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| Research Article / Araştırma Makalesi |

The Evolution Usefulness Scale: Development, Reliability, and Validity[1]

Evrim Yararlılık Ölçeği : Geliştirme, Güvenirlilik ve Geçerlilik Çalışmaları[1]

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Keywords
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2.scale development
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Abstract

Purpose: The aim of the current study was to develop a scale to measure the perceived usefulness of the evolutionary theory among biology students who are pre-service teachers.

Design/Methodology/Approach: Firstly, the related literature was analysed to compose a scale, and then the item pool was constructed. The pilot form of the scale was administered to the biology teacher candidates, and the factorial structure and reliability were analysed via explanatory factor analyses and Cronbach's Alpha coefficient. Then, the final form of the scale was composed based on the results of the pilot testing. The study group of the research included 222 biology teacher candidates. Explanatory and confirmatory factor analyses were conducted to obtain proof on construct validity.

Findings: As a result of these analyses, it was decided that the scale has a unidimensional structure with 58.6% explained variance. As for reliability, Cronbach's Alpha coefficient was estimated, and it was found as .94, which indicates a high level of inter-consistency. At the end of the study, it was concluded that the Evolution Usefulness Scale (EUS), which includes 13 items, can measure the perceived usefulness of the theory of evolution in a valid and reliable manner.

Highlights: It is thought that developing a scale that will determine whether the theory of evolution is useful in understanding other biology topics will fill the gap in the field

Öz

Çalışmanın amacı: Bu çalışmanın amacı evrim teorisini öğrenmenin biyolojinin diğer konularını öğrenmeye faydasının olup olmadığını belirlemek için evrim yararlılık ölçeği geliştirmektir

Materyal ve Yöntem: Ölçek için ilgili literatür incelenmiş ve madde havuzu oluşturulmuştur. Ölçeğin pilot formu biyoloji öğretmen adaylarına uygulanmış, faktör yapısı ve güvenirliği açıklayıcı faktör analizleri ve Cronbach's Alpha katsayısı ile incelenmiştir. Daha sonra, pilot test sonuçlarına göre ölçeğin son formu oluşturulmuştur. Araştırmanın çalışma grubu 222 biyoloji öğretmeni adayından oluşmaktadır. Yapı geçerliliğini kanıtlamak için açıklayıcı ve doğrulayıcı faktör analizleri yapılmıştır.

Bulgular: Analizler sonucunda ölçeğin tek boyutlu bir yapıya sahip olduğu ve % 58.6 varyans açıkladığı görülmüştür. Ölçeğin güvenirliliğini incelemek amacıyla Cronbach Alfa iç tutarlılık katsayısı hesaplanmış ve 0,94 olduğu bulunmuştur. Çalışma sonunda 13 maddeden oluşan Evrim Yararlılık Ölçeği'nin (EYÖ) evrim teorisinin algılanan faydasını geçerli ve güvenilir bir şekilde ölçebileceği sonucuna varıldı.

Önemli Vurgular: Evrim teorisinin biyolojinin diğer konularını anlamaya faydasının olup olmadığını belirleyecek bir ölçek geliştirmenin alandaki boşluğu dolduracağı düşünülmektedir.

[1] This paper is based on a portion of the first author's dissertation research, which was directed by the second author.

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INTRODUCTION

"Evolutionary theory is the central and unifying theme of the discipline of biology "(Rutledge and Warden, 1999). It is possible to see direct and indirect referencing to it in nearly all of the studies linked to the theory of evolution. If the person reading such a statement in a research document or alike and if it is this person's first encounter with biology, he/she may consider that there is no debate on the theory of evolution and it is a generally accepted one all over the world. However, the study of Gallup (2014) has shown that this is not the case. According to Sadler et al. (2004), who has integrated evolution into the socio-scientific issues, it has become so natural for evolution to be discussed in relation to its turning out to be a rather socio-scientific subject which is controversial and open to discussion. With that being said, even though there are some researchers who have directly stated that there has been a discussion about the theory of evolution (Barnes and Brownell, 2018; Konnemann et al., 2016; Village and Baker, 2013), the generally accepted view in scientific communities is that the evolution is indisputable (Moore, 2000; Nelson and Skehan, 2000; Rutladge and Warden, 2000; Scharman, 2005; Skybreak, 2006). According to us, it is quite natural that the theory of evolution is one of the most extensively discussed topics in the socio-scientific field. The reason is straightforward; the theory of evolution makes claims about human existence. Every person has some value judgments about the process of existence that may be learned or believed, and at the end of the process, these judgments become attitudes. Besides, these value judgments have created some problems in the teaching the theory of evolution (Bergman, 1979; BouJoude et al., Asghar, et al., 2010; Dagher and BouJaoude, 1997; Evans, 2001; Hill, 2014; Ingram and Nelson, 2006; Rissler et al., 2014).

The other statement that evolutionary theory postulates is that "Nothing in biology makes sense without the interference of evolution" (Dobzhansky, 1973). Moreover, in many studies, the theory of evolution has been described as follows; "the cornerstone of biology" (Trani, 2004); "the unifying part of biology" (Rutledge and Warden, 1999; NABT,2004; Wiles and Asghar, 2007); "backbone of the biology" (Archila and Molina, 2018; Lovely and Kondrick, 2008). Based on these concepts, researchers frequently assert that topics such as cell, heredity, reproduction cannot be understood without knowing the theory of evolution (e.g. Bishop and Anderson, 1990; Dobshansky, 1973; Nadelson and Sinatra, 2009; Skybreak, 2006). When these studies' results are examined, one may encounter some findings like that; half of the attendants of biology classes do not actually accept the importance of evolution (Rice et al.,2010). In line with these statements, the labels like "cornerstone", "unifying component", and "backbone" are very deliberately strong statements that have often been resorted to with a view to decreasing the negative attitude towards the theory and in return increase the importance to be attached to it.

Popper (1957), stated the following, though hesitantly owing to the fear of being criticized by the evolutionists, underpinning that these expressions are indeed emotional;

> *"Feeling somewhat intimidated by the tendency of evolutionists to suspect anyone of obscurantism who does not share their emotional attitude towards evolution as a 'daring and revolutionary challenge to traditional thought', ... A good illustration of the emotional attitude of evolutionists is C. H. Waddington statement that 'we must accept the direction of evolution as good simply because it is good. (p. 106)"*

Although he was intimidated by evolutionists, Popper (1957) did not refrain from accentuating the aforementioned words and also from that such statements in the relevant studies are, assumed in research, and were emotional expressions of those who carried out the studies. When the literature on the teaching of evolution theory is examined, it would be fair to state that there is no data to support those who expressed these emotional statements with Popper's words (Grimes, 2012; Shankar, 1989). As Popper (1957) stated, Skybreak (2009) also tried to explain his ideas about evolution by using emotional expressions without supporting them with scientific data;

> *"And the basic principles and mechanisms of evolution are so fundamental, lie so much at the core of all modern science (including in fields like geology, archaeology, astronomy, etc.) that it really is no exaggeration to say that, in today's world, without the science of evolution there would be no science. (p. 182)"*

Scientists defend the theory of evolution as an absolute truth of biology, cell biology, and believe that the data and experimental results of genetic and molecular biology would gain meaning if evaluated in the framework of evolutionary analysis. They also pinpoint that evolution is not only the unifying element of biology, but it is the unifying element of all the other branches of science, so everyone accepts the theory of evolution and scientific knowledge should be interpreted according to the theory (Asghar et al., 2007; Ayala, 2013; Berkman and Plutzer, 2011; Bishop and Anderson, 1990; Clough, 1994; Dobshansky, 1973; Johnson and Peeples, 1987; Lewontin, 1981; Lord and Marino, 19993; Rutledge and Warden, 2000; Sagan, 1980; Schilders et al., 2009; Skeybreak, 2006; Williams, 2009). However, in his book entitled "The Philosophy of Biology", Sober (2000) was unable to answer the question as to whether the evolution theory could be said to be central and unifying and whether anything could be accentuated on top of that assumption, and thusly he had to leave the very answer to the readers. The lack of understanding and rejection of the theory of evolution among high school and undergraduate students and biology teachers has been one of the most crucial and researched topics, and this issue has been tried to be solved by a good number of scholars (e.g. Aguillard, 1999; Alter and Nelson, 2002; Banet and Ayuso, 2003; Blackwell et al., 2003; Bybee, 2001; Dagher and BouJoudae, 2005; Kampourakis and Zogza, 2007; Kim and Nehm, 2010; Nunez et al., 2012; Pazza et al., 2010; Weld and McNew, 1999).

On the other hand, it has been witnessed that there is a lack of studies investigating how the theory affects students' attitudes and interests towards biology. Several researchers have found that the rejection or acceptance of evolution theory may create social and affective influences (Brem et al., 2003). Teaching this theory from an evolutionary perspective determines its usefulness

and points to the fact that how the teaching of biology and the theory of evolution should be carried out are essential issues to be analyzed (Scharmann, 2005; Pennock, 2010).

Regarding the related studies, the usefulness of the theory of evolution for the learners can be categorized as follows:

- The comprehension of the subject of biology (Bishop and Anderson, 1990)
- The comprehension of basic sciences (Skeybreak, 2006)
- The development of scientific thoughts (Bybee, 1997)
- The understanding of life (Lewontin, 1981)
- The development of a world view (Schilders et al., 2009)

These listed concepts are the crucial manifestations of learning the theory of evolution. However, there is no study revealing that the learners adopt these concepts and see any usefulness in them. Upon analysing the related studies about the teaching of evolution, the major headings are a) the factors hindering the acceptance of the theory; b) the negative attitudes towards the theory and the reasons for that situation; c) the things that should be done to change the negative attitudes towards the theory; d) the determination of the knowledge of evolution. Although it is emphasized in many studies that the theory of evolution is necessary to understand and make progress in biology and the other disciplines, this has not been converted into statistical data and there is a clear gap in the literature regarding that. The present study aims to develop a scale that measures the usefulness of the evolutionary theory in studying biology to fill in the relevant gap in the literature and explore the situation. Moreover, this scale reveals the perceptions of the students regarding the usefulness of the evolutionary theory, which again carries a potential for contributions to the related literature.

METHOD/MATERIALS

Participants

This study was designed as a scale development research, and the scale development steps stated by DeVellis (2003) were followed. The study population is comprised of 10 public universities in Turkey, which have the Department of Biology Teaching. Due to the limited number of students studying in this department, the convenient sampling method was employed, and the teacher candidates' willingness was taken into account in that sense. The data required for the research were collected from 240 teacher candidates studying in the 3rd, 4th, and 5th grades of biology programs in the faculties of education of four different universities representing the population. Of the 240 responses received, 222 yielded a complete data set. Therefore, the analyses were carried out with the data of 222 teacher candidates. Most of the total sample was females, with 176 individuals, and only 46 participants were males.

Instrument

The instrument was designed to determine prospective biology teachers' perceptions about the evolution theory's usefulness. The item generation process was initiated with the literature review. At this stage, similar scales, as well as the issues pertinent to the education of evolution theory were analysed, and after a comprehensive investigation of the studies, an item pool regarding the usefulness of the evolution theory was formed. Items were prepared as a 5-point Likert scale ranging from "strongly agree" to "strongly disagree." The item pool, including 30 items, was presented to the expert group, composed of experts, of the Turkish language, and those of measurement and evaluation. The experts were asked to provide inputs on the item's relevancy, adequacy, accuracy, and wording. From the item pool, 13 items were selected based on expert opinions. Of 13 items, three items were negatively worded. Then, a pilot study was conducted to check the scale items' comprehensibility. Explanatory Factor Analyses (EFA) were conducted using the pilot study data, and it was found that the scale had a unidimensional structure with 56, 92 % percent explained variance ratio. For internal consistency, the Cronbach Alpha coefficient was utilized, and it was found as .93. After analysing the findings, it was decided that the scale was suitable for field application. The translation of scale items to English was presented in Appendix A.

Data Analyses

Item analyses and factor analyses were utilized to validate and check the reliability of the developed scale. Firstly, the descriptive statistics were calculated at the item and the whole scale level. In the second step, the EFA was conducted, and then the Confirmatory Factor Analysis (CFA) was done to investigate the validity of the scale scores. Before factor analyses, the analyses' assumptions, e.g., missing values, outliers, homogeneity, and normality, were tested. According to the results of missing value analyses, it was found that there were 18 cases including missing values, and they had a random pattern. Hence the cases with missing values were excluded from the data set. With respect to outliers, univariate and multivariate outlier investigations were conducted. For univariate outliers, Z scores were calculated from the participant's total scores, and three were accepted as a lower-bound value for Z scores (Tabachnick and Fidell, 2006). Mahalanobis distances were calculated to detect multivariate outliers, and there were no multivariate outliers. Then, the normality assumption was tested by calculating skewness and kurtosis values. The normality test findings indicated that all of the values were within the recommended levels (-1 and 1), so it was concluded that the normality assumption was met for the data set.

After checking the assumptions, factor analyses were performed. For EFA, Kaiser-Meyer-Olkin (KMO) and Bartlett Test of Sphericity were estimated. As for factor loadings, 0,32, which was suggested by Tabachnick and Fidell (2006), was accepted as a threshold value. The EFA was applied by the Principal Component Analysis (PCA) method. The techniques used to select the number of factors included (a) Kaiser's criterion for those factors with an eigenvalue greater than one, (b) the Cattell's scree plot test, (c) cumulative percent of variance extracted, and (d) factor interpretability and usefulness. CFA was utilized to prove the composed scale's construct validity, and the Maximum Likelihood estimation method was applied. Several statistical tests were used to determine the model-data fit. The tests are enlisted as the Chi-Square Goodness Test, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). Finally, to check the scale's validity, Cronbach Alpha coefficients were calculated, and the findings were interpreted.

FINDINGS

The first finding of the data analyses is the descriptive statistics of total and item scores. The estimated descriptive statistics were presented in Table 1.

Table 1. Descriptive statistics of total score

	N	Mode	Minimum	Maximum	Range	Mean	SD	Skewness	Kurtosis
Total Score	222	39	13	65	52	41,12	11,93	,000	,-413

The values in Table 1 indicate that the total score showed a normal distribution. The range of the scores was calculated as 52, which shows a wide score variety. Hence it can be concluded that the items of the scale measure range of the psychological feature. Also, skewness and kurtosis values were acceptable, so these statistics proved the normality of distribution. The distribution of the scores was shown as a graph below.

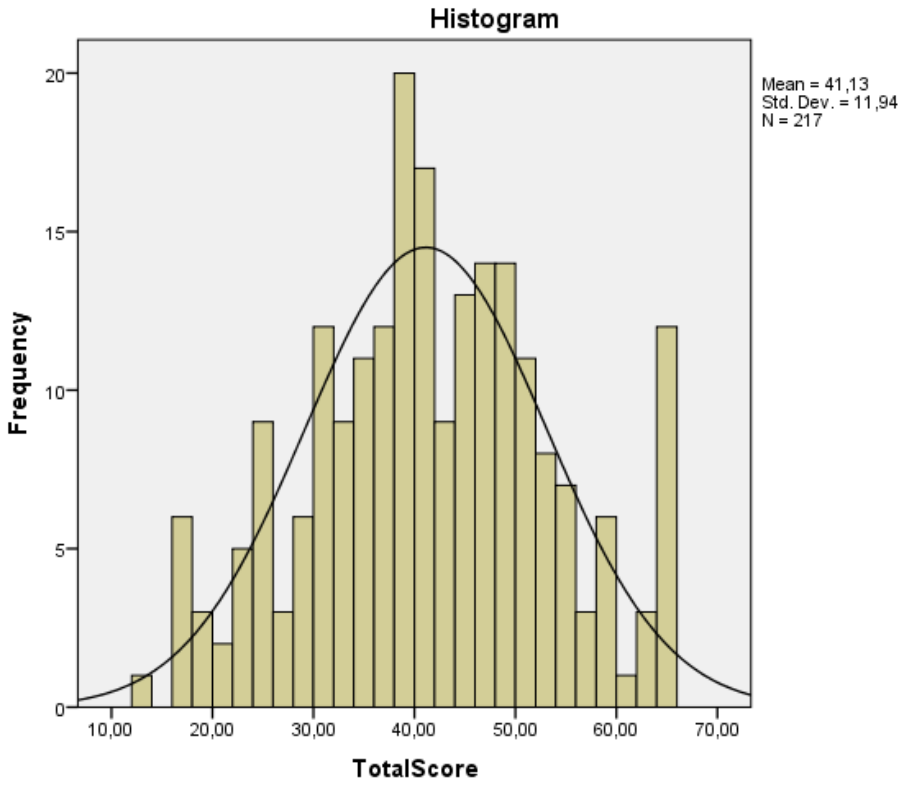

Figure 1. The normal distribution of graph

Figure 1 demonstrates that the participants' total score had a normal distribution. There are few participants at the extreme values, and most of the participants are at the moderate levels. These graphs establish the normality of the scores. The item statistics followed the results. In Table 2, the correlations between the items are presented.

Table 2. Item correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.00												
2	.74	1.00											
3	.59	.57	1.00										
4	.53	.57	.29	1.00									
5	.58	.63	.38	.65	1.00								
6	.51	.42	.56	.34	.33	1.00							
7	.54	.49	.47	.36	.42	.49	1.00						
8	.60	.56	.42	.46	.52	.43	.46	1.00					
9	.64	.59	.46	.48	.49	.46	.47	.71	1.00				
10	.58	.60	.42	.53	.45	.40	.51	.65	.81	1.00			
11	.74	.69	.52	.52	.58	.46	.48	.56	.70	.66	1.00		
12	.67	.61	.45	.53	.56	.43	.49	.52	.52	.59	.68	1.00	
13	.68	.63	.48	.59	.58	.45	.50	.57	.65	.66	.70	.68	1.00

When the item correlation matrix was examined, it was found that the lowest correlations were found between the third and fourth items (r = 0.29), and the highest correlation coefficient was found between the ninth and tenth items (r = 0.81). Although the correlation between the ninth and tenth items might indicate that the two items are similar, it was determined that the two items were different based on expert opinion. Therefore, these items were not excluded from the instrument. In addition to the correlations between the items, item-total correlation coefficients were calculated and given in Table 3.

Validity Analyses

After the descriptive statistics, to discover the scale's factor structure, EFA was applied, and the first finding of the first application of the analysis is the KMO value that was found as ,95, indicating that the sample size was quite sufficient for the analyses. Besides, the assumption of homogeneity was investigated via Bartlett's Test for Sphericity, found as p≤.05. After the statistical tests about the sample size and homogeneity, a screen test was conducted to determine the number of factors, and scree plot graphs were utilized. Factors with an eigenvalue greater than 1 and a scree plot graph in Figure 1 showed that the scale had a one-dimensional structure.

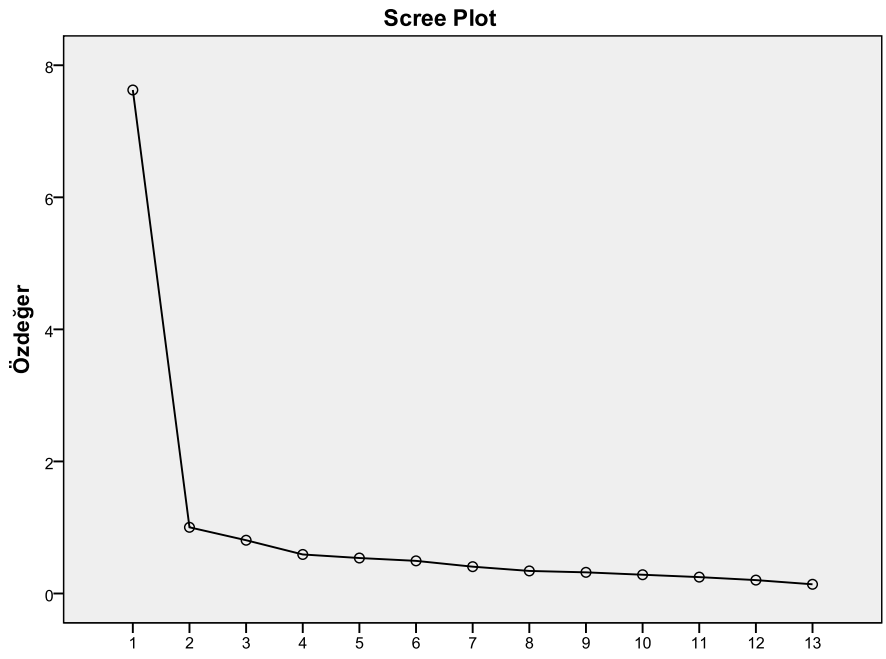

Figure 2. EUS scree-plot

When the factor structure of one-dimensional EUS was examined, it was found that the factor loadings of the items ranged between 0.38 and 0.73. Item variances varied between 0.62 and 0.82 (Table 2), and no items were excluded. As a result, it was found out that EUS has a unidimensional factor structure with 13 items which explains 58.66% of the total variance. Information regarding the factor structure of EUS is presented in Table 3.

Table 3. Item correlation matrix EES factor structure

Items	Variance	Factor Loading
1	.85	.73
2	.82	.68
3	.66	.43
4	.69	.48
5	.72	.52
6	.62	.38
7	.66	.44
8	.76	.57
9	.81	.66
10	.80	.64
11	.84	.71
12	.78	.62
13	.83	.69
Total Variance Explained		%58.66

It was concluded that the scale has a unidimensional structure considering the explained variance and item loadings. Then, CFA tested this factor structure, and the first finding is the Path Diagram, given below.

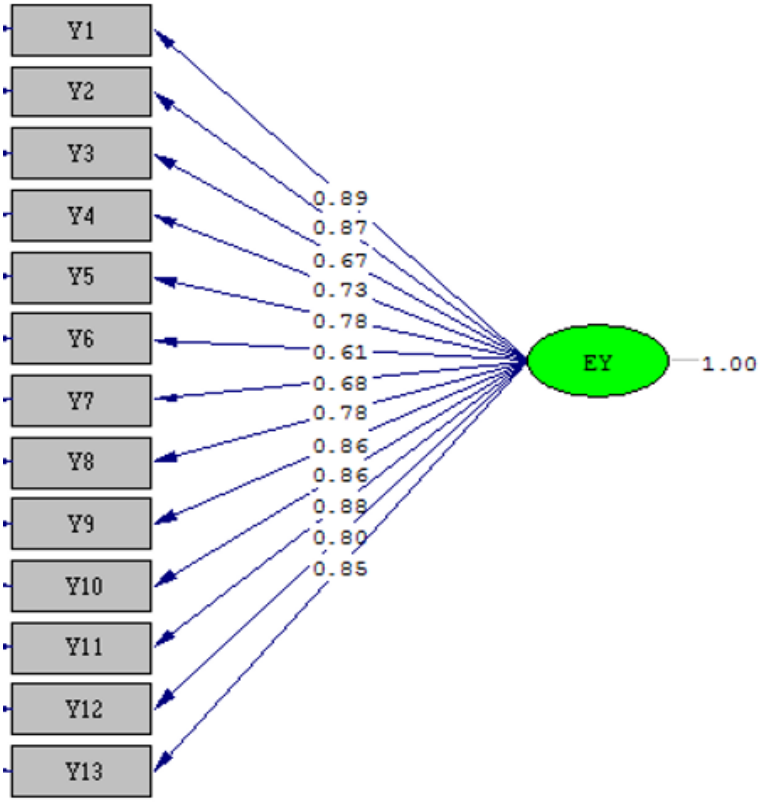

Figure 3. The path-diagram of the CFA

In Figure 3, the path-diagram was given, and the linear relationship between the items and the latent variable can be seen. Firstly, the t-values of the items were analysed, and they were found significant at .01 level. These results indicated that all of the items are significant predictors of the latent variable. After the t values in the path diagram, standardized coefficients were examined, and all of them were above .50. Hence, it can be concluded that the error variances are low, and the reliability of the scale is high.

After item-level analyses, the model-data fit was analysed in terms of fit indexes. For the interpretation of the results, the accepted threshold values suggested by Schermelleh-Engel, Moosbrugger & Müller (2003) were given in Table 4.

Table 4. The indexes thresholds used in the evaluation of model-data fit

Model-Data Fit Indexes	Good Fit	Acceptable Fit
RMSEA	0< RMSEA< 0.05	0.05< RMSEA< 0.10
SRMR	0≤ SRMR≤ 0.05	0.05≤ SRMR≤ 0.10
NFI	0.95≤ NFI≤ 1	0.90≤ NFI≤ 0.95
NNFI	0.97≤ NNFI≤ 1	0.95≤ NNFI≤ 0.97
CFI	0.97≤ CFI≤ 1	0.95≤ CFI≤ 0.97
GFI	0.95≤ GFI≤ 1	0.90≤ GFI≤ 0.95
AGFI	0.90≤ AGFI≤ 1	0.85≤ AGFI≤ 0.90

The calculated values for the EUS were reported in the following table considering the model-data fit indexes.

Table 5. The model-data fit indexes calculated for the tested model

Indexes	CFI	NFI	AGFI	IFI	GFI	SRMR	X^2/df	RMSEA
Values	0.97	0.97	0.99	0.97	0.99	0.057	3.101	0.098

Upon examining the model-data fit, indexes for the proposed model were performed and GFI, was calculated as .99 and showed an acceptable level of model-data fit. Like GFI, AGFI was estimated as .99, and it is higher than the thresholds, too. However, there are more indexes to be interpreted before concluding the model-data fit. The SRMR (0.057) and RMSEA (0.009) were estimated within boundaries of thresholds and indicated a moderate level of model-data fit. The other statistics, IFI and CFI, were higher than .95, showing a high model-data fit. Lastly, the X2/df ratio was found as 3.101, which shows a high level of model-data fit. When all indexes and item loadings are evaluated together, it is concluded that the model-data fit is at a high level. In conclusion, the results of CFA provided proof for the construct validity of the developed scale.

Reliability

Cronbach Alpha internal consistency coefficient was calculated to examine the reliability of the scale. The alpha coefficient calculated for EUS (σ = .94) showed that the scale's reliability is very high. Based on these results, it can be said that EUS is an instrument with high validity and reliability. The scale's reliability was analysed in terms of item statistics, and the findings were given in Table 6 below.

Table 6. Internal consistency reliability statistics for the EUS

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
1	38.05	117.89	.82	.72	.932
2	37.73	120.22	.78	.67	.934
3	38.15	124.29	.61	.49	.939
4	37.63	125.87	.63	.54	.938
5	37.65	124.39	.67	.58	.937
6	38.19	126.74	.57	.43	.940
7	37.80	124.16	.61	.42	.939
8	37.87	121.83	.71	.58	.936
9	38.22	120.37	.77	.76	.934
10	38.04	120.10	.75	.74	.934
11	38.00	119.64	.80	.70	.933
12	38.20	122.07	.74	.61	.935
13	37.96	119.31	.79	.65	.933

When the item-total correlations are analysed, all values are higher than .40, which is the critical value for item discrimination (Tabachnick and Fidell, 2006). Table 6 shows that the correlation between items is r = .57 and .82; therefore, all the items are suitable for the scale. Hence, it can be concluded that item discrimination levels are high, so the items have the power to discriminate against the individuals.

CONCLUSION

When the literature is reviewed, although there exist evolutionary acceptance/ attitude/knowledge scales and tests in the literature and the researchers frequently use them, no study involving an evolution usefulness scale has been found. Through this study, the Evolution Usefulness Scale (EUS) was developed to determine the usefulness of evolution to fill this literature gap. This scale can be used to examine whether the theory of evolution helps the students enrolled at the biology teaching departments and biology teachers better understand biology as a field of study and discipline.

When the studies conducted in the last five decades are examined, it is emphasized that the theory of evolution constitutes a useful and unifying element not only in the field of biology but also in fields such as engineering, medicine, and chemistry. Dobshansky's (1973) article entitled "Nothing in biology makes sense except in the light of evolution," which is referred to in almost all studies and used widely to express the importance of evolution theory, is the focus of the reason for the development of this scale. That said, such a fundamental assumption as the one put forward by Dobshansky (1973) is to be supported by scientific data. Considering the studies on biology education; such issues as the acceptance of the theory of evolution, the level of knowledge of evolution, the factors that complicate the acceptance of evolution and what must be done to address them; negative attitudes towards evolution and their causes; attempts to change the opposing attitudes form the basis for the main framework of the research. In analysing these subjects, it was found that such instruments as evolution acceptance and evolution attitude scales and evolution knowledge tests were used extensively. Nonetheless, whether the theory is the unifying and backbone element in biology and other scientific fields, hitherto has not been researched in a scientific fashion. Further to that, the subject of the evolution theory's usefulness only adorns the articles' introduction sentence, and there is no statistical data shared on the subject.

All these highlight the primary purpose of the evolution usefulness scale composed of 13 items developed in this study. As a result of the study, it was determined that the reliability and validity of the EUS scale were high. The scale can help analyse the views of the ones studying biology regarding whether learning the theory of evolution assist in better learning of biology and its branches such as molecular biology, genetics, and systematic.

Disclosure statement

No potential conflict of interest was reported by the authors.

Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Examples of author contribution statements

The first author conceived of the presented idea. The first author reviewed the literature, collected and prepared the data for analysis, and reported the study. Both authors discussed the results and contributed to the final manuscript. The second author encouraged the first author to investigate and supervised the findings of this work.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

Due to the facts that the study was conducted before 2020 and involved document analysis, approval of an ethics committee was not obtained.

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Appendix A.

English translation of the Turkish version of the Evolution Usefulness Scale

The Evolution Usefulness Scale Instrument

For the following items, please indicate your agreement/disagreement with the given statements using the following scale.

A	B	C	D	E
Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree

1) I think that the course on evolution is a unifying part of the topics in biology.
2) The theory of evolution is an important subject of biology.
3) The importance of the theory of evolution in the field of biology is exaggerated.
4) The course on evolution contributes to understanding the topic of mutation.
5) The course on evolution contributes to understanding the topic of speciation.
6) The course on evolution is misleading about the classification of living beings in biology.
7) The course on evolution was not helpful for me to understand other topics of biology.
8) The course on evolution has increased my interest in documentaries about biology.
9) The course on evolution has increased my interest in biology laboratories.
10) The course on evolution has provided me to observe nature more.
11) The theory of evolution has shed light on the developments in biology.
12) Evolutionary studies are beneficial in finding out the treatments of fatal diseases of our age.
13) The course on evolution contributes to understanding molecular biology.