

Development and Validation of an Instrument to Measure Secondary School Science Students' Social Capital Scale

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ABSTRACT

The purpose of this study is to develop a scale which will ensure that social capital levels of secondary school science students are determined. Validation and reliability works of the scale were performed on 304 (154 girls and 150 boys) students in North Cyprus. In the process of developing the scale, explanatory and confirmatory factor analysis were done, and reliability was determined with Cronbach alfa and split-half methods which are internal consistency tests. In addition to the Cronbach alfa and split-half tests, as the item total item correlations are sufficient, no item was excluded from the scale and it was confirmed that the scale was reliable. Results of confirmatory factor analysis show that the model belonging to social capital scale has perfect consistence and it consists of three dimensions such as trust in peer relations, communication intra-family relations, and sensitiveness in friendship relations.

Keywords: social capital scale, reliability, validity, secondary school students

INTRODUCTION

The first known usage of the concept "social capital" was made by Lyda Judsen Hanifan. The American reformist, educator Hanifan (1916) developed the concept "social capital" in his work titled "*The Rural School Community Center*" in order to attract attention to the existence of good will, friendship, sympathy and social relations related to the daily lives of people between individuals and families who are not covered by the economic dimension of social capital. This concept was further developed with the studies of Coleman (1988), Portes (1998) and Putnam's (1995) where alternative definitions of social capital were emphasised, mostly due to the fact that people from different disciplines use the social capital concept for different targets. However, there is a consensus on putting emphasis on the function of such civil norms as participation in social networks / formal and informal voluntary organizations, understanding, trust, tolerance Duman and Alacahan (2011). In his article Adger (2003) criticized the viewpoints on social capital and collective movements. He asserted that social capital is mostly understood among the public as an economic term. Catts and Ozga (2005) defined social capital as a social glue which keeps people together, and gives a sense of belonging to the people in this changing world. In his book, Field gives the historical development of the concept in the beginning, followed by how the concept was handled in post-modern societies and comparisons between different countries with empirical examples. He deals with the way that Bourdieu (1980), Coleman (1988) and Putnam (1995), who are known as classics in modern literature, examine and improve the social capital concept. Keçeli (2013) says that more effort is needed on the concept, that it is not a concept which is no more examined upon consensus of social scientists, but that it is a key and important concept for us to understand the society. Social capital concept has in recent years been a popular topic which is frequently studied in sociology literature and then in economics and management literature. In several studies, both at home and abroad, it is shown as a panacea for solving the problems that affect the society. For this reason the concept has gained an increasing impact. It is stated that the reason behind the success or failure of some societies or communities within societies is the strength or weakness of this type of capital.

Pretty and Ward (2001) defined social capital with four concepts: 1. Its relation with trust. 2. Exchange or its equivalent. 3. Existing rules, norms and sanctions. 4. Contacts, networks and groups.

Contribution of this paper to the literature

- Social capital scale will reveal the acquisitions of secondary school school students in psychological and sociological terms.
- Social capital scale emerged as a need for secondary school school students.
- The most important stage of being able to utilize opportunities could be realized by having an awareness of social capital sources.

1. Its relation with trust: trust brings cooperation. It reduces the cost between people. It saves time and money. Trust is grouped into two: trust in the people we know or are familiar with, and the other is trust in people we do not know. Platteau (2000) claimed that building trust takes time, but destroying it is very easy.
2. Exchange and its equivalent: Exchange and its equivalent increases trust. The meaning of equivalent here is simultaneous exchange. Sometimes the equivalent does not appear instantly, but there is always a balanced return. According to Platteau (2000), this situation makes contribution to the development of long-term liabilities between people. As a result, positive consequences are created for people.
3. Existing rules, norms, and sanctions: It includes all behavioural norms on which people agree mutually. In group activities, authorising people gives them trust. Individuals act with their own rights without being unfair to others. People accept that they will be punished when they disobey rules.
4. Contacts, networks and groups: Contacts, networks and groups have an important relation to social capital. There may be several differences between groups. These are unidirectional, bidirectional and multidirectional differences.

Social capital supports such socio-economic activities as other types of capital, but unlike them it is a rather difficult type of capital. One of the basic elements of social capital is perhaps being included in social relations or participating in social networks. The more people become socialized, the more mutual relations will take place and several opportunities will arise that can create trust between individuals. Çetin (2006).

According to Karagül and Dündar (2006), the rapid increase in studies on social capital, in the last 15 years, allows for the production of new alternative policies so that societies can solve their economic and social problems more easily. In other words, the popularity a heightened research on social capital has opened doors for updating policies.

Social capital has been examined in the literature in terms of leadership, social relations, group understanding, active involvement and social networks. Orr (1999) stated that social capital presented essential opportunities and advantages as regards overcoming problems at schools and claimed that school leaders can benefit from these opportunities by becoming aware of social capital stages which would function as the most important stage. According to Orr, after this awareness stage, school administrators with leadership skills will invest in areas which will strengthen social capital and make these elements functional within the framework of organizational objectives.

LITERATURE REVIEW

In their research, Gottfredson and Di Pietro (2011) examined the impact of the three stages of organization (records related to students, student-teacher ratios and difference in student learning) on the personal suffering of students. As a result of the study, the secondary school students suffering at schools of which the ratio between student and teacher is not very high, turned out to be lower than the higher ratio between student and teacher. This is the result of the fact that social capital is high generally in schools with low teacher – student ratio. In their research, Ada and Şahin (2013) investigated the usage ratios of social capital in elementary and secondary schools. In this study they developed a data collection consisting of 45 items. The opinions of 305 school managers were obtained in Bayburt, Gümüşhane, and Trabzon provinces. According to the research results, one element of social capital at schools is at “I agree” level, whereas other elements are at “I partially agree” level. In regards to social capital levels at schools, a significant difference is observed in such variables as “type of school”, “gender”, “level of education”, and “type of manager”; however, no significant difference was found in “school size” and “working year-seniority” variables. The level of social capital at schools is “at good level” according to elementary school managers and “at medium level” according to secondary school managers on the base of “type of school” variables. According to the gender variable, male managers declare that they are at good level whereas female managers declare that they are at “medium” or “lower level”. In terms of the “level of education” variable, undergraduate degree holder managers think that they are at “good level”; whereas graduate degree holder managers think that they are at “medium level”. Social capital level at schools is determined as “good” by school managers and “medium” by deputy managers. Kurt and Çalık (2010) studied the impact of social capital on organized knowledge sharing at elementary schools. A research was conducted on 267 teachers at 16 schools. Findings show that social

capital has an important impact on the sharing of organized knowledge. In their study on social capital profiles of Selçuk University students, Gökçe and Uğuz (2009) found out that in the participation and trust dimension the social capital level of students is low; however, they concluded that evaluating social capital only through trust or participation levels would be a weak assessment. The tolerance level of students for differentiation turned out to be high. Yeong and Suk's (2016) examined the impact of social capital on school adaptation of students in their study. The result of the research showed that social capital and the school environment has a direct impact on the time needed by students for adaptation to school. Meier et al. (2016) examined the relation between social capital and school achievement. As a result of the study, it was emphasised that high social capital reserves affected school performance positively.

Although several studies have been conducted on the concept of social capital, it has been found out and made apparent that most studies on social capital scale are on elementary, university or the society in general. Studies conducted by such researchers as Ardahan (2012), Ardahan and Ezici (2014), Chen et al. (2009) reached similar conclusions. However, the research of Krasnyi et al. (2013) is about the measurement of social capital between youth. However, the five-Likert scale was not used in their study; instead, "yes" and "no" options were given. The sum of evaluations is taken as basis in Likert scale and calculations are made with the scores given to the options which indicate degrees. However, words such as yes or no indicate status, not degree. They cannot indicate neutral or "no idea" status of individuals. In the literature five-Likers scale is used for elementary and secondary education; however, as regards secondary school stage only "yes" and "no" scales have been determined.

Literature search gave the impression that a social capital scale should be developed for secondary school science students.

MAIN PURPOSE AND SIGNIFICANCE OF THE STUDY

The aim of this study is to develop a scale which will ensure that social capital levels of students are determined. Validation and reliability works of the scale were performed on students in North Cyprus. The purpose of developing and using the scale is to improve the quality of lives of students as well as their relations with peers and adults; thus, create a positive interaction environment at school and develop healthy individuals and social structures. Social capital scale will reveal the acquisitions of secondary school science students in psychological and sociological terms and is an essential element which will direct their education lives. It is an essential dimension in such topics as bullying, absenteeism, school drop rates, and creating a positive school environment, especially for secondary school science students who are not obliged to read. Gilman and Huebner (2006) stated that studies conducted established more positive relations between adolescents who have high life satisfaction and their peers and parents, that they displayed more positive attitudes towards the school and teachers and had higher academic achievement rates; in summary, that they showed that there is positive correlation between positive adolescent development and life satisfaction and negative correlation between positive adolescent development and problem behaviour (Bugay et al., 2015).

METHOD

Development of Social Capital Scale

In order to prepare scale questions, interviews were made with 15 senior students' and 15 teachers' at Famagusta region with convenience sampling method. In interviews conducted with students, themes and sub-themes obtained from the research findings on the social capital development of students are as follows: (1) relation of social capital with confidence, (a) opinions on trust to their environment, (b) opinions on self-confidence, (2) relation of social capital with change and its equivalent, (a) opinions on the sincerity of relations, (b) opinions on performing unwanted behaviours, (3) opinions on the relation with existing rules and norms, (b) opinions of students on the linguistic expressions they use in communication, (b) opinions of students on the justice prevailing at school, (4) opinions on connections, networks and groups, (a) opinions on showing interest in social and societal problems, (b) opinions on organization of cultural events, (c) opinions on social networking sites.

As a result of the interviews, it was found out that only 3 students thought that they were sincere and candid in their peer relations, and 2 students did not do anything to others that they did not want to be done to them. Nevertheless, students stated that all of them used slang language in their communication which is seen as a part of normal speech. In the interview, it was expressed that 6 students interested themselves in social and societal problems but that these 6 students addressed social and societal problems only once or twice.

As an outcome of the interviews and literature research, a pool of 84 questions was compiled. These questions were presented to the opinions of various experts and linguists from related fields (University Turkish Language and Literature Lecturers, School Counsellors and University Lecturers of the Educational Sciences Department).

Table 1. Distribution of students with regard to the region

Region	Number of secondary school science students *	N/Ni	Number of students to be included in the sample
Nicosia	602	0.42	127
Famagusta	374	0.26	79
Kyrenia	198	0.14	42
Guzelyurt	149	0.10	31
Iskele	121	0.08	25
Total	1444	1.00	304

*Source; Ministry of National Education - North Cyprus

Based on their feedback, the recommendation that students would not be able to answer questions related to the behaviour of teachers resulted in 20 questions being omitted. These obtained results are questions which measure the same purpose and can be excluded from the subject. Respectively, 4 questions were added in line with specialist opinions and a scale of 68 items was formed. In addition, with the pilot application on 40 pupils, students were asked to identify the questions that they could not understand; at the end of the practice it was concluded that the scale was adequate in measuring the social capital level of students.

Study Group

The population is the structure which covers all members constituting the research topic Arık (1992). The universe of this research consists of 12th grade students at public general secondary school science students of the Secondary Education Department of the Ministry in the 2015-2016 academic year. In order to determine the universe and sample of the research, contact was made with the NEM and the list of 12th grade students was obtained. The total number of students in the universe was determined as 1444. As reaching the entire research universe would be difficult in terms of time, cost and control, a sample which would represent the research universe was chosen and stratified random sampling method was used. According to Gay (1987) stratified sampling is a sample choosing method which ensures that sub-groups in the universe are determined and represented according to their real ratio in the universe. In addition, stratified sampling is used for choosing samples equally from each sub-group when a comparison among them is requested. In short, the purpose of stratified sampling is to guarantee that relevant sub-groups are represented.

N: Number of people in study sample

n: Number of people to be included in the sample

p: Frequency of the event under examination (probability of happening)

q: Frequency of the event for non-happening (probability of not happening)

t: Theoretical values found according to z table at a certain meaningfulness level

d: Sampling error accepted according to the happening frequency of the event

$$n = \frac{N * t^2 * p * q}{(N - 1)d^2 + t^2 * p * q} \quad n = \frac{1444 * (1.96)^2 * 0.50 * 0.50}{(1443)(0.05)^2 + (1.96)^2 * 0.50 * 0.50} = 304$$

Procedure

In order to be able to apply the question form, written permission was obtained from the Secondary Education Department of the Ministry of Northern Cyprus and verbal permission was obtained from the principals of schools where the application would be made. The scale was applied to the students covered by the study between 1st and 31st of October, 2015, paying attention to boy-girl distribution. During the study, the researcher entered the classrooms and explained the voluntariness principle to the students, and told that their personal information would not be shared with third parties, so as to ensure that they give correct answers. The students completed the survey in approximately 60 minutes without being affected by anyone.

DATA ANALYSIS

Validity of the Construct

Explanatory factor analysis (AFA) and Confirmatory Factor Analysis (DFA) were used in order to validate the structure of the sample.

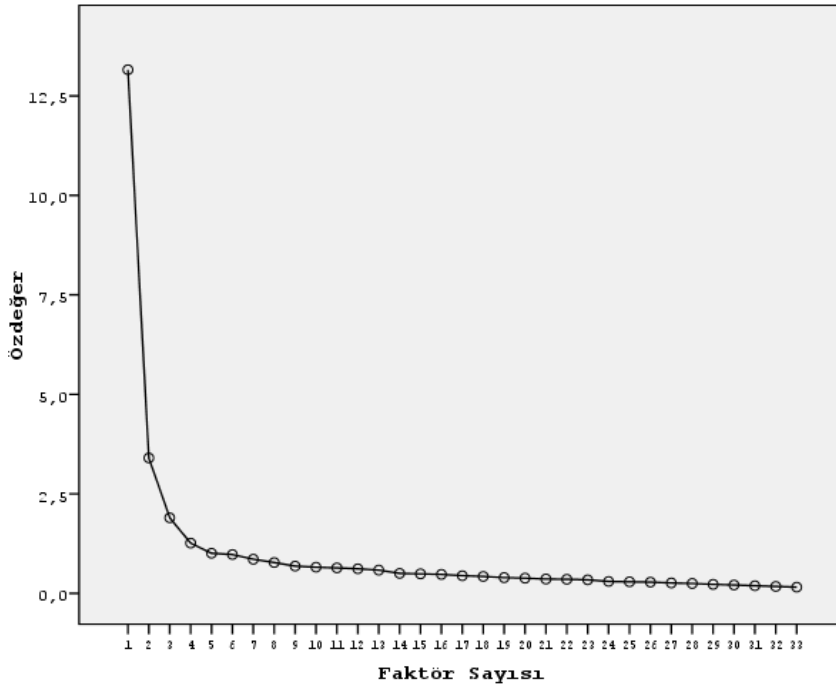


Figure 1. Exploratory Factor Analysis Scree Plot Graphic

Explanatory Factor Analysis

One of the aims of the researcher is to display whether there is a regular order between the reactions given by participants to each stimulant (item) included in a developing scale tool. Factor analysis used for this purpose is one of the multi-variant analysis techniques used in obtaining information on the recognition of psychological dimensions and their content Tavşancıl (2006).

Before starting to explain the explanatory factor analysis in regards to the scale, conformity of dataset to normal distribution was examined with Shapiro-Wilk test and it was found to be consistent with normal distribution. Convenience of data for factor analysis can be examined with the Kaiser - Meğer - Olkin (KMO) coefficient and Barlett sphericity test. KMO coefficient tells whether data matrix is suitable for factor analysis and the convenience of data structure for factor extraction. It is expected that KMO is above 60 to indicate factorability. The Barlett test, on the other hand, seeks the existence of a relation between variables based on partial correlations Büyüköztürk, (2009). KMO coefficient of the sample was found as 0.95 and the Chi-square value belonging to Bartlett's Test of Sphericity was found as 16006.67, according to which the sample is found suitable for factor analysis.

In the results of explanatory factor analysis which was applied by means of basic components analysis and varimax transformation, the scree plot graphic and variances explained by factors given in **Figure 1** were examined and it was decided that the scale consisted of a 3-factor structure with an eigenvalue larger than 1. Items with factor loads lower than 0.5 were expelled from the scale and explanatory factor analysis was repeated. As a result of explanatory factor analysis, 35 items were expelled from the scale. In line with these results, it was found that the scale consisted of 33 items and 3 sub-dimensions explaining 51.50% of the total variance. Explanatory factor analysis results are given in **Table 2**.

Table 2. AFA results as regards social capital scale

	Factor I	Factor II	Factor III	Explained variance
Item 8	0.80			
Item 38	0.74			
Item 9	0.72			
Item 1	0.71			
Item 56	0.70			
Item 60	0.68			
Item 55	0.67			
Item 39	0.66			23.09
Item 57	0.65			
Item 33	0.64			
Item 28	0.59			
Item 50	0.57			
Item 59	0.53			
Item 2	0.52			
Item 3	0.50			
Item 29		0.72		
Item 41		0.70		
Item 48		0.67		
Item 22		0.67		
Item 4		0.62		15.05
Item 68		0.58		
Item 7		0.58		
Item 18		0.56		
Item 25		0.51		
Item 46			0.71	
Item 45			0.66	
Item 43			0.64	
Item 47			0.63	
Item 44			0.61	13.36
Item 30			0.60	
Item 35			0.58	
Item 42			0.56	
Item 19			0.49	

Table 3. Social capital scale DFA goodness of fit index values

χ^2/df	2.86
Mean square root of approximate errors (RMSEA)	0.05
Goodness fit index (GFI)	0.92
Normed fit index (NFI)	0.95
Comparative fit index (CFI)	0.91

Confirmatory Factor Analysis (DFA)

As a result of the DFA performed by the researcher, 11 more items determined by AFA were expelled and the final form of Social Capital Scale consisting of 22 items was created. Confirmatory factor analysis is used in order to determine whether there is adequate connection between determined factors and whether the factors are sufficient for explaining the model Özdamar (2004).

Fit indexes determined as a result of Confirmatory Factor Analysis are given in Table 3. When the fit indexes of the model are examined, it is determined that χ^2/df is 2.86. Chi-square is a goodness of fit index used for testing whether the covariance matrix belonging to the original variable is different from the suggested matrix. The ratio of calculated chi-square value to the degree of freedom is extremely important. If this ratio is below 3, it means it is a perfect fit; if it is below 5, it corresponds to an average fit Kline (2005).

Mean square root of approximate errors (RMSEA) is an index used in order to estimate population covariances; a figure between 0.00 and 0.05 shows the existence of a perfect fit whereas a figure between 0.05 and 0.08 shows a good fit Brown (2006). It is seen that RMSEA value found as a result of DFA is 0.05 which indicates an acceptable fit.

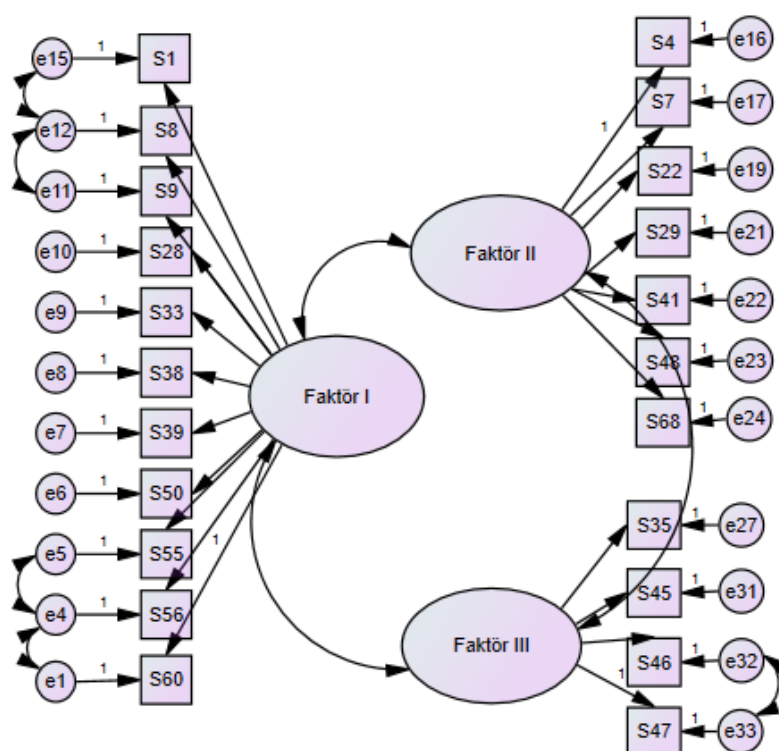


Figure 2. PATH diagram as regards the model

As a result of the applied DFA, it was found out that goodness of fit index (GFI) is 0.92. GFI shows the extent to which the model measures the covariance matrix in the sample and it can be accepted as the sample variance through which the model is explained Çokluk et al. (2010). The GFI takes a value between 0 and 1, where 1 indicates a perfect fit and 0 indicates a lack of any fit. The GFI value is between 0.95 and 1, this shows a perfect fit and a value between 0.90 and 0.95 shows the existence of an acceptable fit Sümer (2000). Accordingly, an acceptable fit has been identified.

Normed Fit Index (NFI) evaluates the estimation of the model through comparison of X^2 value of the independence model and X^2 value of the model. If the critical value determined for this index is between 0.90 and 1.00 it means the existence of a good fit Tabachnick and Fidell, (2001). In the study it has been found out that the NFI value belonging to the model was 0.95 showing that the model has a good fit.

Comparative Fit Index (CFI) compares the covariance matrix produced by the independence model (the model which predicts that there is no relation between potential variables) and the covariance matrix produced by the recommended structural equality model. As for the critical values determined for this index, 0.97-1.00 interval shows good fit, 0.95-0.97 interval shows acceptable fit (Tabachnick and Fidell, 2001). It is seen that the CFI value found by the researcher is 0.91 showing that it has an acceptable fit.

The χ^2/df , NFI, GFI and CFI goodness of fit indexes obtained, as a result of the performed Confirmatory Factor Analysis, were then compared to the expected critical values in regards relevant indexes. It has been determined that the model belonging to the Social Capital scale is in perfect harmony, and is therefore a perfect fit. According to this result, each factor represents its constituent expression accurately.

When the Path diagram given in **Figure 2** is examined, it has been found that the scale consists of three dimensions, namely Factor I (trust in peer relations) the 11 item, Factor II (interaction in intra-family relations) the 7 item and Factor III (sensitiveness in relations with friends) its include the 4 item.

Reliability

The reliability of the scale was tested with Cronbach alfa and split-half method which are internal consistency tests. In addition, correlation-based item-total score analysis has also been performed. As a result of the analysis conducted by the researcher, Spearman Brown coefficient and Guttman Split-Half coefficient were found as 0.86 and 0.83, respectively. As a result of the Cronbach alfa test which was conducted in regards to the reliability of the

Table 4. Item-total correlations as regards to the social capital scale

Item	Item-Total Correlation	Item	Item-Total Correlation
Item 1	0.55*	Item 4	0.42*
Item 8	0.49*	Item 7	0.37*
Item 9	0.56*	Item 22	0.36*
Item 28	0.53*	Item 29	0.46*
Item 33	0.51*	Item 41	0.54*
Item 38	0.58*	Item 48	0.58*
Item 39	0.59*	Item 68	0.45*
Item 50	0.53*	Item 35	0.45*
Item 55	0.48*	Item 45	0.47*
Item 56	0.48*	Item 46	0.38*
Item 60	0.49*	Item 47	0.44*

*p<0.05

Table 5. Items and their numbers

1. I feel that I belong to a peer group at school.
4. I think that my parents care for me.
7. I can explain my thoughts and feelings to my parents' easily.
8. I feel comfortable when I am with my friends.
9. I can declare my opinions among my friends without hesitation.
22. My family praises me if I show a successful performance at school.
28. We show respect to the feelings of each other.
29. Me and my parents show respect to the feelings of each other
33. We act sincerely and frankly to each other in our friendships and relationships.
35. My schoolmates show respect to each other.
38. We say hi to our friends when we see each other outside school.
39. We give importance to keeping promises among friends.
41. My parents value give importance to keeping, their promises.
45. At our school our friends express their requests from each other kindly..
46. At our school people show respect to the rights of each other.
47. At our school people protect the rights of each other.
48. Family members show respect to my rights.
50. My friends show respect to my rights.
55. I show effort to see my schoolmates outside school, too.
56. My schoolmates frequently call me.
60. We have connections with schoolmates on social networking sites.
68. My parents give importance to our cultural values.

entire scale and its sub-dimensions, it was found out that Cronbach alfa reliability coefficient for the entire scale, trust in peer relations sub-dimension, interaction in intra-family relations sub-dimension and sensitiveness in friendship relations were 0.88, 0.83, 0.82 and 0.79, respectively.

Item-total correlation coefficients given in **Table 4** are between 0.48 and 0.76 and it has been found out that all are statistically significant (**p<0.05**).

As a result of the fact that, in addition to the Split-half and Cronbach alfa tests, item-total item correlations are sufficient, no items were excluded from the scale and it was confirmed that the scale was reliable.

RESULTS AND DISCUSSION

The purpose of this research was to develop a quantitative measurement instrument so as to measure the social capital of students at schools which aim at supplying the society with qualified individuals, and a social capital scale consisting of three dimensions was developed. χ^2/df , NFI, GFI and CFI goodness of fit indexes obtained as a result of the performed Confirmatory Factor Analysis were compared with the expected critical values as regards relevant indexes and it was found out that the model belonging to social capital model had a perfect fit.

Performed analysis show that the developed social capital index consists of 22 items and is a valid and reliable scale.

Social capital scale is a scale which can be used effectively in growing qualified individuals at schools. It is believed that with the scale, some problems experience at schools and in the society can be easily identified and

solutions can be generated. Nevertheless, political powers will be able to apply this scale on young people who are representatives of the future and identify the direction of the change of the general structure of the society. Orr (1999) stated that social capital provided important opportunities for overcoming the problems at schools and claimed that the most important stage of being able to utilize these opportunities, in the part of school leaders, could be realized by having an awareness of social capital sources. After this awareness stage school leaders and managers will be able to invest in areas which will strengthen social capital and make functional the mentioned elements within organizational purposes.

LIMITATIONS OF THE RESEARCH AND SUGGESTIONS FOR FUTURE RESEARCH

This scale was developed for secondary school science students and is limited to the relevant age group. It is suggested that social capital scales should be developed for students in other age groups, too.

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APPENDIX

Development of Social Capital Scale

In the following questionnaire there are 22 expressions each of which consists of 5 options Please mark the most suitable option for you in each question.	Never	Rarely	Some-times	Mostly	Always
1.I feel that I belong to a peer group at school.	()	()	()	()	()
2.I think that my parents care for me.	()	()	()	()	()
3.I can explain my thoughts and feelings to my parents' easily.	()	()	()	()	()
4.I feel comfortable when I am with my friends.	()	()	()	()	()
5.I can declare my opinions among my friends without hesitation.	()	()	()	()	()
6.My family praises me if I show a successful performance at school.	()	()	()	()	()
7.We show respect to the feelings of each other.	()	()	()	()	()
8.Me and my parents show respect to the feelings of each other	()	()	()	()	()
9.We act sincerely and frankly to each other in our friendships and relationships.	()	()	()	()	()
10.My schoolmates show respect to each other.	()	()	()	()	()
11.We say hi to our friends when we see each other outside school.	()	()	()	()	()
12.We give importance to keeping promises among friends.	()	()	()	()	()
13.My parents value give importance to keeping, their promises.	()	()	()	()	()
14.At our school our friends express their requests from each other kindly..	()	()	()	()	()
15.At our school people show respect to the rights of each other.	()	()	()	()	()
16.At our school people protect the rights of each other.	()	()	()	()	()
17.Family members show respect to my rights.	()	()	()	()	()
18.My friends show respect to my rights.	()	()	()	()	()
19.I show effort to see my schoolmates outside school, too.	()	()	()	()	()
20.My schoolmates frequently call me.	()	()	()	()	()
21.We have connections with schoolmates on social networking sites.	()	()	()	()	()
22.My parents give importance to our cultural values.	()	()	()	()	()

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