ORIGINAL ARTICLE

Development of an Attitude Scale on Activities Related to Biology and Nature for Mentally Disabled Students

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***Abstract**: The aim of this study is to develop a valid and reliable scale to determine the attitudes towards the activities that can be applied to the mentally retarded students about biology and nature. During the preparation of the draft form of the scale, an item pool was created from relevant literature. Then, these items were presented to expert opinion in terms of language, intelligibility and content. This draft scale with 30 items in 5-point Likert type was applied to 177 pre-service teachers studying in the special education department of the faculty of education at a state university. Item analysis, exploratory factor analysis and confirmatory factor analysis were performed for the data collected after the application. As a result of the analyses, it was revealed that the scale had a five-factor structure consisting of 20 items. Confirmatory factor analysis revealed that the factor structure was compatible with the data. Goodness of fit index values was sufficient. The Cronbach Alpha internal consistency coefficient of the scale was calculated as 0.89. It can be said that the scale is valid and reliable in determining the views of pre-service teachers about the activities to be applied for mentally retarded students. In addition, the scale is suitable not only for teacher candidates, but also for use by teachers and researchers. In addition, different types of samples such as students in other fields at the undergraduate level and special education teachers who take courses related to special education can be included in the study group.*

Science Insights Education Frontiers 2023; 18(2):2885-2904.
Doi: 10.15354/sief.23.or416

How to Cite: Gul, S., Ozay Kose, E., & Ozdemir, B. (2023). Development of an attitude scale on activities related to biology and nature for mentally disabled

students. Science Insights Education Frontiers, 18(2):2885-2904.

Keywords: *Biology and Nature, Mentally Disabled Students, Teacher Attitude, Scale Development*

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Conflict of Interests*: None*

Introduction

BIOLOGICAL science has provided important services for the benefit of people in every period and its importance has increased in our age. Biology education prepares individuals to help them make social, psychological and personal decisions, as well as to help them with their problems such as health, nutrition, environmental protection and love. Biological science does this both by collecting information through research and by explaining the negative effects of humans on this balance by examining the "natural" relationships between living things. Biology is an important basic science with both scientific and social aspects that directly involves human beings (Yetkin, 1998).

In the biology course curriculum, it was emphasized that the students' knowledge, skills, competence and values should be developed in relation to the interactions between science-technology-society-environment. Student-centred education model is dominant in our country and students with special educational needs also benefit from the programs prepared (Özyürek, 2009). Individual differences, which are based on various factors such as heredity, environment, and culture, manifest themselves in various dimensions such as interests, needs, and tendencies. However, this situation includes differences both among individuals and within the individual. Considering these differences, the biology curriculum was prepared by considering the sensitivities regarding individual differences (Ministry of National Education [MoNE], 2018). The MoNE defines the individual in need of special education as “an individual who, for various reasons, differs significantly from her/his peers in terms of individual characteristics and educational qualifications” (MoNE, 2018). Individuals with special educational needs may differ from each other in terms of various types and levels of disability such as mental, emotional, social, physical and communication (Cavkaytar, 2015; Yazici & Sözbilir, 2022). In our country, the number of students with special education needs is high and it is the duty of teachers and society to get these students a good education (Sözbilir et al., 2015). Like individuals with normal development, individuals who need special education can continue their development in their daily lives and participate in social life with the education given to them. Through education, individuals gain the ability to meet their needs, communicate with the people around them, and ultimately become a productive and independent person in society. However, ensuring that individuals live together with healthy individuals is carried out with the education methods applied. Individuals requiring special education include visually impaired, hearing impaired, mentally disabled and gifted individuals. This research includes individuals with mental disabilities. Mental disability is a condition that occurs due to various reasons and affects the life of the individual. In the related literature, mental disability is defined in various

ways. Definitions are made in different ways depending on the reasons for the formation of mental disability or its effects on the individual (Çağlayan, 2014). According to the World Health Organization (WHO), mental disability is a state of cessation or incompleteness of mental development characterized by the low level of skills that contribute to the general level of intelligence, such as cognitive, language, motor and social skills that occur especially during the developmental period (WHO, 1996). Similarly, the indicators of an individual's mental disability are as follows; social inadequacy, being mentally below normal, pauses and interruptions in development, delayed maturation, a structural cause, and an incurable condition (Karaelmas, 1998). Eripek (2012) stated that the most important feature that distinguishes individuals with mental disability from their normal peers is their inability to learn. According to Jensen (1998), the only proof of something learned is memory. Students with mental disabilities forget information faster than children with normal development because they cannot transfer information from short-term memory to long-term memory. Not having the right information about these children who show incompetence in the classroom causes them to be called mischievous or useless. However, Gardner (2013) emphasizes that a mentally disabled student can learn some of them even if they are insufficient in learning some knowledge and skills, or what they learn can be permanent when they use some intelligence areas. The mentally retarded individual may have limited perception difficulties for various reasons. However, each individual has different abilities and potentials with various limitations. Each individual has unique abilities, physical, and mental sensory and social characteristics. In order to eliminate the limitations of students with mental disabilities in their academic skills, these individuals their performance levels, taking into account their training needs. It is necessary to organize and carry out an education and training process that they can use at the highest level. In line with the ages, learning characteristics of these students, education and training processes should be planned. Functional planning of these plans for teaching academic skills considering the limitations in academic skills and these skill areas are literacy, mathematics, science and social sciences. It is quite possible to cover all areas such as information is important (Özok ɕı, 2018). These should be considered, especially in science and nature education (Uslu, 2008). Aslan and Kurt (2021) stated in their study that inclusive students were indifferent to the lesson due to their low learning levels, and they also had problems in crowded classrooms. In the study of Denizli and Uzoğlu (2016), in which they determined the views of science teachers on inclusive education, it was determined that the teachers had problems with the overcrowding of the classroom and the distraction of the students in the lesson.

Nature is a field that plays a very important role in the psychological and physical development of children. Nature and natural elements should be

included outdoors as much as possible for the education of individuals. According to the "Biophilia" hypothesis advocated by Edward Wilson, the genotype of human includes love of nature and the desire to exist in nature. Well; there is an innate and instinctive tendency in human genes to living systems and organisms. Love of living things (Biophilia), loving life and living systems, that is, being together with other living organisms keeps it alive and this situation ensures the continuity of life (Wilson, 1993). Natural areas also play an important role in the development of children's creativity. Researchers have found that children in areas with higher diversity in topography and vegetation designed with natural elements have higher levels of concentration, motor skills and social activities (Uslu & Shakouri, 2012).

Biology and nature-related activities contribute to the cognitive and sensory development of the individual to the extent of their abilities. In addition, such activities psychologically support the development of individuals by giving them a sense of confidence and achievement, so they are accepted as members of the society as they will become productive. One of the biggest indicators of disability, the inability of the disabled individual to participate in the social life, is also destroyed in a sense. It is important not only for the disabled individual but also for the society and family of the disabled individual that the disabled individual participates in a productive activity in terms of education and job opportunities. As the physical and mental abilities of the disabled person are developed, they will be more independent and productive (Uslu, 2012).

Aslan and Kurt (2021), in their study, stated that biology teachers should teach inclusive students primarily the information that will be useful to the student in daily life. They also stated that it is necessary to provide an education based on visuals, where they can learn by doing and experiencing. Akkuş (2019) examined the views of science teachers about inclusive education and found that teachers used learning by doing, visual materials and videos in order to ensure the active participation of inclusive students in the lesson.

In a study conducted in the United States, it was determined that activities performed in areas designed with natural elements cause positive behavioural changes in children with attention disorders. In the same study, it is reported that these activities have a developing and supportive effect on the focusing skills of children with concentration difficulties. In a study conducted in Chicago, it was observed that children move and play more and are more creative in a playground with high vegetation, while they are relatively less active in playgrounds with poor vegetation (Uslu, 2008).

Special education studies in our country have gained momentum in recent years, and in parallel with these studies, some studies have been started in the field of special education (Sözbilir et al., 2015; Terzioğlu, Akbıyık & Yıkmış, 2023). In particular, publications on inclusion and individu-

alized education have been made available to the reader. However, although there are many teachers working in the field of the mentally handicapped, most of the private and public schools provide education for mentally retarded children and there are departments that train teachers for the field, the scales that researchers, teacher candidates and teachers can use on the mentally handicapped and their education are very limited. It is thought that the existence of scales in various disciplines regarding the mentally handicapped will positively affect both the attitudes of the pre-service teachers in the education process and indirectly the quality of the education provided to the mentally handicapped children. Therefore, the aim of this study is to develop a valid and reliable scale to determine the attitudes towards the activities that can be applied to the mentally retarded students about biology and nature.

Method

In this study, a survey method based on a quantitative research paradigm was utilized. The participants of the study consist of 177 teacher candidates studying in the special education department of a state university in 2022-2023 academic year. Of the teacher candidates, 128 are girls and 49 are boys. The ages of the teacher candidates participating in the study ranged from 17 to 25. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were performed on the same sample due to the insufficient number of teacher candidates in the special education department.

Development of the Measurement Tool

The development process of the scale consists of several stages. These stages include (i) creating item pool, (ii) content and face validity, (iii) application, (iv) construct validity, and (v) reliability analysis (**Figure 1**).

During the preparation of the scale, which was developed in order to determine the attitudes of special education teacher candidates towards activities related to biology and nature for the mentally retarded students, a large-scale literature review was conducted on the subject and similar studies were identified (Aslan & Kurt, 2021; Eripek, 2012; Karakaş, 2018; Özyürek, 2009; Uslu, 2012; Uslu & Shakouri, 2012). As a result of the researches on the subject, the scale items were prepared by the researchers who carried out this study, as well as the items taken from the literature. Thus, a 32-item draft form was developed. The draft scale was examined by two faculty members from the subject area and field education experts. Expressions in the scale were evaluated by experts mainly on the basis of simplicity, clarity, fluency, appropriate use of language, spelling of expressions and intelligibility criteria. In line with the suggestions of the experts, the items that are not suitable for the scope or that reduce the face validity were removed from the

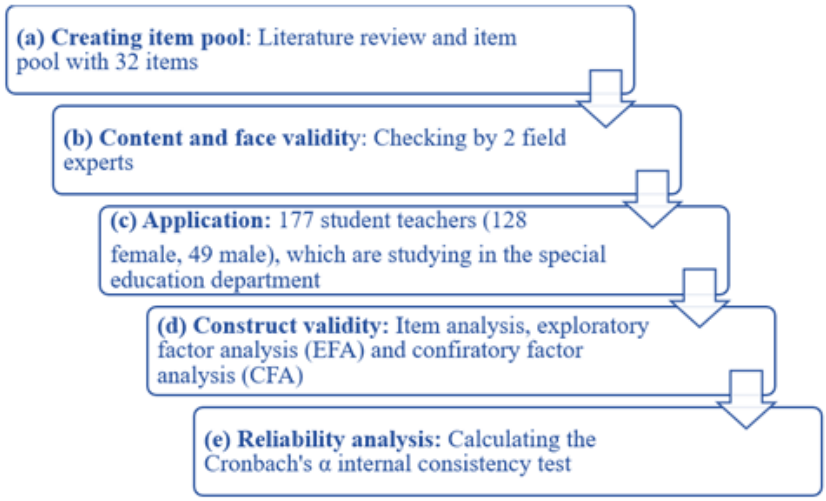

Figure 1. Stages of Scale Development.

draft measurement tool and a draft form of the scale was created out of the remaining 30 items. The items in the draft form of the scale are in 5-point Likert type. All expressions have positive sentence structure.

Validity and Reliability

The draft form of the scale, which was rearranged by making a preliminary examination in line with expert opinions, was applied to the sample group in order to determine the construct validity of the scale, that is, its sub-dimensions, and to determine the level of reliability. Item analysis studies of the attitude scale towards activities related to biology and nature for mentally retarded individuals were carried out with item-scale correlations were examined with Pearson correlation coefficient. Item analysis is the process of determining which items should be included in the developed scale, using various criteria, generally through different statistical techniques (Sunaet et al., 2013). One of the most frequently used analyses in this process is the item-scale total score correlation. In the study, it was examined whether there were items that showed a significant correlation of 0.25 and above with the scale scores as a result of the analysis (Tavşancıl, 2006).

After the item analysis using the SPSS program, the factor structure of the scale was analysed using EFA. EFA is a statistical technique that aims to explain the same construct with fewer variables by gathering together the variables (items) that measure the same construct in the process of collecting

evidence for the construct validity of the scale (Suna et al., 2013; Williams, Brown & Onsman, 2012).

In the EFA, the results of the Bartlett test and Kaiser-Meyer-Olkin (KMO) test were considered for the suitability of the data for factor analysis (Tavşancıl, 2006). It is expected that the Bartlett test result will be significant and the KMO value will be greater than 0.50. In the relevant literature, this value can be evaluated as "good" according to the KMO criterion and indicates that the sample size is sufficient (Leech, Barrett, & Morgan, 2005).

In order to obtain additional evidence for the validity of EFA, CFA based on the structural equation model was performed. The reliability of the final scale obtained after all analyses was examined with the Cronbach Alpha reliability coefficient.

Findings

Item Analysis

In the study, item analysis was performed for each item in the scale. For this purpose, item-total score correlation values explaining the relationship between the scores obtained from the test items and the total score of the test were calculated. According to Özdamar (2004), the fact that the item-total score correlation of the items in the scale is positive and even greater than 0.25 indicates the reliability of the scale. Items that do not comply with this rule are recommended to be removed from the scale. As a result of the item analysis in the study, 2 items (I5 and I26) whose item-total score correlation values were below 0.25 were removed from the scale. Thus, the number of items in the scale was reduced to 28 (**Table 1**).

When the findings in Table 1 are examined, the item-total correlations of the other items in the scale vary between 0.296 and 0.674. Accordingly, it can be said that the scale items are reliable enough to measure similar behaviours.

Construct Validity

The construct validity of the scale was tested with EFA and CFA. Analysis results are presented below, respectively.

Exploratory Factor Analysis (EFA)

In EFA process, first of all KMO value was calculated in order to test the adequacy of the sample. In addition, Bartlett's sphericity value was calculated to examine the suitability of the data for factor analysis. According to the findings, the KMO value of the scale was calculated as .869. Also, Bart-

Table 1. Item-Total Correlations of Items in Scale.

Item No	Item-Total Correlation
I1	0.477
I2	0.296
I3	0.462
I4	0.411
I5	-0.143
I6	0.324
I7	0.481
I8	0.566
I9	0.437
I10	0.526
I11	0.600
I12	0.610
I13	0.542
I14	0.674
I15	0.527
I16	0.500
I17	0.526
I18	0.512
I19	0.612
I20	0.536
I21	*0.575*
I22	*0.528*
I23	*0.430*
I24	*0.548*
I25	*0.488*
I26	0.014
I27	0.552
I28	0.539
I29	0.513
I30	0.523

lett test of sphericity was statistically significant (χ^2=2057.986, df=378). According to these findings, it can be said that the data set is suitable for factor analysis. Afterwards, factor analysis was performed on 28 items using Principal Components analysis and varimax rotation. In determining the number of factors to be kept, the eigenvalue greater than 1 and the scree-test (Field, 2009) criterion were considered. On the other hand, a factor load value of 0.40 was considered to evaluate the suitability of the items.

Item 22, 19, 29, 13, 1, 11 and item 12 were excluded because they were included in two factors and the difference between their values in both

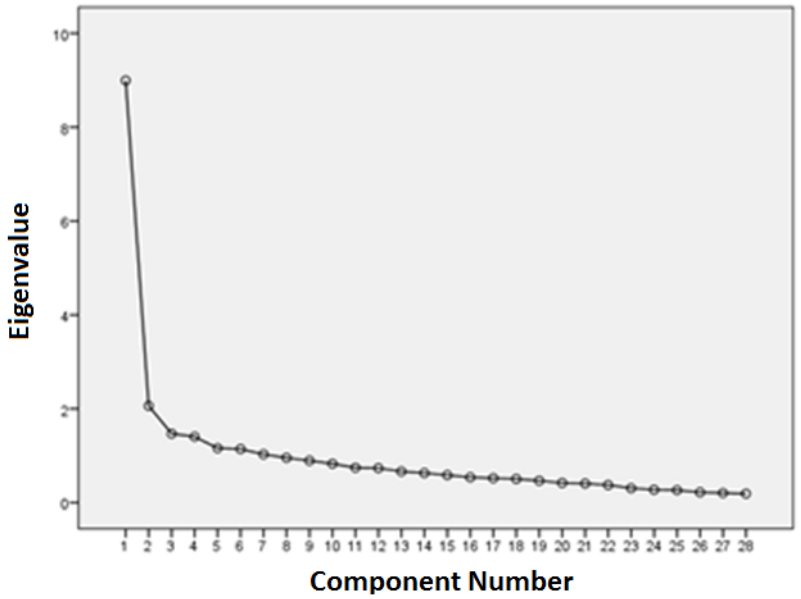

Figure 2. Graph of Scree Plot.

factors was less than 0.10. Additionally, findings from the scatterplot showed that the five-factor structure with an eigenvalue of 1 or higher was more appropriate (**Figure 2**).

According to these results, subsequent analysis was performed. Thus, as a result of the subsequent analyses, it was revealed that the factor loads of 20 items in the scale were above the lower limit of 0.40. In addition, a five-factor structure with eigenvalues of 1 and higher was determined (**Table 2**).

As seen in **Table 2**, the total variance explained for the five-factor structure of the scale is 57.372%. Gürer and Yıldırım (2014) state that it is sufficient for the total variance to be between 40% and 60% and for any factor to be significant, at least 5% of the total variance explained must be attributed to that factor. Therefore, it can be said that the factors in this study explain the variance at a sufficient level. On the other hand, according to EFA results from **Table 2**, factor loads of 6 items in the first factor are between 0.849 and 0.497, factor loads of 4 items in the second factor are between 0.665 and 0.605, factor loads of 4 items in the third factor are between 0.828 and 0.474, factor loads of 4 items in the fourth factor are between 0.845 and 0.520. The factor loads of the 3 items in the fifth factor ranged between 0.821 and 0.630.

According to the item statements, the first factor was named "In-school activities", the second factor was named "Interaction with animals",

Table 2. The Findings for Final EFA.

Factors	Factors Loads
Factor I: In-school activities Eigenvalue: 3.179 Variance: 15.137	
I27: Performing biology-related laboratory activities increases the attitude of mentally retarded individuals towards biology and nature.	0.849
I30: Inviting expert guests in biology and nature (doctor, veterinarian, biologist, etc.) to the class increases the attitude of mentally retarded individuals towards biology and nature.	0.723
I21: Observing animate and inanimate nature elements with a microscope and lens increases the attitude of mentally retarded individuals towards biology and nature.	0.680
I14: Watching documentaries, photographs, slides or movies about biology and nature increases the attitude of mentally retarded individuals towards biology and nature.	0.565
I28: Doing activities aimed at observable change, such as fermenting yoghurt and making pickles, increase the attitude of mentally retarded individuals towards biology and nature.	0.518
I20: Collecting living and non-living things in nature increases the attitude of mentally retarded individuals towards biology and nature.	0.497
Factor II: Interaction with animals Eigenvalue: 2.414 Variance: 11.495	
I9: Going to the zoo increases the attitude of mentally retarded individuals towards biology and nature	0.665
I8: Fishing increases the attitude of mentally retarded individuals towards biology and nature.	0.646
I7: Doing activities that communicate with animals, such as riding horses and swimming with dolphins, increase the attitude of mentally retarded individuals towards biology and nature.	0.609
I25: Participating in swimming and diving activities to watch underwater creatures increases the attitude of mentally retarded individuals towards biology and nature.	0.605
Factor III: Activities related to the sense organs Eigenvalue: 2.340 Variance: 11.143	
I16: Smelling activities such as flowers and spices that will appeal to the sense of smell increase the attitude of mentally retarded individuals towards biology and nature.	0.828
I17: Conducting various fruit and vegetable tasting activities that will appeal to the sense of taste increases the attitudes of mentally retarded individuals towards biology and nature.	0.779
I18: Doing activities by touching various living things and inanimate objects that will appeal to the sense of touch increases the attitude of mentally retarded individuals towards biology and nature.	0.656
I15: Listening to music containing various animal, water and nature sounds that will appeal to the hearing sense increases the attitude of mentally retarded individuals towards biology and nature.	0.474
Factor IV: interaction with plants Eigenvalue: 2.129 Variance: 10.139	
I23: Participating in tree and sapling planting activities increases the attitude of mentally retarded individuals towards biology and nature.	0.845
I6: Doing activities such as planting seeds and collecting fruits and vegetables increases the attitude of mentally retarded individuals towards biology and nature.	0.627
I24: Participation in the camp-picnic event increases the attitude of mentally retarded people towards biology and nature.	0.617
I10: Going to the botanical garden increases the attitude of mentally retarded individuals towards biology and nature	0.520
Factor V: free time activities Eigenvalue: 1.986 Variance: 9.458	
I2: Growing ornamental plants increases the attitude of mentally retarded individuals towards biology and nature.	0.821
I3: Spending time with inanimate elements such as stone, soil, sand increases the attitude of mentally retarded individuals towards biology and nature.	0.658
I4: Observing celestial elements such as stars, clouds and rainbows increases the attitude of mentally retarded individuals towards biology and nature.	0.630
Total variance explained (%): 57.372	

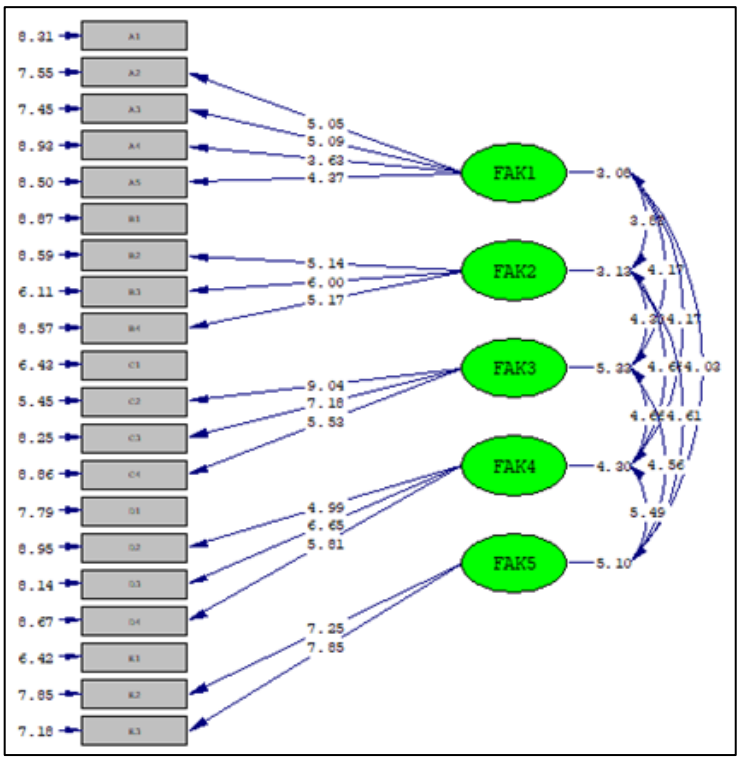

Figure 3. Path Diagram.

the third factor was named "Activities related to the sense organs", the fourth factor was named "Interaction with Plants", and the fifth factor was named "free time activities".

Confirmatory Factor Analysis (CFA)

In the study, CFA was performed to test the accuracy of the structure consisting of five factors as a result of EFA. For this purpose, a path diagram was created for the model that includes 20 items and five factors. At the same time, fit statistics were calculated for the data. For this purpose, each factor and its related items were coded as A1…A6 for the first factor, B1…B4 for the second factor, C1…C4 for the third factor, D1…D4 for the fourth factor, and E1…C3 for the fifth factor. **Figure 3** shows that the standardized factor loads between the items in the original scale and the constructs that the items tend to measure were found to be statistically significant according to the t-test results and all factor loads (Demir & Yurdugül, 2014).

Table 3. Overall Goodness-of-Fit in the Scale.

Overall Goodness-of-Fit Index	Criteria	Application Results	Evaluation Results
	Absolute Fit Indices		
Likelihood-ratio χ2	P < 0.05	373.37	poor
df	-	160	-
GFI	≥ 0.90	0.82	poor
AGFI	≥ 0.90	0.76	poor
RMR	≤ 0.08	0.07	good
SRMR	≤ 0.08	0.08	good
RMSEA	≤ 0.08	0.08	good
	Relative Fit Indices		
NFI	≥ 0.90	0.70	poor
NNFI	≥ 0.90	0.76	poor
IFI	≥ 0.90	0.80	poor
CFI	≥ 0.90	0.80	poor
	Parsimony Fit Indices		
PGFI	≥ 0.50	0.59	good
PNFI	≥ 0.50	0.62	good
Likelihood-ratio χ2/df	≤ 3	2.33	good

As seen in **Figure 3**, it is χ^2=2.33, df=160, and RMSEA=0.087. After the path diagram is drawn, the t values of the items are checked first. If the t value exceeds 1.96, it is considered significant at the 0.05 level, while if it exceeds 2.56, it is considered significant at the 0.01 level. Items with a statistically insignificant t value should be removed from the scale (Şimşek, 2007). In the model we have, the t values of all items are significant, a necessary condition for the model to be acceptable.

Table 3 indicates the fit indices and evaluation results. In the literature, it is recommended to use the χ^2/df ratio, which is called the normed chi-square, since χ^2 is sensitive to sample size. In addition, in large samples, a ratio below 3 is accepted as an indication of perfect fit, and below 5 is an indication of medium level of fit (Şimşek, 2007; Yılmaz & Çelik, 2009). Therefore, it can be said that χ^2/df ratio is good. On the other hand, it is stated in the literature that RMSEA between 0.05 and 0.10 is accepted as an indicator of medium agreement, while values above 0.10 indicate poor agreement (MacCallum, Browne, & Sugawara, 1996). Therefore, in this study, it can be said that the value of 0.08 of RMSEA provides an adequate but borderline fit. More recently, however, a cut-off value close to 0.06 or a solid upper limit of 0.07 appears to be a general consensus among authorities in the field (Hooper, Coughlan, & Mullen, 2008).

According to the literature, CFI, GFI and AGFI values take values between 0 and 1, and closer to 1 indicates perfect fit, and closer to 0 indicates inconsistency (Çokluk, Şekercioğlu & Büyüköztürk, 2010). When **Table 3** is examined, it is seen that these values are weak. According to some researchers, GFI value is less preferred in recent years because it is sensitive to sample size. Also, regarding the GFI, there is AGFI with more saturated models that adjust the GFI to degrees of freedom and reduce the fit. For this reason, it has been recommended not to be used in some studies in recent years (Hooper et al., 2008). Regarding the fit indices, the NFI value was calculated to be low in the study. Similar to GFI, it is a significant disadvantage that NFI is sensitive to sample size, especially for samples less than 200. Therefore, it is recommended to rely on this value alone. RMR, SRMR, PGFI and NNFI seem to have good value. When the findings regarding the fit indices are evaluated in general, it can be said that the model shows an acceptable fit for the most basic indices (such as RMSEA, χ^2/df).

Scale's Reliability

In the study, Cronbach's Alpha coefficient was calculated to determine the overall scale and reliability of each factor. According to the findings, this value (α) is 0.83 for the "In-school activities" factor, 0.68 for the "Interaction with animals" factor, 0.76 for the "Activities related to the sense organs", 0.70 for the "Interaction with Plants" factor and 0.67 for the "free time activities" factor. In addition, it was calculated as 0.89 for the overall Cronbach's Alpha scale. Therefore, it can be said that the scale and its dimensions are quite reliable (Özdamar, 2004).

Discussion

It is a known fact that the most important feature that distinguishes mentally retarded individuals, who are defined as individuals who differ significantly from their peers in terms of their personal characteristics and educational qualifications for different reasons, from their normally developing peers is their inability in learning. However, although mentally retarded students may have inadequacies in learning some knowledge and skills, each individual may have different abilities and potentials with various limitations. It is also emphasized that these individuals can learn some of the knowledge and skills or that what they learn can be permanent when different intelligence areas are addressed (Gardner, 2013). Therefore, enabling individuals with mental disabilities to live together with healthy individuals can be achieved with appropriate educational methods and activities designed for them. Although biology and nature are fields that play an important role in the psychological and physical development of children, it has been determined that

the concentration, motor skills, creativity and social activities of children who are applied activities related to biology and nature are at a higher level (Uslu & Shakouri, 2012). For this reason, it is important to carry out activities related to biology and nature for mentally handicapped students. However, there is a need to evaluate the attitudes of many teachers and preservice teachers working in the field of mental disabilities towards activities related to biology and nature for mentally retarded students. When the literature is examined, no valid and reliable measurement tool developed for the determination of these attitudes has been found. Therefore, in this study, a scale was developed that determines the attitudes of teacher candidates towards activities related to biology and nature for mentally retarded individuals.

After the analyses made in the research, a 5-point Likert-type scale consisting of 20 items and five sub-factors defined as "in-school activities", "interaction with animals", "activities related to the sense organs", "interaction with plants" and "free time activities". When the expressions in the items in the sub-factors are examined, it is observed that they reflect each sub-factor. The total variance explained by the 20-item and five-dimensional structure of the special education teacher candidates' attitude scale towards activities related to biology and nature for mentally retarded individuals is 57.372%. Accordingly, it can be said that the variance explained by the structure of the scale adequately explains the quality it measures. The CFA result, which was carried out to obtain evidence for the validity of the five-factor structure of the scale determined by EFA, also shows that the model is compatible with the data. This finding confirms the idea that the scale has a five-factor structure. In addition, it was calculated as 0.89 for the overall Cronbach's Alpha scale. It can be said that the scale and its factors are quite reliable.

When the findings obtained in the study are evaluated, it can be said that this scale has the qualifications suitable for the purpose. Therefore, it is thought that the scale will help researchers in determining the feelings, thoughts and behaviours of prospective teachers about activities related to biology and nature for mentally retarded individuals. When the studies in the literature about the sub-dimensions obtained from the scale are examined; In some studies, in the literature regarding the "in-school activities" factor, it has been determined that the implementation of different activities in the school contributes positively to the lessons of students with special needs (Çulha, 2010; Güldenoğlu & Kargın, 2012; Güven & Tufan, 2010). Tandoğan (2016), especially the place of natural elements social, physical, emotional, cognitive, movement stated that it had positive effects on their development and creativity. For the "interaction with animals" factor; it has been emphasized that animals motivate people by relieving loneliness and increasing social interactions in people with mental illness or disability, and im-

prove physiological health, normalize and even increase quality of life with their calming effects (Çakıcı & Kök, 2020). Regarding the "activities related to the sense organs" factor, it was emphasized that an understanding of an educational environment should be applied to children with learning disabilities, which they can perceive with their senses of sight, hearing, touch and smell (Uslu & Shakouri, 2012). As a matter of fact, Okcu and Sözbilir (2017) also stated that the use of tools, materials or activities that appeal to different sensory organs of students have positive effects on students' learning. Moreover, looking at nature and experiencing nature in a way by hearing the sounds of nature has a tension and stress-reducing effect, as revealed in many studies (Sam and Kouhirostami, 2020). As for the "interaction with plants" factor, some findings have been obtained in the literature: Vegetable, fruit or ornamental plant production activities have increased the sense of achievement and production for people with physical or mental disabilities. Taking care of production and maintenance works with natural materials such as plants and soil, spending time with plants, which are living and variable materials, means mobility, productivity and success for the disabled. With plant production, a continuous learning process begins in disabled individuals, the need for observation, research, nurturing their sense of curiosity arises, problem solving and decision-making skills and creativity are strengthened (Uslu, 2012). Pouya, Bayramoglu and Demirel (2017) stated that the relationship between need-activity-space while designing school gardens. Organic gardens that will support nature and environmental education by emphasizing the need to question vegetation areas, natural ponds, mud pools, hills and sandboxes, tenting and camping areas, traffic training tracks, animal feeding shelters, large grass surfaces and playgrounds for physical and spiritual development and practice gardens (tactile, auditory and scent gardens) can be designed. According to the "free time activities" factor, it was emphasized that leisure activities improve the motor skills and physical fitness of children with mild mental retardation (Karakaş, 2018).

Conclusion

It can be said that the scale developed as a result of this study is valid and reliable in determining the views of pre-service teachers about the activities to be applied for mentally retarded students. In addition, the scale is suitable not only for teacher candidates, but also for use by teachers and researchers. Similarly, the applications of the research were carried out with teacher candidates. In addition, different types of samples such as students in other fields at the undergraduate level and special education teachers who take courses related to special education can be included in the study group.

In this study, external criterion validity was not examined within the scope of validity studies. Therefore, in order to ensure external criterion va-

lidity in similar measurement tools to be developed in future studies, external criterion validity can be examined with a measurement tool that deals with variables such as gender, age.

The scale developed according to the results obtained in this research was applied to the special education teacher candidates who are related to the special education field. Therefore, it was not possible to collect data from a different sample group for CFA due to the insufficiency of the sample in the relevant area of the study. However, although the inability to perform CFA analysis is considered a limitation of the study, this should not be seen as a disadvantage. On the contrary, these analyses are mostly preferred in scale adaptation studies. However, in a future scale adaptation study on this subject, it may be considered to use CFA and structural equation modelling in addition to EFA.

By applying the scale developed in this study to teachers and researchers who teach students with mental disabilities, a survey study can be carried out in which their opinions are taken. Thus, the usefulness of the scale and the general attitudes of teachers towards these activities can be examined.

Considering the structure of different countries and different cultures, new scales of similar nature can be developed and different dimensions from the scale in this study can be revealed.

Acknowledgement

All authors would like to thank all students for their contribution to the process of administering the scale.

References

Akkuş, A.N.Ş. (1998). Fen bilimleri dersine giren öğretmenlerin kaynaştırma eğitimine yönelik görüşlerinin incelenmesi [Analysis of teachers' opinions who take science class towards inclusive education]. Master, diss., University of Sakarya, Sakarya.

Aslan, K., & Kurt, M. (2021). Sınıfında kaynaştırma öğrencisi bulunan biyoloji öğretmenlerinin kaynaştırma eğitimine ilişkin görüşlerinin değerlendirilmesi [Evaluation of the opinions of biology teachers with inclusion students on inclusion education]. *Journal of Education and New Approaches*, 4(1):1-13. DOI: https://doi.org/10.52974/jena.883947

Çağlayan, N. (2014). Zihinsel engelli bireylerin eğitiminde görsel sanatlar dersinin yeri ve önemi [The role and importance of visual arts in the education of individuals with

mental disabilities]. *Karabük University Journal of Institute of Social Sciences*, 4(1):91-101. DOI: https://doi.org/10.14230/joiss63

Çakici, A., & Kök M. (2020). Animal assisted therapy. *Current Approaches in Psychiatry*, 12(1):117-130. DOI: https://doi.org/10.18863/pgy.526378

Cavkaytar, A. (2015). Children with special needs and special education. [Özel eğitime gerek duyan çocuklar ve özel eğitim.]. Ankara: Pegem Publishing. ISBN: 978-605-5885-26-7. pp.3-27.

Çokluk, Ö., Şekercioğlu, G., & Büyüköztürk, Ş. (2010). Sosyal bilimler için çok değişkenli istatistik: SPSS ve LISREL uygulamaları [Multivariate statistics for social sciences: SPSS and LISREL applications]. Ankara: Pegem Publishing. ISBN: 978-605-588-56-70. pp.275-330.

Çulha, S. (2010). Zihinsel yetersizliği olan ilköğretim kaynaştırma öğrencilerine yabancı dil öğretiminde eşzamanlı ipucuyla sunulan bireysel destek eğitiminin etkililiği [The effects of individual supportive education applying by simultaneous prompting in teaching foreign language for the primary school inclusive education students with mental disabilities]. Master, diss., University of Anadolu, Eskişehir.

Demir, Ö., & Yurdugül, H. (2014). The adaptation of the scale of attitude towards computer into Turkish for middle and secondary school students. *Education & Science*, 39(176):247-56. DOI: https://doi.org/10.15390/EB.2014.3619

Denizli, H. & Uzoğlu, M. (2016). Determination of views of science teachers on the process of inclusive practices. *Journal of Turkish Science Education*, 13:3-37. DOI: https://doi.org/10.12973/tused.10158a

Eripek, S. (2012). Individuals with mental disabilities and their education [Zihin yetersizliği olan bireyler ve eğitimleri]. Ankara: Pegem Academy Publishing. ISBN: 978-605-241-431-6. pp. 230-255.

Field A.P. (2009). Discovering statistics using SPSS: And sex and drugs and rock 'n' roll. London: Sage Publications. ISBN: 144-624-918-2. pp.686-700.

Gardner, H. (2013). Çoklu zeka: Yeni ufuklar [Multiple intelligences: New horizons]. İstanbul: Optimist Publishing. ISBN: 9786054538782. pp.55- 58.

Güldenoğlu, B. & Kargın, T. (2012). Examination of the effectiveness of the reciprocal teaching technique on the reading comprehension skills of students with mild mental retardation. *Ankara University Faculty of Educational Sciences Journal of Special Education*, 13(1):17-34. DOI: https://doi.org/10.1501/Ozlegt_0000000164

Gürer M.D., & Yıldırım Z. (2014). Development, validity and reliability study of the learning object evaluation scale. *Education & Science*, 39(176):121-30. DOI: https://doi.org/10.15390/EB.2014.3713

Güven, E. & Tufan, E. (2010). Music lessons with cooperative learning method in mainstreaming classes. *Journal of Uludağ University Faculty of Education*, 23(2):557-573.

Hooper D, Coughlan J, Mullen M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, 6(1):53-60.

Jensen, E. (1998). Introduction to brain-compatible learning. San Diego, CA: The Brain Store. ISBN: 978-1412954181. pp.38-40.

Karaelmas, O. (1998). Başbakanlık sosyal hizmetler ve çocuk esirgeme kurumu saray rehabilitasyon merkezi dış mekân planlaması [Prime ministry social services and child protection agency saray rehabilitation center outdoor planning]. Master diss., University of Ankara, Ankara.

Karakaş, G. (2018). Hafif düzeyde zihinsel engelli çocuklara uygulanan serbest zaman aktivitelerinin fiziksel uygunluk ve motor gelişimleri üzerine etkisi [The effect of leisure activities applied on mild mental disabled children on their physical fitness and motor development]. Ph.D. diss., University of Sakarya, Sakarya.

kararları: Doğan Çağlar ortopedik engelliler okulu [A disabled school garden design master decisions: Doğan Çağlar orthopedically handicapped school]. *Kastamonu Üniversitesi Orman Fakültesi Dergisi*, 17(4):682-690. DOI: https://doi.org/10.17475/kastorman.277535

Leech, N.L., Barrett, K.C., & Morgan, G.A. (2005). SPSS for intermediate statistics: Use and interpretation (2nd Edition). New Jersey, London: Lawrence Erlbaum Associates. ISBN: 9781848729995. pp.82.

MacCallum RC, Browne MW, Sugawara HM. (1996). Power analysis and determination of sample size for covariance structure modelling. *Psychological Methods*,

1(2):130-49. DOI: https://doi.org/10.1037/1082-989X.1.2.130

Milli Eğitim Bakanlığı [MoNE] (2018). Ortaöğretim kurumları biyoloji dersi öğretim program, Talim terbiye kurulu başkanlığı [Secondary education institutions biology course curriculum, Education and training board presidency]. Available at: http://mufredat.meb.gov.tr/Dosyalar/20182215535566-Biyoloji%20d%C3%B6p.pdf

Okcu, B., & Sözbilir, M. (2017). An activity design for students with visual impairment: What is electrical fuse? *Journal of Inquiry Based Activities*, 7(1):42-50.

Özak, H. & Avcıoğlu, H. (2012). Zihinsel yetersizliği olan öğrencilere okuma becerilerinin öğretiminde bilgisayar aracılığıyla sunulan eş zamanlı ipucuyla öğretimin etkililiği [The effects of simultaneous prompting presented via computer on the reading skills of children with intellectual disability]. *Abant Izzet Baysal University Journal of Faculty of Education*, 12(1):33-50.

Özdamar, K. (2004). Paket programlar ile istatistiksel veri analizi [Statistical data analysis with package programs]. Eskişehir: Kaan Publishing. ISBN: 9789756428566. pp.633.

Özokçu, O. (2018). Zihin yetersizliği olan öğrenciler. Özel eğitim [Students with mental disabilities. Special education]. Vize Akademik Publishing. ISBN: 978-605-7989-40-6. pp.59-79.

Özyürek, M. (2009). Developing and basics of an individualized education program [Bireyselleştirilmiş eğitim programını geliştirme ve temelleri]. Kök Publishing. ISBN: 978-975-499-244-1. pp.16.

Pouya, S., Bayramoğlu, E. ve Demirel, Ö. (2017). Bir engelli okulu bahçesi tasarım ana

Sam, M. ve Kouhirostami, M. (2020). A critical review on the impact of combining outdoor spaces and nature with learning spaces on students' learning ability. *GRID - Architecture Planning and Design Journal*, 3(2):272-290. DOI: https://doi.org/10.37246/grid.664546

Şimşek, Ö.F. (2007). Yapısal eşitlik modellemesine giriş: Temel ilkeler ve LISREL uygulamaları [Introduction to structural equation modeling: Fundamentals and applications of LISREL]. Ankara: Elinoks Publishing. ISBN: 9789944495073. pp. 74-93.

Sözbilir, M., Gül, Ş., Okcu, B., Yazıcı, F., Kızılaslan, A., Zorluoğlu, S. L., & Atila, G. (2015). Trends in research papers about teaching science to visually impaired students. *Abant Izzet Baysal University Journal of Faculty of Education*, 15(1):218-241. DOI: https://doi.org/10.17240/aibuefd.2015.15.1-5000128604

Suna, H.E., Atik, Z., Karaman, N., & Çok, F. (2013). Developing an attitude scale towards young people. *Education & Science*, 38(170):347-360. DOI: https://acikerisim.tedu.edu.tr/xmlui/handle/123456789/62

Tandoğan, O. (2016). Çocuklar İçin Daha Yaşanılır Okul Bahçeleri [More Liveable School Grounds for Children]. *Megaron*, 11(4):629-637. DOI: https://doi.org/10.5505/megaron.2016.92053

Tavşancıl, E. (2006). Tutumların ölçülmesi ve spss ile veri analizi [Measuring attitudes and data analysis with SPSS]. Ankara: Nobel Publishing. ISBN: 978-605-133-740-1. pp.204.

Terzioğlu, N. K., Akbiyik, M., & Yikmiş, A. (2023). Zihinsel Yetersizliği Olan Öğrencilere Fen Öğretiminde Artırılmış Gerçeklik Teknolojisinin Kullanımı: Özel Eğitim Öğretmenlerinin Görüşleri. *Yükseköğretim ve Bilim Dergisi*, 13(1):93-104. DOI: https://doi.org/10.5961/highereducsci.1192245

Uslu, A. (2008). Engelli çocuklara dost oyun alanı ve dış mekân tasarımı [Disabled children friendly playground and outdoor design]. *Ufkun Ötesi Bilim Dergisi*, 1:67-86.

Uslu, A. (2012). The horticultural therapy for the people with mentally and physically disabilities abstract. *Ufkun Ötesi Bilim Dergisi*, 1:5-24. DOI: https://dergipark.org.tr/en/pub/uobild/issue/47076/591992

Uslu, A., & Shakouri, N. (2012). Engelli çocuklara dost oyun alanı ve dış mekan tasarımı [Friendly design of playground and outdoor space for the disabled children]. *Erciyes University Journal of the Institute of Science and Technology*, 28(5):367-374.

WHO (1996). Guide for Mental Retardation. Available at:

http://www.who.int/mental_health/media/en/69.pdf

Williams, B., Brown, T., & Onsman, A. (2012). Exploratory factor analysis: A five-step guide for novices. *Journal of Emergency Primary Health Care*, 8(3):1-13. DOI: https://doi.org/10.33151/ajp.8.3.93

Wilson, E. O. (1984). Biophilia. Cambridge: Harvard Üniversity Press. ISBN: 9780674074422. pp. 116

Wilson, E. O. (1993). Biophilia and the Conservation Ethic. Island Press. ISBN: 9780203792650. pp. 31-41.

Yazici, F., & Sözbilir, M. (2022). Designing and evaluation of 3D materials for teaching biological systems to 6th grade students with visual impairment (SVI). *Journal of Biological Education*, 1-23. DOI: https://doi.org/10.1080/00219266.2022.2072363

Yetkin, Y. (1998). The influence of biology education on attitudes to humanity and world peace. *Turkish Journal of Biology*, 22:347-367.

Yılmaz, V., & Çelik, H. E. (2009). LISREL ile yapısal eşitlik modellemesi I: Temel kavramlar, uygulamalar, programlama [Structural equation modeling with LISREL I: Basic concepts, applications, programming]. Ankara: Pegem Publishing. ISBN: 9786055213480. pp. 43-51.

Received: 15 May 2023
Revised: 31 May 2023
Accepted: 12 June 2023