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The Evaluation of the Attitudes of Prospective Teachers of Social Sciences Towards the Geoscience's Topics

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Abstract: This research was carried out to achieve awareness about the problems experienced in teaching earth sciences topics. It involves the factors affecting the perception and instruction of earth sciences. The sampling is composed of 100 students at Dumlupinar University, Education Faculty, Social Sciences Teaching Department. In the study, a scale of 24 articles was applied to determine the attitudes of the subjects towards earth sciences. The study was carried out in four stages which are determining the articles in the scale, preparing the sample scale, application of the scale and determining the validity and reliability of the scale. As a result, the attitudes of the students were found to be positive in general. The findings indicated that this scale of 24 articles could be used to determine the attitudes of students at universities in Turkey towards earth sciences topics.

Key words: Earth sciences · attitude scale · geography

INTRODUCTION

Learning generally occurs through forming a relation between the already known and newly-encountered stimulus. In this context, what students already know bears great importance in learning. Since the previous experiences and educational past of each student vary, so do their background levels. If the already-known information is enough to grasp the subject, learning occurs faster and more healthily. However, if the background information is wrong, conflicting or lacking, it will be more difficult to perceive and signify new stimulus. Therefore, it is considered essential to review and enhance the background information first before starting to learn a new subject. Indeed, some of this background information is considered as prerequisite for the new learning tasks andtherefore, it might be hard to learn the new information before completing it. If the new information and the existing one are complementary, learning takes place easily; otherwise, the student either ignores or distorts the new information [1]. Studies show that the background information of students affects the learning and teaching processes in the classroom environment considerably [2].

Students develop alternative ideas (those different from scientific ones) by constructing the new ideas with their own thoughts. Thus, conceptual errors occur, which prevents some students from grasping some subjects wholly; in other words, hinders conceptual perception [3]. Therefore, it is crucial to discover the background information of the students, their conceptual errors and alternative conceptions.

The ideas of students about scientific concepts have been drawing interest over the last three decades. Thanks to various studies, it has been found that students have insufficient perceptions and unscientific ideas about the basic scientific concepts Cited in [4]. Recent studies have revealed that students have difficulty in grasping the concepts in many areas of science [5]. In the past few years there has been significant interest in the alternative conceptions held by teachers: in particular, teachers of science. Currently, work in this area is predominately conducted in the United States and the United Kingdom. However, the alternative conceptions of pre- and in-service teachers are also being studied in other countries, such as Australia, Canada, Greece, Hong Kong, India, Israel, Pakistan, South Africa and Spain. This extensive research shows that teachers generally have a range of perspectives along the non-scientific to scientific

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continuum of conceptual understanding. Most commonly, teachers mix scientific and non-scientific ideas to create their own world-view and models of natural phenomena. These alternative conceptions and mixed mental models have been identified among a range of topics in biology, chemistry and physics. Although there has been extensive investigation into children's ideas in Earth science, those of teachers have remained relatively unexplored [6].

The study of conceptual understanding and conceptual change in the Earth Sciences, however, has typically been limited to issues related to space science or the environment. Additionally, the few existing studies are almost exclusively limited to K-12 students, with very little examination of ideas held by college students. We report here on a multi-institution study of the ideas held by college students about a variety of geoscience topics. This research is part of a larger project aimed at developing an assessment instrument for entry-level geoscience courses [7].

Geologic time, both with respect to absolute time and relative time, especially with reference to stratigraphy and the sequence of geological events, such as the appearance of organisms in the fossil record. Understanding geologic time is necessary for understanding those geologic concepts that cannot be directly observed on human time scales, such as mountain building [7].

There can be various reasons for misconceptions. It is important that the misconceptions of students, especially prospective teachers, be determined because they affect, even sometimes prevent their learning later. Moreover, prospective teachers might transfer their own misconceptions to their students unintentionally during their teaching [8]. These results show that the success levels of prospective teachers in the relevant concepts are sometimes below the required level because they have developed certain misconceptions during their training in those subjects. Considering the fact that they will soon start teaching, it is crucial for a higher quality education that these misconceptions be determined and corrected during their undergraduate education for the prospective teachers and during in-service trainings for teachers [8].

Teachers should have concrete and solid perceptions for what they will teach their students; otherwise, their misconceptions will unavoidably be transferred to their students. Therefore, their mastery in their domains is vital in teaching-learning process. However, recent studies have showed that elementary school teachers have either missing or alternative ideas about many scientific concepts pre-service [9]. The same case holds for the earth science topics and it is highly critical that the alternative conceptions of prospective teachers be determined and corrected.

There has been an increase in the number of the studies conducted to determine the perceptions of students at social and science domains over the past few years. Likewise, outstanding studies have also been carried out the conceptual perceptions and misinterpretations of students in geography. Moreover, several other studies have been conducted in the teaching of geography as well to improve the teaching of geography. These studies aim to keep up with the modern techniques and applications in geography by implementing the new teaching methods in this domain andalso to come up with new strategies to teach geographical information better. It is a well-known fact that some geographical topics cause difficulties in teaching them to students most of which are in subjects with intensively abstract topics. Researches in geography education involve determining the topics and the concepts in those topics that have been taught inaccurately and have caused challenges in teaching and suggesting solutions to overcome these obstacles [10].

In Turkey, the prospective teachers generally see the topics of earth science in geography and social sciences courses. In this study, the level of awareness (understandings and misconceptions) of prospective teachers about the topics related to earth sciences was analysed. For this purpose, first of all, the researcher developed an attitude scale for the earth sciences topics.

MATERIALS AND METHODS

In this study, general survey model, which Karasar [11]. had established to determine the current state with the quantitative analysis of the data in the scale, was used. Thus, the attitudes and level of awareness of university students about the earth sciences were determined.

Sampling: The sampling is composed of 100 prospective teachers (58% female and 42% male) at Dumlupinar University, social sciences teaching department in Kütahya and was based on convenience sampling. The scale applied to the sampling tried to determine the perception level of the students about the earth sciences and whether they really make use of the earth sciences in their lives. The study was conducted during the 2006-2007 education year and any sort of discrepancies due to misinterpretations was minimized by basing the scale on neutrality principle.

Table 1: Findings related to factors as a result of factor analysis total variance explained

	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
Component	Total	Variance (%)	Cumulative (%)	Total	Variance (%)	Cumulative (%)	Total	Vvariance (%)	Cumulative (%)
1	5.867	24.446	24.446	5.867	24.446	24.446	4.131	17.214	17.214
2	4.152	17.301	41.747	4.152	17.301	41.747	3.015	12.563	29.778
3	1.962	8.174	49.921	1.962	8.174	49.921	2.688	11.198	40.976
4	1.567	6.529	56.450	1.567	6.529	56.450	2.652	11.051	52.027
5	1.408	5.868	62.318	1.408	5.868	62.318	1.688	7.033	59.059
6	1.065	4.436	66.754	1.065	4.436	66.754	1.590	6.627	65.687
7	1.054	4.391	71.146	1.054	4.391	71.146	1.310	5.459	71.146
8	0.884	3.682	74.828						
9	0.806	3.359	78.187						
10	0.791	3.294	81.481						
11	0.744	3.100	84.581						
12	0.611	2.545	87.126						
13	0.573	2.387	89.513						
14	0.525	2.189	91.702						
15	0.469	1.953	93.655						
16	0.381	1.587	95.242						
17	0.342	1.423	96.665						
18	0.266	1.110	97.776						
19	0.216	0.902	98.677						
20	0.194	0.807	99.484						
21	0.124	0.516	100.000						
22	2.51E-13	1.05E-12	100.000						
23	1.16E-13	4.82E-13	100.000						
24	-3.57E-15	-1.49E-14	100.000						

Extraction method: Principal component analysis

Data collection tools: The scale (GAS-Geoscience Attitude Scale) used as a data collection tool was developed by the researcher. It is composed of 90 articles and was developed by making use of Turkish attitude scales about biography [12-14]. It was applied to 50 students as a trial test and this continued for sometimes every three weeks to determine the continuity coefficient. Finally, the original and converted-type of the scale were compared by the researcher to do the required corrections on the disparate articles. In order to conduct the validity and reliability studies of the scale, the converted type was presented for the opinions of total 19 people consisting of two assessment experts, two learning psychologist, four teacher's trainers, one education programmer and ten teachers to determine the suitability of the scale in terms of meaning, content and technique. After seeking experts' opinions, necessary corrections were conducted on the expressions in the scale. In the Likert Scale of 5, the following choices were presented: Strongly Agree (5), Agree (4), Somewhat (3), Disagree (2), Strongly Disagree (1). In order to test the reliability level of the GAS scale, the scale was conducted on a main subject group of 100 students. With the scores in hand, internal reliability (Cronbach alpha, Split-half and Guttman), score consistency and article analysis were conducted for the whole test and its sub-tests.

Analysis of the data: As a result of studies on the scope validity, 24 articles were included in the scale. The structural validity and reliability studies were carried out on calculations of the scores from the main applications. In order to reveal the factor structure of the scale, factor analysis was carried out on the answers given for all the articles. In order to determine the reliability of the scores given for the whole scale, Cronbach Alpha (0.82) method was used. Sub-test and total correlations of articles were used to determine the differentiation of the articles. Sub-test and total correlations of articles and factor load aftermath rotation were used in the selection of the articles for the scale. The articles with the factor load and sub-test and total correlations above 0.40 were included in the scale, whereas those below this number were excluded from the scale.

Development of the attitude scale and results: Thanks to the factor analysis that had been carried out to test the structural validity of the trial scale, how many dimensions the scale had and what these dimensions were could also be determined. As a result of the analysis of the basic components and conversion process through Varimax technique, 10 factors with values above 1.00 were determined. However, as the number of the factors was more than expected, whether this number could be decreased or not was tested. Initially, elimination was conducted by considering the differences between the factors and those below with differences 0.1 were excluded from assessment.

As seen in Table 1, the values of the ten factors in the scale are as follows: 5.86, 4.15, 1.96, 1.56, 1.40, 1.0 and 1.05. All of the seven factors account for 71.1% of the total variance. It can be said that this is above the accepted level of 41% [15], which allows it to be assessed as a scale of 10 factors. According to the findings, the internal reliability coefficient (Cronbach alpha) was found to be 0.82. The scale was composed of total 7 factors and 24 articles: Six negative and 18 positive. The first factor had 4 articles while the second had 6, the third and the fourth had 5, the fifth had 2, the sixth and seventh had one article each. The findings related to the reliability of the scale showed that the findings were sufficient. As can be understood from the data, the scale covered considerably large part of the expected scope. The mean score was 96,66 andthe mean value was 96.00 andthe standard deviation was found to be 7.64. The calculated deviance coefficient for the distribution was 0.34 and the splay coefficient was 0.16. The distribution showed the characteristics of normal dispersion. Arithmetic average of each article and standard deviation were calculated andthe following tests were conducted: The remaining articles, total articles, test repeat test. As there were no

Table 2: Distribution of the articles according to factor loads

	Component						
MD	1	2	3	4	5	6	7
X3	0.995	0.008	-0.048	0.016	-0.024	-0.019	0.028
X5	0.995	0.008	-0.048	0.016	-0.024	-0.019	0.028
X8	0.995	0.008	-0.048	0.016	-0.024	-0.019	0.028
X18	0.995	0.008	-0.048	0.016	-0.024	-0.019	0.028
X16	-0.049	0.692	0.158	-0.132	0.158	0.205	0.189
X22	0.057	0.691	0.093	0.096	0.307	-0.138	-0.149
X17	0.120	0.663	-0.001	0.325	0.034	0.334	0.050
X4	-0.068	0.651	0.396	-0.032	0.008	-0.278	-0.006
X23	0.059	0.580	0.361	0.276	0.197	0.203	0.089
X1	-0.008	0.440	0.287	0.268	0.307	-0.330	-0.339
X7	-0.097	0.146	0.735	0.210	-0.029	0.079	0.196
X14	-0.062	0.229	0.727	-0.126	0.264	0.259	-0.146
X10	-0.012	0.165	0.673	0.214	-0.117	0.103	0.009
X20	-0.154	0.351	0.518	0.055	0.387	-0.197	0.357
X6	-0.011	0.001	0.505	0.425	0.040	-0.128	0.265
X2	-0.027	0.030	0.110	0.810	0.045	0.110	-0.160
X13	-0.017	0.226	0.186	0.691	0.288	-0.287	0.076
X12	0.226	-0.031	0.144	0.623	-0.086	0.369	0.019
X11	-0.140	0.424	0.049	0.494	-0.293	-0.017	0.397
X21	-0.028	0.367	0.326	0.446	0.141	0.435	-0.012
X15	-0.082	0.163	-0.019	-0.105	0.762	0.122	0.093
X9	0.010	0.205	0.063	0.313	0.616	0.071	0.020
X24	-0.102	0.062	0.149	0.079	0.145	0.775	0.080
X19	0.139	0.030	0.169	-0.040	0.133	0.096	0.813

Rotated component matrix(a)

Table 3: The table of total internal consistency

Cronbach alfa	Split-half	Guttman	Hotelling's T-squared
0.82	0.80	0.78	1337,1338 F=53.198
0.83	0.81	0.79	P<0.01

articles below 0.20, Factor analysis was conducted on all the articles. In order to determine the suitability of the data for factor analysis, Kaiser-Meyer-Olkin (KMO) and Barlet Tests were conducted. In the analysis of the basic components, the value of KMO was found to be 0.87. The KMO test tests whether the partial correlations are small and whether the distribution is sufficient for factor analysis or not. That the Kaiser value (0.87) is above 0.80 is considered favorable. The result of the Barlet test was found to be 29.78 ($p < 0.01$) and this test was significant (meaningful) at 0,01 level. These two findings showed that the size of the sampling was large enough and the data were appropriate for factor analysis. Accordingly, total variance rate expressed by the seven factors was 71.146%. The bigger the rates of variance acquired as a result of factor analysis, the stronger the factor structure of the scale.

Table 2 shows the factor loads and factor distribution of the articles decided to be kept in the scale as a result of factor analysis. rotation was reapplied in such a way to enable the articles to be distributed into the seven factors. According to the data acquired as a result of the calculations, the principle was that the articles could exist in a factor at least with.4 factor load and an article existing in more than one factor should be with at least.1 more value in one factor than another. For social sciences, 0.40 factorial variance is enough. This finding shows that two factors determined to be important factors in analysis can together explain an important fraction of the variance related to the scale. The rotations applied with Varimax Rotation Method to distinguish the factors effectively didn't change the results related to the factor structure. As a result of this method, the articles with factor loads bigger than 0,30 and those existing in 7 factors are presented in the tables. As can be understood from the data, the factor loads of the articles change as such: 0.99-0.99, 0.69-0.44, 0.73-0.50, 0.82-0.44, 0.76-0.61, 0.77, 0.81. This finding shows that the proficiency of each article in the scale to represent its factor is predictable. All these results can be interpreted there is a strong relation between each article and the sub-tests of the factors and the whole scale.

Rotated component matrix (a): The differences among the total scores of the scale acquired through the independent variables like gender and graduation department were tested to find evidence about the structural validity of the scale but no significant difference was found.

As seen in Table 2, the factor loads about the 24 articles in the trial scale change between 0.44 and 0.99. In this respect, this characteristic can be viewed as an indicator of the fact that the 24 article is legible to exist in the scale.

The test was applied Cronbach Alpha, Split, Guttman and Hotelik T-test. The vale of alpha was found 0.8246, while that of Split-half was 0.8060 and that of Guttman was 0.7869, al of which are within the expected range of values. In other words, the reliability of our scale is consistent in the light of all techniques. It is also seen that the reliability of the scale is high thanks to 0,82 value of Cronbach Alpha test (Table 3).

DISCUSSION

It is a well-known fact that the topics of earth sciences have unfortunately become horrible in educational institutions in Turkey. Therefore, the topics of earth sciences are facing important problems due to the fact that they have been misinterpreted and thus taught wrongly.

Many people perceive the topics of earth sciences as statistical bulk of information and thus form negative attitudes towards them [16]. The most important reason for this is the attitudes, behaviours and beliefs of prospective teachers [17]. Changes are expected in the behaviours of individuals who undergo educational processes because education changes the aims, knowledge, behaviours and attitudes andthis change is supposed to be positive [18]. An attitude is an acquired tendency to respond to a certain subject, situation, institution, concept or other people in a negative or positive manner [16]. In this study, the attitudes of the students who are educated at universities to be social sciences teachers towards earth sciences were analysed. As a result, it was established that most of the students had positive attitudes towards earth sciences. It is a probable case in terms of the professional expectations and developments of prospective teachers of social sciences that their negative attitude at university turns into a positive one afterwards. This situation which is also an indicator of the fact that students might sometimes understand and perceive the topics of earth sciences at university better also shows that, at the same time, they can use their knowledge in their professional and casual lives more efficiently. Therefore, if a firm relation can be formed between these topics in class and the daily lives of students, their attitudes towards these topics will

enhance. If the attitudes of students at primary, secondary and high schools towards the topics of earth sciences are determined, more concrete suggestions can be put forwards to boost their success in these subjects. The factors affecting these attitudes might sometimes date back to their primary school experiences and persist until their university years. Therefore, while presenting the topics of earth sciences at universities to the students of social sciences, this situation should be taken into account and relevant studies should be carried out accordingly.

CONCLUSION

As a result of these analysis: No article in the scale was significant (sd-99, $p>0.05$) as a result of independent group t-test that was conducted to see whether there was a significant difference among the articles of the perception about the earth sciences according to gender. As a result, no significant (meaningful) difference was found depending on gender among the subjects of the research according to the articles in the scale.

According to the analysis, 4 of the articles were in the first factor, while 6 of them were in the second; 5 of them were in the third; 5 of them were in the fourth; 2 of them were in the fifth; 1 of them were in the sixth and 1 of them were in the seventh factor. It can be said from the meanings the 16 articles in the second, third and fourth factors that the perception levels of the students about the earth sciences are reflected to their attitudes. Satisfactory information about the attitudes of prospective teachers was acquired thanks to the perception level scale in this study. Being aware of the topics related to the earth sciences as social sciences prospective teachers essentially means the management of the topics within the content of the earth sciences and that a fluid structure to monitor the individual information expected to be shaped is formed.

Suggestions: It is necessary and crucial to determine the attitudes of the students towards earth sciences effectively at the beginning, during and at the end of the process to enhance the learning process. It is thought that this attitude scale for earth sciences can easily be used by prospective teachers. Authorities should conduct the necessary promotion of these kinds of scales that are thought to be so invaluable in enhancing the success of the students in earth sciences. Similar studies can also be developed for other domains to attract the attention of researchers and prospective teachers to cognitive characteristics and attitudes.

Transformation of mineral phases is found affected by different temperature during cement production. The formation of belite and alite phases in cement clinker can be clearly observed under scanning electron microscope. The microstructure study indicates the formation of belite at temperature approximately 1200°C, followed by transformation to α-belite, β-belite and finally changed to alite at high temperature within suitable condition.

APPENDIX: THE SCALE OF ATTITUDE FOR EARTH SCIENCE TOPICS

Dear students: There are sentences reflecting the feelings and ideas about earth science topics below with five choices as "Strongly Agree", "Agree", "Somewhat", "Disagree" and "Strongly Dis Agree". Please read the sentences carefully and mark the option that suits you best.

1. The Earth Sciences sound interesting to me.
2. I find the Earth Sciences more interesting than other disciplines.
3. I find the Earth Sciences boring.
4. I prefer learning the Earth Sciences by experiences them.
5. My folks don't think that the Earth Sciences is an important course.
6. I intend to take up a profession in the Earth Sciences in the future.
7. I think I can use what I have learned in the Earth Sciences in my daily life.
8. I don't want to go to school when there is earth sciences course.
9. Earth sciences is an important course for every one
10. I wish the earth sciences course were more interesting.
11. I never get bored watching documentaries about the Earth Sciences.
12. I enjoy sharing my knowledge about the Earth Sciences with others.
13. I enjoy participating in the field excursion on the Earth Sciences.
14. I conduct research on the Earth Sciences with pleasure.
15. I like the Earth Sciences since they give information about natural phenomenon.
16. I believe that the Earth Sciences will be very useful in my life.

17. I am afraid of earth sciences exams.
18. I find books on the Earth Sciences inadequate.
19. I am confused with the subjects of the Earth Sciences.
20. I always look forward to my earth sciences course.
21. The Earth Sciences satisfy my curiosity.
22. I like my earth sciences course since I think it is useful.
23. I like my earth sciences course when it involves up-to-date information.
24. The Earth Sciences increase my general knowledge.

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