56	I think I do not need to learn computers for my success in classes.	0.777	0.635
M57	I do not think I need to follow the developments in information technologies.	0.730	0.661
M54	I think there will still be jobs that do not require computer skills in the future.	0.705	0.608
M55	I believe that I can improve myself without learning computers.	0.675	0.493
M52	I am studying for the Information Technologies and Software course just to pass the course.	0.663	0.724
M53	I am not interested in publications on information technologies.	0.624	0.644
M50	I think it is unnecessary to know the subjects of the Information Technologies and Software course other than in understanding certain basic knowledge.	0.610	0.746
M49	I think that what I have learned in the Information Technologies and Software course is unnecessary for me.	0.593	0.763
M51	I would like to choose a profession that has the least to do with information technologies.	0.576	0.583
M58	I do not believe that equipping the classrooms with computers increases success in the course.	0.416	0.492
	2nd Factor: Lack of Willingness toward the Course		
M32	I get bored in the Information Technologies and Software classes.	0.918	0.612
M31	I feel restless when entering the Information Technologies and Software classes.	0.910	0.541
M33	I do not want to do the homework given in the Information Technologies and Software classes.	0.739	0.592
M37	I would be happy with a reduction in the content taught within the Information Technologies and Software course.	0.476	0.676
M39	I am interested in other things in the Information Technologies and Software classes.	0.406	0.656
M38	I do not want to go to school on the days when the Information Technologies and Software classes are taught.	0.405	0.724
	3rd Factor: Lack of Self-Confidence		
M62	When others talk about computers, I feel inadequate about it.	0.780	0.466
M63	I hesitate to express my thoughts in the Information Technologies and Software classes.	0.739	0.463
M60	I think it is difficult to learn the subjects that are taught in the Information Technologies and Software course.	0.682	0.701
M48	I am afraid of the Information Technologies and Software course exams.	0.679	0.682
M59	Learning to use a computer requires a lot of time.	0.629	0.608
M47	I am afraid of not being able to do the activities in the Information Technologies and Software classes.	0.623	0.585
M41	I do not feel confident in the Information Technologies and Software classes.	0.439	0.645
	4th Factor: Lack of Technological Willingness		
M42	I do not think I will ever willingly use computers in my life.	0.605	0.682
M43	I use computers very little in my daily life.	0.563	0.474
M44	Working with a computer makes me feel uneasy.	0.552	0.630
M45	Solving problems encountered while using a computer does not appeal to me.	0.428	0.657

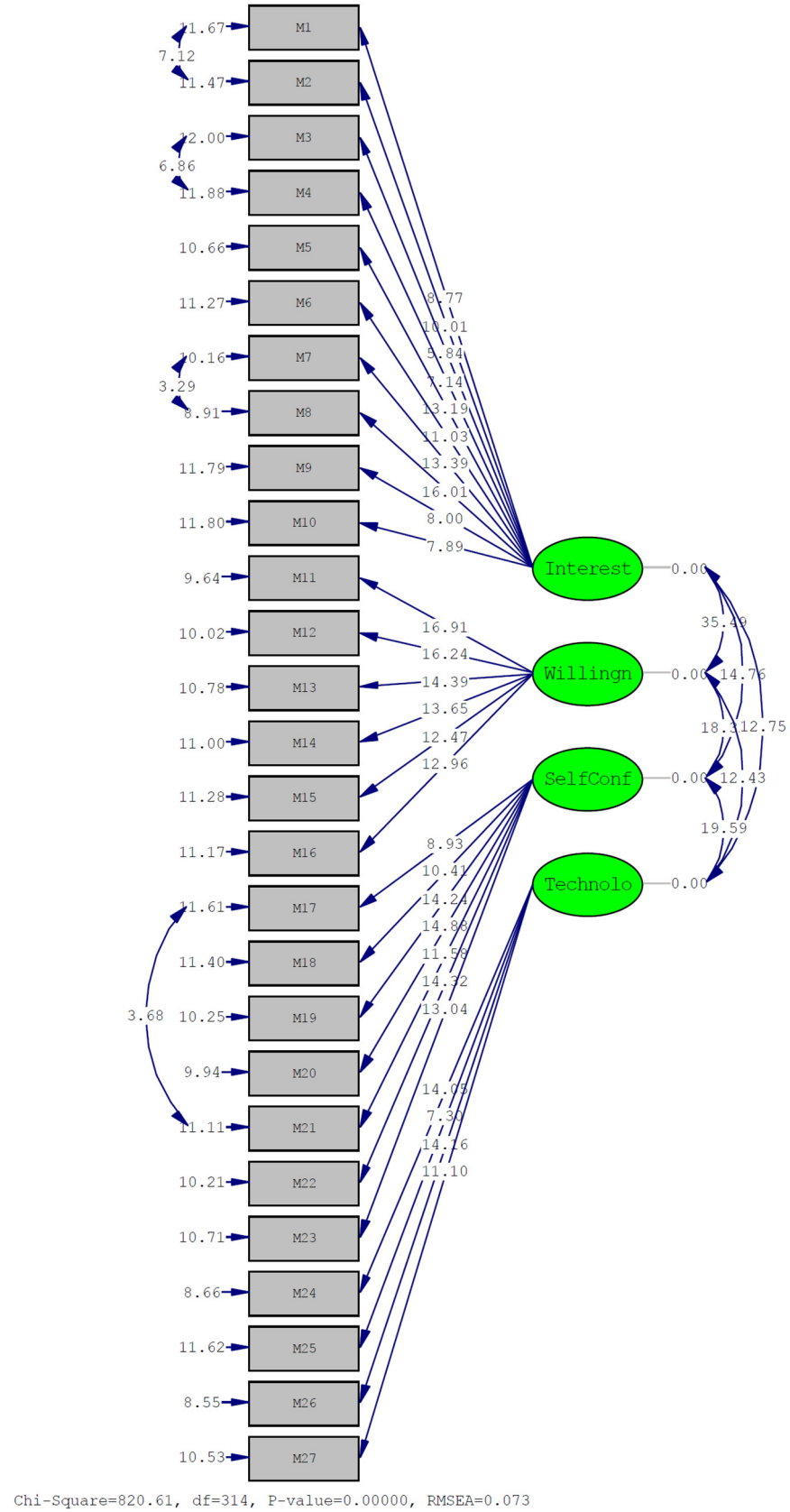


Figure 2. Significance Levels of the Rates of Latent Variables Explaining Observed.

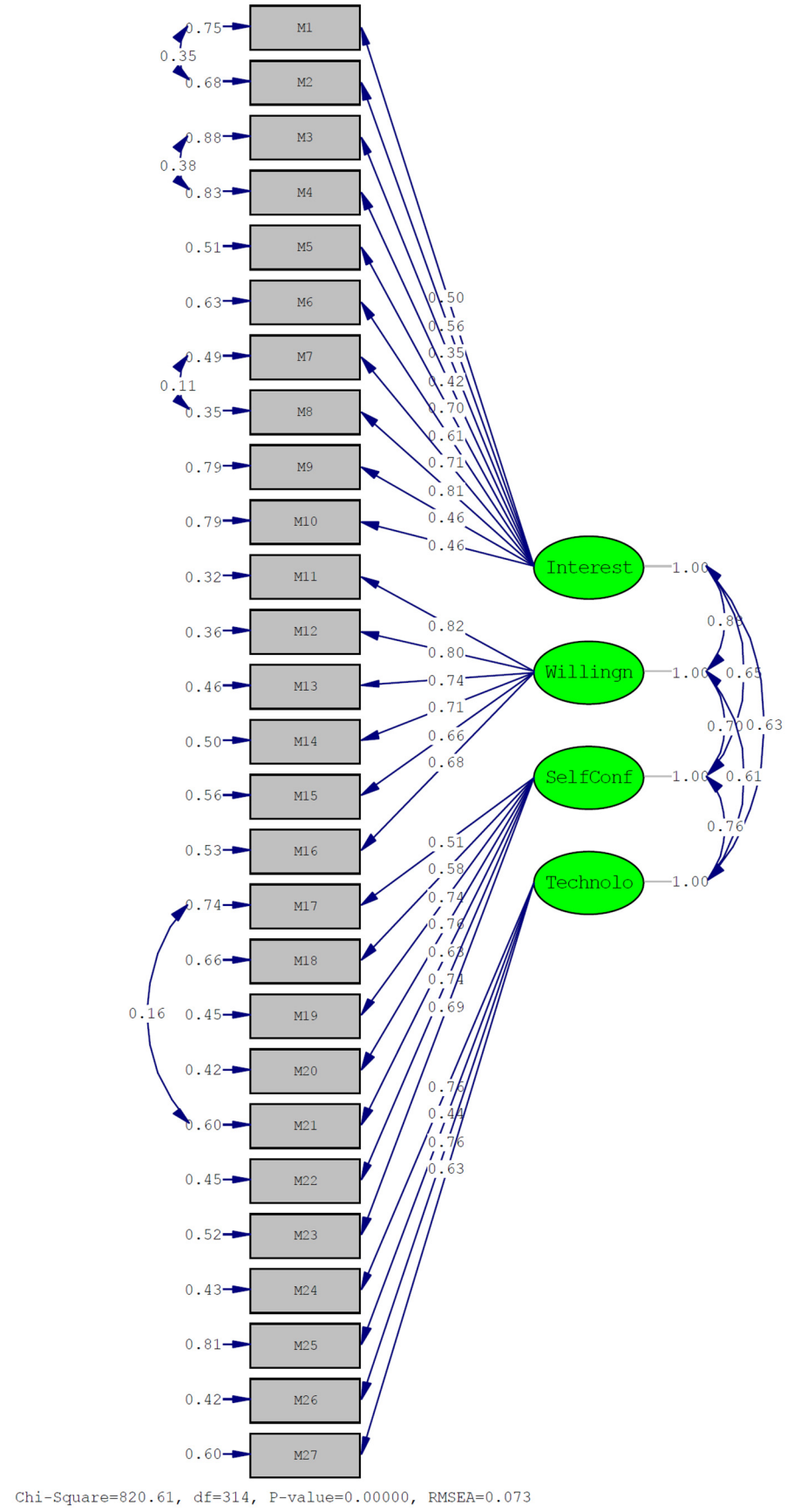


Figure 3. Factor-loading Values and Error Variances of the Variables.

Table 7. Measurement Model Results.

Items	Estimates of Factor Loadings	Standard Error
	1st Factor	
M2	0.69	0.097
M1	0.69	0.072
M4	0.50	0.13
M3	0.58	0.11
M4	0.72	0.053
M5	0.72	0.081
M6	0.74	0.041
M7	0.71	0.028
M8	0.48	0.069
M9	0.64	0.13
M10	0.69	0.097
	2nd Factor	
M11	0.84	0.035
M12	0.70	0.027
M13	0.82	0.053
M14	0.84	0.063
M15	0.55	0.035
M16	0.48	0.024
	3rd Factor	
M21	0.71	0.061
M18	0.61	0.064
M19	0.81	0.052
M20	0.78	0.045
M17	0.65	0.089
M22	0.78	0.050
M23	0.79	0.063
	4th Factor	
M24	0.67	0.039
M25	0.60	0.13
M26	0.74	0.047
M27	0.74	0.079

As seen in the path diagram in Figure 2, the t values showing the extent to which the latent variables explain the observed variables are significant at the 0.01 level. In parameter estimations, if the t values are above 1.96, they can be said to be significant at the level of 0.05. If they are above 2.56, then they can be said to be significant at the level of 0.01 [29]. In Figure 3, it is seen that the factor-loading values of the observed variables vary between 0.35 and 0.81 and that the error variances vary between 0.32 and 0.88. In an appropriate measurement model, error variances are expected to be low and factor-loading values to be high. Factor-loading values below 0.30 mean that this factor cannot be interpreted [38].

When the fit indices of the model are obtained as a result of the analysis and are examined, it was observed that all of the fit indices were within the recommended cut-off values and close to a good fit (GFI = 0.83; AGFI = 0.80; CFI = 0.96; RMR = 0.082; SRMR = 0.063; RMSEA = 0.073; NFI = 0.94; NNFI = 0.96). Model fit indices are given in Table 8.

Table 8. Model Fit Indices.

Fit Indices	Values	Fit
X2/sd	2.61	Perfect Fit
RMSEA	0.073	Good Fit
GFI/AGFI	0.83/0.80	Acceptable
RMR/SRMR	0.082/0.063	Good Fit
CFI	0.96	Perfect Fit
NFI/NNFI	0.94/0.96	Good Fit/Perfect Fit

When the fit indices of the model were examined, it was noted that the value of X2/sd was 2.61. In large sample sizes, an X2/sd value below 3 indicates a perfect fit, while a value below 5 indicates a moderate fit [39]. Thus, it can be said that the analysis value obtained indicates a perfect fit.

The calculated RMSEA value was 0.073. An RMSEA value lower than 0.08 means that the model shows a good fit [39,40].

It was observed that the GFI value was 0.83 and the AGFI value was 0.80. These parameters can be between 0 and 1. A value higher than 0.95 indicates a perfect fit [39]. Thus, it can be said that the fit indices obtained are among the recommended cut-off values.

When the obtained findings continue to be examined, it is seen that the RMR and SRMR values are 0.082 and 0.063, respectively. If these values are less than or equal to 0.08, then it means that the model shows a good fit [41].

A CFI value of 0.96 indicates a perfect fit. The closer the value is to 1, the better fit the model is considered to show [39].

It is seen that the NFI value is 0.94 and the NNFI value is 0.96. These values' being above 0.90 indicates a good fit and being above 0.95 indicates a perfect fit [39]. In this respect, it can be said that the NFI fit index corresponds to a good fit and the NNFI fit index corresponds to a perfect fit.

When the fit values obtained as a result of the analysis are compared with the cut-off points for acceptance, it can be said that the model generally shows a good fit. Thus, it can be stated that the 4-factor construct of the scale of attitudes, consisting of 27 items, toward the Information Technologies and Software course has been confirmed as a model.

3.3. Reliability

Cronbach's Alpha (α) coefficient was calculated to examine the internal consistency of the finalized scale; it was found to be 0.919. Cronbach's Alpha (α) coefficient is a value that shows the homogeneity of the test. A low coefficient indicates that the scale measures several features together. If the internal consistency coefficient is greater than 0.80, then it indicates that the scale is highly reliable [17].

When the item total correlation values of the items in the scale are examined, it was observed that they vary between 0.371 and 0.689. It can be said that the discrimination of items with an item total correlation value of 0.30 and higher is good [35].

4. Discussion and Conclusions

4.1. Discussion

In the current study, the aim was to develop a Likert-type scale whose validity and reliability were tested in order to measure the secondary school students' attitudes toward the Information Technologies and Software course.

Through the review of the relevant literature, an item pool was created. The attitude statements were reorganized after technical inspections were made and expert opinions were sought. The draft scale consisted of 63 items, 30 positive and 33 negative, and was made ready for piloting.

The draft scale was administered to a group of 900 people with characteristics similar to those of the target population. In this study, for the exploratory factor analysis, 600 students who had taken the Information Technologies and Software course in previous years were included. For the confirmatory factor analysis, 300 different students were included.

In the first stage, a correlation-based item analysis was conducted to determine the measurement power of each item. Furthermore, it was created for the attitude to be measured, and the correlation between each item in the scale and the total scale score was calculated. Items with a negative correlation coefficient and items with a correlation coefficient below 0.30 were excluded from the scale. Following this, there were 33 items left. As a result of the repeated analyses, Cronbach's Alpha (α) value was calculated to be 0.961.

As a result of the evaluation regarding the findings obtained from the exploratory factor analysis, the scale was determined to have four factors. In order to determine the

items that would remain in the scale, a factorization process was performed, and the results were examined in terms of cross-loading and factor-loading values. By taking the sample size into consideration, the factor-loading cut-off value was accepted to be 0.40. Item deletion was then started with the item that possessed the lowest factor-loading value. As a result of the analysis, six items were removed from the scale and a 4-factor scale consisting of 27 items was obtained. The contribution of these four factors to the total variance was 59.231%.

Confirmatory factor analysis was performed to confirm the scale as a model and to test its construct validity. When the findings were examined, it was observed that the t values, which were related to the extent to which the latent variables explain the observed variables, were significant at the 0.01 level. In addition, the factor-loading values ranged between 0.35 and 0.81, and the error variances ranged between 0.32 and 0.88. When the fit indices of the model were examined, it can be stated that the model fitted well in general and that its 4-factor structure, consisting of 27 items, was confirmed as a model.

As a result of the analysis performed to examine the internal consistency of the finalized scale, the Cronbach's Alpha (α) coefficient was found to be 0.919.

When the findings regarding the validity and reliability of the scale were examined, it can be concluded that the scale is a valid and reliable measurement tool that can be used to measure attitudes toward the Information Technologies and Software course.

Motivation and attitudes have an important place in increasing student success because students who are highly motivated and have a positive attitude toward the lesson will be more willing to learn and will be able to accomplish their own learning. The student's attitude toward learning is an indispensable part of student success [42].

According to Rogers' diffusion of innovation theory, the most important element of adopting information technology is the attitude that is developed by the individual toward it [43]. The scale of attitudes toward the Information Technologies and Software course can facilitate decision-making at the stage of determining classroom management strategies in order to meet various student needs. Moreover, understanding and recognizing students' attitudes toward the course can foster their motivation toward the course [44].

It is thought that the positive thoughts of the students toward accepting the information technologies and software course will increase their attitudes toward the course in a positive way and, accordingly, the probability of being successful in this field will be higher. This view is supported by the technology acceptance model (TAM), which was developed by Davis [45] and creates a perspective on the use and adoption of technology by individuals. This model, which is based on the perception of usefulness and ease of use, provides information about the acceptance or rejection of technology by the individual [45]. When the relevant literature is examined, it is observed that the different theories were developed to make predictions about the adoption and acceptance of technology by individuals. One of these theories, the UTAUT (unified theory of acceptance and use of technology), focuses on the factors affecting the use of information technology. The UTAUT, which is one of the communication tools developed to master technology and to develop and control behavioral intentions, aims to integrate dominant structures, such as TAM [45] and the motivational model [46], which examine human behaviors and computers [47]. Similarly, the TPACK (technological pedagogical content knowledge) model is widely used, which provides suggestions for utilizing technology, teaching technological concepts, and details how students can benefit from technology [48]. Positive or negative thoughts about technology affect the performance of individuals in the technology they use. If individuals perceive the technology they use as easy and useful, they develop a positive attitude toward it. Positive attitudes enable them to develop a positive intention to use technology [49]. Similarly, Bandura [50] states that there is a close relationship between individuals' attitudes and beliefs and that this relationship affects behaviors. In this context, students' thinking that they will benefit from the Information Technologies and Software course in the teaching process will strengthen their attitudes toward the use of information technologies in a positive way.

4.2. Conclusions

With information technologies becoming more and more important, various scales have been developed to measure individuals' attitudes toward computers. These scales have also been used to integrate these attitudes into all educational environments, and for using computers as a learning tool. Garland and Noyes [51], in their study, aimed to evaluate the suitability of some of these scales for use today. By examining four commonly used computer attitude scales, they concluded that the scales are reliable. However, it has been concluded that the traditional computer attitude scale style is not relevant enough for today and that the structures have changed [51]. Woodrow [52], in her study comparing four computer attitude scales, concluded that only two of the scales exemplified the attitudes that relate to all dimensions in the scale [52]. In this context, it is thought that there is a deficiency in the relevant literature. In addition, the updates made in the curriculum of information technologies and software courses, especially regarding coding, make it necessary for this course to be taught from a young age. It is thought that this developed scale will fill the gap in the relevant literature in measuring student attitudes toward the Information Technologies and Software course, even in regard to the curriculum that has been updated and includes secondary school students.

5. Delimitations

This scale was developed with data collected from Turkish student participants who are studying in secondary school. Conducting similar studies among students from different cultures and different age groups could be used to help guide the understanding of the attitudes of students toward information technologies courses. In addition, identifying the factors that determine such attitudes will help to encourage students' attitudes toward technology.

Author Contributions: Conceptualization, H.Ş. and A.M.E.; methodology, S.Ö.; software, G.M.Y.; validation, S.K., M.E. and A.M.E.; formal analysis, S.K.; investigation, H.Ş.; resources, G.M.Y.; data curation, M.E.; writing—original draft preparation, A.M.E.; writing—review and editing, S.Ö.; visualization, G.M.Y.; supervision, S.K.; project administration, H.Ş. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The questionnaire and methodology for this study were approved by the Social and Human Sciences Scientific Research and Publication Ethics Committee of the University of Akdeniz (Ethics approval number: 03.02.2022-284113).

Informed Consent Statement: Written informed consent was obtained from the Antalya Provincial Directorate of National Education (03.03.2022/E-98057890-20-44921111).

Data Availability Statement: To protect the privacy of participants in the study, data are available upon written request via the email of the corresponding author listed.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ural, Ş. *Bilim Tarihi*; Çantay: İstanbul, Turkey, 2011.
2. Pesen, A.; Epçaçan, C. The Analysis of High School Students' Tendencies about Lifelong Learning. *Univers. J. Educ. Res.* **2017**, *5*, 26–31. [CrossRef]
3. Uşun, S. *Bilgisayar Destekli Öğretimin Temelleri*; Nobe: Ankara, Turkey, 2013.
4. Kalkınma Bakanlığı, T.C.; Dairesi, B.T. 2015–2018 Bilgi Toplumu Stratejisi ve Eylem Planı (Yayın No. 2939). 2015. Available online: http://www.bilgitoplumu.gov.tr/2015/2015-2018-bilgi-toplumu-stratejisi-ve-eylem-plani-yayimlandi-2/ (accessed on 22 July 2022).
5. Hepp, P.; Hinostroza, J.E.; Laval, E.; Rehbein, L. *Technology in Schools: Education, ICT and the Knowledge Society*; World Bank, Distance & Open Learning and ICT in Education Thematic Group, Human Development Network, Education: Washington, DC, USA, 2004; pp. 30–47.

6. Luhmann, N. *Social Systems*; Stanford University Press: Redwood City, CA, USA, 1995. Available online: https://books.google.com.tr/books?hl=tr&lr=&id=zVZQW4gxXk4C&oi=fnd&pg=PR9&dq=luhmann+1995&ots=7GFRla3NST&sig=GEBIWS5BQvw7QNFDeWQCpmpf6yE&redir_esc=y#v=onepage&q=luhmann%201995&f=false (accessed on 10 July 2022).
7. Kozma, R.B. National policies that connect ICT-based education reform to economic and social development. *Hum. Technol. Interdiscip. J. Hum. ICT Environ.* **2005**, *1*, 117–156. [CrossRef]
8. Kozma, R.B. Comparative analysis of policies for ICT in education. In *International Handbook of Information Technology in Primary and Secondary Education*; Springer: Boston, MA, USA, 2008; pp. 1083–1096.
9. Stager, G. Seymour Papert (1928–2016). *Nature* **2016**, *537*, 308. [CrossRef]
10. Twining, P. ICT in Schools: Estimating the Level of Investment, meD8. 2002. Available online: https://www.researchgate.net/publication/251511811_ICT_in_Schools_Estimating_the_level_of_investment (accessed on 22 July 2022).
11. MEB. MEB 2010–2014 Stratejik Planı. 2010. Available online: https://sgb.meb.gov.tr/meb_iys_dosyalar/2013_05/08030019_2010_14_sp_genelbilgi.pdf (accessed on 13 June 2022).
12. MEB. Bilişim Teknolojileri ve Yazılım Dersi Öğretim Programı (Ortaokul 5 ve 6. Sınıflar). 2018. Available online: http://mufredat.meb.gov.tr/Dosyalar/2018124103559587-Bili%C5%9Fim%20Teknolojileri%20ve%20Yaz%C4%B1l%C4%B1m%205-6.%20S%C4%B1n%C4%B1flar.pdf (accessed on 13 June 2022).
13. Işık, A.D.; Rıza, E.T. Bilişim teknolojileri dersine yönelik tutum ölçeğinin geçerlik ve güvenirlik çalışması. *Educ. Sci.* **2011**, *6*, 46–53.
14. Tezbaşaran, A.A. Likert tipi ölçek hazırlama kılavuzu (3. Sürüm). *E-Kitap* **2008**, *12*, 2013.
15. Pickens, J. Attitudes and perceptions. *Organ. Behav. Health Care* **2005**, *4*, 43–76.
16. Smith, B.; Caputi, P.; Rawstorne, P. Differentiating computer experience and attitudes toward computers: An empirical investigation. *Comput. Hum. Behav.* **2000**, *16*, 59–81. [CrossRef]
17. Tavşancıl, E. *Tutumların Ölçülmesi ve SPSS ile Veri Analizi*; Nobel: Ankara, Turkey, 2018.
18. Anderson, L.W.; Çıkrıkçı, N. Tutumların ölçülmesi. *Ank. Univ. J. Fac. Educ. Sci. (JFES)* **1991**, *24*, 241–250. [CrossRef]
19. Çelik, B.; Gündoğdu, K. Animasyon destekli bilişim değerleri eğitiminin akademik başarıya ve tutuma etkisi. *Anadolu J. Educ. Sci. Int.* **2000**, *10*, 1066–1091.
20. Özgenel, M.; Baydar, F.; Çalışkan, Y.F. Ortaokul öğrencilerinin bilişim teknolojileri ve yazılım dersine yönelik tutumları ile akademik başarıları arasındaki ilişkinin incelenmesi. *Electron. Turk. Stud.* **2018**, *13*, 111–128. [CrossRef]
21. Sturm, N.; Bohndick, C. The Influence of Attitudes and Beliefs on the Problem-Solving Performance. In *Frontiers in Education*; Frontiers Media SA: Lausanne, Switzerland, 2021; p. 6. [CrossRef]
22. Aydoğan, D. İlköğretim 8. Sınıf öğrencilerinin bilişim teknolojilerine yönelik tutumları ile bilişim teknolojileri okuryazarlıkları arasındaki ilişki. *Kafkas Üniversitesi Sos. Bilim. Enstitüsü Derg.* **2013**, *1*, 61–76.
23. Abdullah, Z.D.; Ziden, A.B.A.; Aman, R.B.C.; Mustafa, K.I. Students' attitudes towards information technology and the relationship with their academic achievement. *Contemp. Educ. Technol.* **2015**, *6*, 338–354. [CrossRef]
24. Palaigeorgiou, G.E.; Siozos, P.D.; Konstantakis, N.I.; Tsoukalas, I.A. A computer attitude scale for computer science freshmen and its educational implications. *J. Comput. Assist. Learn.* **2005**, *21*, 330–342. [CrossRef]
25. Loyd, B.H.; Gressard, C. Reliability and factorial validity of computer attitute scales. *Educ. Psychol. Meas.* **1984**, *44*, 501–505. [CrossRef]
26. Berberoğlu, G.; Çalıkoğlu, G. Türkçe bilgisayar tutum ölçeğinin yapı geçerliliği. *Ank. Univ. J. Fac. Educ. Sci. (JFES)* **1991**, *24*, 841–845. [CrossRef]
27. Şerefhanoğlu, H.; Nakipoğlu, C.; Gür, H. İlköğretim ikinci kademe öğrencilerinin bilgisayara yönelik tutumlarının çeşitli değişkenler açısından incelenmesi: Balıkesir örneği. *İlköğretim Online* **2008**, *7*, 785–799.
28. García-Peñalvo, F.J.; Mendes, A.J. Exploring the computational thinking effects in pre-university education. *Comput. Hum. Behav.* **2018**, *80*, 407–411. [CrossRef]
29. Çokluk, Ö.; Şekercioğlu, G.; Büyüköztürk, Ş. *Sosyal Bilimler İçin Çok Değişkenli İstatistik: SPSS ve LISREL Uygulamaları (5. Baskı)*; Pegem Akademi: Ankara, Turkey, 2018.
30. DeVellis, R.F. Scale Development: Theory and Applications (26. Baskı). 2016. Available online: https://books.google.com.tr/books?id=48ACCwAAQBAJ&printsec=frontcover&dq=deVellis&hl=tr&sa=X&redir_esc=y#v=onepage&q=deVellis&f=false (accessed on 13 August 2022).
31. Büyüköztürk, Ş.; Kılıç-Çakmak, E.; Akgün, Ö.; Karadeniz, Ş.; Demirel, F. *Bilimsel Araştırma Yöntemleri (5. Baskı)*; Pegem Akademi: Ankara, Turkey, 2010.
32. Demir, K.; Akpınar, E. Mobil öğrenmeye yönelik tutum ölçeği geliştirme çalışması. *Eğitim Teknol. Kuram Uygul.* **2016**, *6*, 59–79. [CrossRef]
33. Türker, N.K.; Turanlı, N. Matematik eğitimi derslerine yönelik tutum ölçeği geliştirilmesi. *Gazi Üniversitesi Gazi Eğitim Fakültesi Derg.* **2008**, *28*, 17–29.
34. Duatepe, A.; Çilesiz, Ş. Matematik tutum ölçeği geliştirilmesi. *Hacet. Üniversitesi Eğitim Fakültesi Derg.* **1999**, *16*, 45–52.
35. Büyüköztürk, Ş. *Sosyal Bilimler İçin Veri Analizi el Kitabı: İstatistik, Araştırma Deseni, SPSS Uygulamaları ve Yorum (26. Baskı)*; Pegem Akademi: Ankara, Turkey, 2019.
36. Eşmekaya, E. Faktör analizi (factor analysis). *YBS Ansiklopedi* **2019**, *7*, 24–35.

37. Karaman, H.; Atar, B.; Aktan, D.Ç. Açımlayıcı faktör analizinde kullanılan faktör çıkartma yöntemlerinin karşılaştırılması. *Gazi Üniversitesi Gazi Eğitim Fakültesi Derg.* **2017**, *37*, 1173–1193. [CrossRef]
38. Harrington, D. *Confirmatory Factor Analysis*; Oxford University Press: Oxford, NY, USA, 2009.
39. Sümer, N. Yapısal Eşitlik Modelleri: Temel Kavramlar ve Örnek Uygulamalar. *Türk Psikol. Yazıları* **2000**.
40. Jöreskog, K.G.; Sörbom, D. LISREL 8: Structural equation modeling with the SIMPLIS command language. *Sci. Softw. Int.* **1993**. Available online: https://books.google.com.tr/books?hl=tr&lr=&id=f61i3quHcv4C&oi=fnd&pg=PR15&dq=.+LISREL+8:+Structural+equation+modeling+with+the+SIMPLIS+command+language.+Sci.+Softw.+Int&ots=ujEquj0B3u&sig=_GaEZOf9ngAVLC5WJgLpYDn409g&redir_esc=y#v=onepage&q=.%20LISREL%208%3A%20Structural%20equation%20modeling%20with%20the%20SIMPLIS%20command%20language.%20Sci.%20Softw.%20Int&f=false (accessed on 20 August 2022).
41. Brown, T.A. *Confirmatory Factor Analysis for Applied Research*; Guilford Publications: New York, NY, USA, 2006.
42. Majid, A.N.; Rohaeti, E. The effect of Context-Based Chemistry learning on student achievement and attitude. *Am. J. Educ. Res.* **2018**, *6*, 836–839. [CrossRef]
43. Ramdhony, D.; Mooneeapen, O.; Dooshila, M.; Kokil, K. A study of university students' attitude towards integration of information technology in higher education in Mauritius. *High. Educ. Q.* **2021**, *75*, 348–363. [CrossRef]
44. Ardies, J.; De Maeyer, S.; Gijbels, D.; Van Keulen, H. Students attitudes towards technology. *Int. J. Technol. Des. Educ.* **2015**, *25*, 43–65. [CrossRef]
45. Davis, F.D. A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. Doctoral Dissertation, Massachusetts Institute of Technology, Cambridge, MA, USA, 1985.
46. Davis, F.D.; Bagozzi, R.P.; Warshaw, P.R. Extrinsic and intrinsic motivation to use computers in the workplace. *J. Appl. Soc. Psychol.* **1992**, *22*, 111–132. [CrossRef]
47. Chang, A. UTAUT and UTAUT 2: A review and agenda for future research. *Winners* **2012**, *13*, 10–114. [CrossRef]
48. Mishra, P.; Koehler, M.J. Technological pedagogical content knowledge: A framework for teacher knowledge. *Teach. Coll. Rec.* **2006**, *108*, 1017–1054. [CrossRef]
49. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* **1989**, *13*, 319–340. [CrossRef]
50. Bandura, A. *Social Foundations of Thought and Action: A Social Cognitive Theory*; Prentice Hall: Englewood Cliffs, NJ, USA, 1986.
51. Garland, K.J.; Noyes, J.M. Computer attitude scales: How relevant today? *Comput. Hum. Behav.* **2008**, *24*, 563–575. [CrossRef]
52. Woodrow, J.E.J. A Comparison of Four Computer Attitude Scales. *J. Educ. Comput. Res.* **1991**, *7*, 165–187. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.