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DEVELOPING THE CONTEXT-BASED CHEMISTRY MOTIVATION SCALE: VALIDITY AND RELIABILITY ANALYSIS

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Abstract. *In order to explain chemistry subjects by linking them to everyday life and accordingly, to improve the quality of education, context-based learning has come into use widely in chemistry teaching recently. The aim of this study is to develop a scale to determine secondary school students' motivations towards chemistry activities supported with context-based learning. Validity and reliability analysis of the scale were done with the participation of 525 high school students. To determine the structural validity of the scale, exploratory factor analysis was done. The factor analysis concluded that the scale had a three-factor structure with 20 items. Cronbach Alpha internal consistency coefficient of the scale was calculated to be 0.91. Cronbach Alpha internal consistency coefficients of sub dimensions were found to be 0,84; 0,80 and 0.81 respectively. In the light of the findings of this study, the scale developed is concluded to be of use in determining high school students' motivations towards context-based chemistry.*

Key words: *context-based chemistry, high school students, motivation.*

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Introduction

Chemistry, as a field of science, is a significant building block of the modern world. It contributes to most of the developments in science and technology and provides a reasonable explanation for natural events either with numeric data or practical methods (Yücel, Seçken & Morgil, 2001). However, subjects of chemistry, since it includes abstract concepts as well, are considered unrelated by many students to the world they live in. This leads students to try to learn chemistry through memorization and fails to prevent them from perceiving chemistry as a difficult lesson no matter how hard they try (Demirci, 2000; Gilbert, Justi, Van Driel, De Jong & Treagust, 2004; Osborne & Collins, 2001; ; Pekdağ, 2010; Simon, 2000). However, many incidents and situations that are encountered and observed in daily life are of direct and indirect relevance to the chemistry (Huntemann, Paschmann, Parchmann & Ralle, 1999; Özden, 2007; Özmen, 2003). In order to make learning of chemistry more permanent and fun, students need to associate subjects related to chemistry with daily life events and they should be able to use them in everyday life. Therefore, it is of great importance to relate the information learned to the incidents that are encountered in daily life (Bennett, 2005; Bulte, Westbroek, De Jong & Pilot, 2006; Coştu, Ünal & Ayas, 2007; Karagölge & Ceyhun, 2002; Palmer, 1997). In order to explain chemistry subjects by linking them to everyday life and accordingly, to improve the quality of education, context-based learning has come into use widely in chemistry teaching recently (Acar & Yaman, 2011; Bennett & Lubben, 2006; Demircioğlu, Demircioğlu & Çalık, 2009; Huntemann, Haarmann & Parchmann, 2000; Ramsden, 1997; Schwartz, 2006; Van Driel, Bulte & Verloop, 2005; Vos, Taconis, Jochems & Pilot, 2011).

Chemistry is perceived as an abstract science and a separate world in itself (Osborne & Collins, 2001; Pekdağ, 2010). Lately, strategies that are used by students to explain the emergent events in their surroundings and the learning realization processes started to be researched in the family-media-street-school quadrilateral. In this manner, it was determined that students learn in their class environment as much as by being influenced by the environment with which they are in interaction (Shaw & Dybdahl, 2000; TPSI, 1991). In fact, everyday life is societal and social dimensions of the science. Since students are not able to transfer chemistry knowledge learnt at school into the life out side of the classroom, a major gap occurs between school and everyday life. Therefore, with an intent to fill the gaps between student's everyday life and chemistry lesson, it is necessary to raise awareness regarding the interpretation of chemistry subjects within the frame of daily life. At this point, it starts to become more of an issue to give students an insight that many events encountered in daily life are actually one within another with the chemistry.

Associating everyday life and chemistry and generalizing this context in education formed a new approach possible in the chemistry education. The purpose of the context-based learning is to increase eagerness and motivations of the students to learn science while presenting scientific concepts by means of contexts chosen from everyday life (Barker & Millar, 1999; Özay-Köse & Çam-Tosun, 2011).

Motivation is a psychological process, which enables a goal-oriented behavior to commence and be maintained (Ziegler, 1999). According to Gymnich (1999), motivation is a general and comprehensive process, which is effective in developing a behavior in a positive way. In other words, motivation is a driving force that introduces the behavior. In development of behaviors, the factors such as motive, need, pressure, interest, drive, instinct are effective. The motivation also defined as a willpower that ensures people to pursue their goals eagerly and decisively, may occur depending upon factors such as daily needs and instant stimulants as well (Felser, 2000). Since the motivation is a process, while seeking an answer to questions of which activities the individuals prefer, how much effort they make for these activities and to what extent they are persistent to continue these activities, it is possible to make an inference regarding motivation by way of observing verbal statements of these individuals (Pintrich & Schunk, 1996). Furthermore, due to the fact that motivation has a goal dimension, tendency levels of the students regarding various situations can be roughly measured with the grading types (Erkuş, 2006).

In terms of student motivation and achievement, it is very important to create a content for the chemistry lessons within a style that is interrelated with the context-based approach. Furthermore, quantitative assessment of this motivation is necessary to ensure the validity and reliability of the studies. In the studies conducted so far, the motivation for context-based chemistry has been generally discussed through observation. However, in the literature, a quantitative data collection tool for determining the motivation of context-based chemistry has not yet been developed. For this reason, this research was intended to develop a valid and reliable measurement tool for determining motivation of the students concerning chemistry activities supported by context-based learning.

Methodology of Research

General Background of Research

The research was performed by means of a descriptive scanning model in order to determine motivation of high school students towards context-based chemistry. The research conducted by the descriptive scanning model is a research that aims to gather data for determining the opinions of large communities regarding a specific subject and its characteristics (Fraenkel & Wallen, 2006, p 397). The study group of the research was determined by two-stage sampling among random sampling types.

Sample of Research

Sampling of the research consisted of 525 randomly selected students who were receiving their education in different high schools located in Ankara during the 2011-2012 academic years. The number of items in the scale was considered in determining the number of students. The scale consisted of 20 items. Kline (1994) indicates that the number of the subject (variable) and sample size at the 10:1 ratio is enough. Therefore, special attention was paid to keeping the size of the sampling as large as possible.

Data Analysis

The validity of data obtained from students with the factor analysis was examined with Kaiser-Meyer-Olkin and Barlett's Sphericity Test. After determining that the data are applicable for the factor analysis, exploratory factor analysis was carried out with the intention of determining the structural validity of scale points and the factor structure of the scale. An item analysis based on the correlation and upper-lower 27% group comparison was performed to establish the level of distinctiveness of scale items. With a view to confirm whether the items in the scale are adequate to differentiate the students in terms of motivation for learning the context-based chemistry, the relevance of the difference between item scores of the upper 27% groups and lower 27% groups was examined with sample t-test. The reliability of the scale was assessed with Cronbach Alpha internal consistency coefficient. For data analysis, SPSS 15.0 package software was used. As the level of significance, p=0.05 was taken into consideration for the statistical analysis and interpretation of data.

Results of Research

Development of an Item Pool and Taking Expert Opinion

Before developing a context-based chemistry motivation scale, studies concerning development of a motivation for learning science were reviewed in terms of language and expression. At the stage of preparation, simple items were written in a plain and clear way and a draft containing 34 items was prepared. To determine whether the draft form is sufficient for questioning the behaviors intended to be measured, the 34-item previously prepared pool was presented to the experts in their field and as a result of their evaluations, 4 items with incoherencies were removed from the draft form. Finally, 30 items were selected as relevant to determine the motivation of context-based chemistry. The pilot scheme of the previously established draft scale was implemented on 540 students. The obtained data were reviewed and after the evaluations, 525 draft forms were deemed suitable for the data analysis. The draft form was drawn up in quinary grading scale as "Strongly disagree" (1), "Disagree" (2), "Neutral" (3), "Agree" (4) and "Strongly agree" (5). While the highest score that a student can receive from the draft form is 150, the lowest score is 30. The higher score means that the motivation of the individual towards context-based chemistry is high and the lower score means that the motivation of the individual towards context-based chemistry is low.

Item Analysis

The results obtained from a trial test application may be analyzed in several levels. One of them is the item analysis. In general, item analysis is carried out in order to present the findings regarding the simplicity and reliability of the item, its distinctiveness and accordingly its validity, and finally operability of the options other than the right answer (Özçelik, 2010). In this research, item analysis based on a correlation and an upper-lower 27% group comparison were conducted with an intent to determine the level of distinctiveness of Context-Based Chemistry Motivation Scale (CBCMS) items. Findings obtained as a result of item analysis based on a correlation are shown in Table 1.

Table 1. CBCMS item total correlation coefficients.

Item No	Item Total Correlation	Item No	Item Total Correlation
1	0.63	11	0.53
2	0.53	12	0.27
3	0.38	13	0.50
4	0.59	14	0.60
5	0.49	15	0.48
6	0.21	16	0.42
7	0.55	17	0.53
8	0.45	18	0.48
9	0.59	19	0.06
10	0.42	20	0.40

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Item No	Item Total Correlation	Item No	Item Total Correlation
21	0.54	26	0.33
22	0.55	27	0.53
23	0.58	28	0.51
24	0.43	29	0.59
25	0.57	30	0.11

As it is seen in Table 1, values of item total correlation coefficient range from 0.06 and 0.63. According to Tezbaşaran (1996), in the correlation-based item analysis, item total correlation coefficients should be positive and at least 0.25. However, it is seen that the item total correlation coefficients of items 6, 19 and 30 have values less than 0.25. Therefore, these articles adversely affects the internal consistency of the test. So as to determine whether to include the articles in question to the final scale, it was decided to establish the efficacy of item distinctiveness.

Efficacy of Item Distinctiveness

An analysis based on upper-lower 27% group comparison was conducted with an intent to determine the validity distinctiveness of Context-Based Chemistry Motivation Scale (CBCMS). In this analysis, after scoring, scale data obtained from 525 students were ranked from the highest to the lowest according to the total score. It was determined in such a way that 27% of the students with higher score formed the upper group and 27% of the students with lower score formed the lower group. For each item, the total score averages were calculated in respect of upper and lower group. In order to determine whether the difference between item total score averages of the students at upper group (n=141) and lower group (n=141) was significant, Independent Sample t-Test was carried out. The data acquired as a result of the comparison of upper - lower 27% group are shown in Table 2.

Table 2. Average and t-values of CBCMS items.

	Upper: 1 Lower: 2	$\bar{X}$	t		Upper: 1 Lower: 2	$\bar{X}$	t
1	1.00 2.00	4.44 2.31	17.77	11	1.00 2.00	4.22 2.52	13.09
2	1.00 2.00	4.02 2.44	13.01	12	1.00 2.00	3.52 2.52	6.86
3	1.00 2.00	4.21 2.80	9.28	13	1.00 2.00	4.34 2.77	12.45
4	1.00 2.00	4.09 2.26	14.65	14	1.00 2.00	4.49 2.45	17.79
5	1.00 2.00	4.51 2.70	13.60	15	1.00 2.00	4.54 2.90	12.24
6	1.00 2.00	3.58 2.82	4.91	16	1.00 2.00	3.62 1.96	12.20
7	1.00 2.00	4.51 2.74	13.82	17	1.00 2.00	4.26 2.57	13.70
8	1.00 2.00	3.64 2.18	11.91	18	1.00 2.00	4.51 2.72	13.55
9	1.00 2.00	4.53 2.52	17.09	19	1.00 2.00	2.97 2.48	2.78
10	1.00 2.00	3.46 1.87	11.47	20	1.00 2.00	3.50 2.09	10.33

	Upper: 1 Lower: 2	$\bar{X}$	t
21	1.00	4.30	14.02
	2.00	2.51	
22	1.00	4.36	15.03
	2.00	2.62	
23	1.00	4.11	15.66
	2.00	2.24	
24	1.00	4.09	11.04
	2.00	2.67	
25	1.00	4.40	15.66
	2.00	2.48	

	Upper: 1 Lower: 2	$\bar{X}$	t
26	1.00	3.39	8.36
	2.00	2.16	
27	1.00	4.33	13.34
	2.00	2.71	
28	1.00	4.21	14.27
	2.00	2.42	
29	1.00	4.17	16.89
	2.00	2.33	
30	1.00	3.54	2.79
	2.00	3.07	

As it is seen in Table 2, significant differences were found between the total score averages of all the items that belong to upper and lower group as a result of Independent Sample t-Test ($p< 0.01$). However, as a result of the analysis carried out, t values of items 3, 6, 12, 19, 26 and 30 were determined to be lower when compared to other items. Since items 3, 6, 12, 19, 26 and 30 were considered to adversely affect the internal consistency of the scale, it was decided to remove those items from the draft scale.

Exploratory Factor Analysis

So as to determine the extent the scores acquired from the test were actually intended structure, they were studied in terms of structure validity. One way of studying it is the factor analysis. When carrying out a factor analysis, there are some points to take into consideration. One of them is the sample size and the other one is normality. In order to ascertain the suitability and sufficiency of the data obtained from the sample for the factor analysis, Kaiser-Meyer-Olkin (KMO) test was performed. To determine whether the measured variable is multivariate in the parameter of universe, Barlett's Sphericity Test was conducted. The results of KMO value and Barlett's Sphericity Test were presented in Table 3.

Table 3. CBCMS Kaiser-Meyer-Olkin and Bartlett's test analysis results.

Kaiser-Meyer-Olkin Sample Size Adequacy		0.93
Bartlett's Test	χ^2	3792.68
	SD	190
	p	0.00

It can be seen from Table 3 that the KMO value is 0.93, and the Bartlett's Test value is statistically significant ($\chi^2 = 3792.68$; $p<0.05$).

In order to reduce the factor number, a factor having a difference less than 0.1 between their factor loads was eliminated. The factor covering items 10, 16, 20 and 24 did not take into consideration. In addition to this, scree test was performed in order to determine the important factor number. Scree test is realized in the way of showing each eigenvalue in a diagram and determining the factor number according to the distinction point where the monotone distribution degenerates (Akbulut, 2010).

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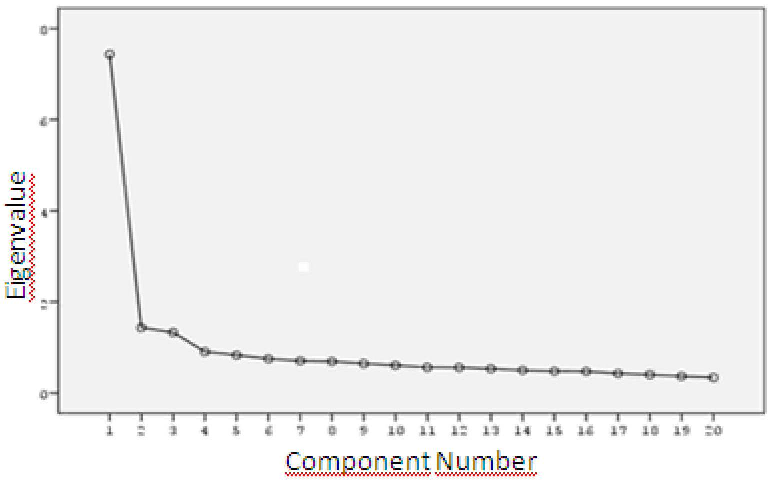

Figure 1: Line chart showing the factor number of CBCMS.

It can be seen from Figure 1 that the visible distinction starts from the third factor. Therefore, it was concluded that the line chart and CBCMS have a three-factor structure. Having a factor load of 0.45 or higher is a suitable measure for the selection (Büyüköztürk, 2010). Based upon this view, the items having a factor load of 0.45 and higher were selected. Distribution by factors, factor loads, eigenvalues, represented variance percentages and Cronbach Alpha internal consistency coefficients of the items taken part in the scale are shown in Table 4.

Table 4. C0 BCMS factor analysis.

Factors	Factor Loading	Eigenvalue	Declared Variance Percentage	Cronbach Alpha	p
1. Factor		7.43	37.15	0.84	.000
M 22	0.691				
M 27	0.678				
M 17	0.668				
M 25	0.646				
M 21	0.621				
M 14	0.571				
M 28	0.570				
M 11	0.558				
M 13	0.523				
2. Factor		1.43	7.18	0.80	.000
M 1	0.717				
M 2	0.713				
M 4	0.681				
M 8	0.666				
M 23	0.542				
M 29	0.534				

Factors	Factor Loading	Eigenvalue	Declared Variance Percentage	Cronbach Alpha	p
3. Factor		1.33	6.65	0.81	.002
M 7	0.742				
M 5	0.732				
M 9	0.707				
M 15	0.699				
M 18	0.527				

Declared total variance: 51%
Whole scale Cronbach Alpha: 0.91

Table 4 demonsrates that the factor loads of the items are higher than the acceptable value. The scale consists of 20 items in total and it is seen that there are 9 items in the first factor, 6 items in the second factor and 5 items in the third factor. The variance factors which the factors represent separately are 37.15% for the first factor, 7.18% for the second factor and 6.65% for the third factor. The total variance represented by 3 factors is 51%. According to Dunteman (1989), if the variance represented in the factor analysis performed for social sciences is between 40% and 60%, it is considered to be sufficient.

While naming the factors constituting the scale, the macro model suggested by Keller (1999) regarding formation of the incentive was used and factors were named according to the expressions they include. The first factor consists of 9 items, which express eagerness, enthusiasm and willingness to make experiments for an individual. Therefore, it was deemed suitable to name this factor as "Enthusiasm". The statements such as "*I would like to give scientific explanations for chemistry related events with which I encounter in everyday life*" and "*I would like to carry out the experiments that I learnt from chemistry lessons at home with the equipment used in daily life*" can be examples of items belonging to these factors. The second factor consists of 6 items regarding what the acquisitions of the students mean for them. Consequently, it was deemed suitable to name this factor "Efficacy". Some examples of the items belonging to this factor are as follows; "*I can relate the daily events which I hear from the media and internet with the chemistry*", "*I can explain chemical reasons of the events which I encountered everyday life with my chemistry knowledge*". The third factor consists of 5 items which involve the student expectations regarding their acquisitions and using these acquisitions. Accordingly, this factor is named "Performance". "*I understand the chemistry subjects more quickly when the teacher tells these subjects by linking them with everyday life*" is an example of an item belonging to this factor.

In order to prove that the 3 factors of Context Based Chemistry Motivation Scale measures the same property, Pearson Product-Moment Correlation coefficients were calculated and the correlations between factors were analyzed.

Table 5. Correlation coefficients of context-based chemistry motivation scale factors.

Factor	Eagerness	Efficacy	Performance
Eagerness	1	0.616 *	0.618 *
Efficacy	0.616 *	1	0.566 *
Performance	0.618 *	0.566 *	1

**p* <0.01

Table 5 reveals positive expressive relations between factor of the scale as a result of performed correlation analysis ($r = 0.616$; $r = 0.618$; $r = 0.566$, $p<0.01$). This result shows that the scale has a consistent factor structure.

Reliability Study

In a reliability research of scales, the purpose is to determine the stability level of a scale in itself as a measuring means (Özçelik, 2010). So as to determine the internal consistency of Context-Based Chemistry Motivation Scale,

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Cronbach Alpha reliability coefficient was calculated and as a result of analysis, the coefficient was determined to be 0.91. When examining the Cronbach Alpha values on the basis of factors, Table 4 shows the value of 0.80 and above all for 3 factors as well. According to Nunnally (1967), if the evaluation criteria of Alpha coefficient is $0.80 < \alpha < 1.00$, the scale is highly reliable. Accordingly, it can be said that Context-Based Chemical Motivation Scale items measure the same property, the scale is homogeneous and the items are consistent and satisfactorily reliable.

After the item analysis and reliability studies, it was concluded that Context Based Chemistry Motivation Scale is a 5-point Likert Type scale. It consists of total 20 items and graded between "Strongly agree" (5) and "Strongly disagree" (1). The scale has a three-factor structure called Eagerness, Efficacy and Performance. While the highest score that can be received from the scale is 100, the lowest score is 20. The higher score means that the motivation of the individual towards context-based chemistry is high and the lower score means that the motivation of the individual towards context-based chemistry is low (see App. 1).

Discussion

The process of scale development was started with a literature review and establishing an item pool. The prepared 34-item pool was presented to the expert opinion and consequently, it was decided to remove 4 items. The validity and reliability studies trial form consisting of 30-items was carried out with 540 high school students. When the data obtained from the students were analyzed, it was determined that 525 test form was found suitable for the analysis. Statistical analysis was started with the item analysis based on item total correlation and the comparison of the upper-lower 27% group item scores. As a result of the analysis conducted, 6 item was removed from the test form. Before starting the exploratory factor analysis, Kaiser-Meyer-Olkin test was performed so as to determine the conformity of sample size to the factor analysis and the KMO value was determined as 0.93. KMO value is qualified as 'bad' in the range of 0.50-0.60; 'weak' in the range of 0.60-0.70, 'moderate' in the range of 0.70-0.80; 'good' in the range of 0.80-0.90 and 'perfect' if higher than 0.90 (Kline, 1994; Leech, Barrett & Morgan, 2005; Tavşancıl, 2006). To determine whether the measured variable is multivariate in the parameter of universe, Barlett's Sphericity Test should be conducted (Thompson, 2004). Bartlett's Test value was determined as statistically significant (χ^2 χ^2 = 3792.68; $p<.05$). In so far as the KMO coefficient is higher than 0.50 and the Barlett's test is expressive, the data are applicable for the factor analysis (Büyüköztürk, 2010). It makes great contributions to the assessment of structure validity of scale scores (Fraenkel & Wallen, 2006). The factor analysis is applied to see whether the items in a scale are split into few mutually exclusive factors, in other words for the purpose of item reduction. And for the items to determine the same factor cluster (Balcı, 2001). Exploratory factor analysis was commenced with 24 items. In a good factor analysis, variable reduction and correlate between the produced factors are the basic principle for reducing the number of factors. Eigenvalue coefficient is taken into consideration when deciding on an important factor number. In the factor analysis, factors with eigenvalue of 1 or greater than 1 are considered as important factors. And in order to reduce the factor number, factors having a difference less than 0.1 between their factor loads should be eliminated (Büyüköztürk, 2010). As a result of the analysis, a factor whose eigenvalue is less than 1 and who is having a difference less than 0.1 between their factor loads was completely removed. This factor was consisting of 4 items.

After the analysis, it was ascertained that Context Based Chemistry Motivation Scale was consisting of 20 items with factor load values ranging between 0.523 and 0.747. The scale has a three-factor structure. In the factor "Enthusiasm", the first factor of the scale, there are 9 items and the factor loading values of the items range between 0.523 and 0.691. Item total correlation coefficients of the items presented in this factor range between 0.50 and 0.60. The variance which the factor represents alone is 37.15%. In the factor "Efficacy", the second factor of CBCMS, there are 6 items and the factor load values of the items range between 0.534 and 0.717. Item total correlation coefficients of the items presented in this scale range between 0.45 and 0.63. This factor represents alone 7.18% of the total variance. In the factor "Performance", the third factor of CBCMS, there are 5 items and the factor load values of the items range between 0.527 and 0.742. Item total correlation coefficients of the items presented in this scale (corrected item total correlation) range between 0.48 and 0.59. This factor represents alone 6.65% of the total variance. It is seen that the total variances represented by three factors reach 51%. According to Dunteman (1989), the variance represented in the factor analysis, which is performed for social sciences, ranges between 40% and 60%. It is undesirable for represented total variance to be lower than the non-represented variance. Therefore, it is intended that the total variance represented in a good factor analysis is at least 50% (Akbulut, 2010, p.103).). As a result of the analysis carried out for determining the reliability of the scale, the Cronbach Alpha internal consistency coefficiency of the was calculated as 0.91 for whole scale; 0.84 for the first factor; 0.80 for the second factor and 0.81 for the third factor.

Conclusion

Nowadays, the adapted version of context-based learning approach to chemistry lesson is known as context-based chemistry (Huntemann, Paschmann, Parchmann & Ralle, 1999; Parchmann et. al., 2006). The purpose of context-based chemistry learning is to ask students the scientific concepts regarding chemistry by forming contexts from everyday life and thus to increase students' motivations, their attitude towards the lesson and their success. Furthermore, it enables students to understand and correlate the link between daily life events and other science lessons when they put them into practice. While studies conducted so far have the feature for revealing the effect of context-based learning over motivation of the relevant lesson (Choi & Johnson, 2005; İlhan, 2010; Koçak, 2011; Kutu, 2011; Parchmann et al., 2006), in this study the motivation factor was directly dealt with in terms of context-based chemistry. During the additional literature review performed, it was found that there is no data collection instrument which enables to determine the motivations of the students regarding learning of context-based chemistry. With reference to this view in the current study, developing a scale was aimed so as to determine the motivations of high school students for learning context-based chemistry.

In the motivation scale, the reason and the trends that can be considered as indicators of motivation were specified and they were examined in terms of their different aspects. In the factoring study, it is considered that each phrase group expressed by a factor defining the motivation of the student toward the factor in question. Due to the fact that the sub-dimensions of the developed scale are independent of each other, it makes it possible to review the properties of the motivation specified in each sub-factor separately. Findings obtained from the validity and reliability studies of the Context Based Chemistry Motivation Scale show that this scale can be used to determine motivations of the students towards context-based chemistry. Studies in the literature have focused mainly on determining the motivation levels of students towards the subject area and it was observed that there were no studies on determining the motivation levels of students towards context-based learning method. Therefore, this study aimed to determine the motivation levels of students about the context-based learning method with respect to the chemistry subject.

In further studies on this topic, the results that are going to be obtained form this motivation scale, which will be administered with the aim of assessing the motivations of students about the topics to be taught, would provide positive feedback for teachers on whether the context-based learning method was implemented effectively. Hence, these results would act as a pretest in determining the preliminary motivation levels of students about learning the topic. Furthermore, this motivation scale has the characteristic of a guiding assessment tool in terms of determining the appropriate strategies that could be used by teachers in teaching environments. Administering this assessment tool as a posttest following the introduction of the topic to the students and evaluating the results would provide essential feedback on the effectiveness of teaching.

The scale has been developed with the aim of determining students' motivation levels about learning chemistry within a context-based approach. It could be modified in order to assess the motivation levels of students about context-based learning in diverse fields of science such as biology, physics and mathematics.

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Appendix 1

CONTEXT-BASED CHEMISTRY MOTIVATION SCALE Hereby below, you may find statements regarding your opinions about the chemistry subject and the science of chemistry. Please, read each statement carefully and mark the box with (X) according to your rating for the statement. Please, mark each statement and do not leave any statement blank. Thank you for your contribution. **Name of the school:** **Classroom:**	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
Enthusiasm					
1. I feel enthusiastic about observing chemical events occurring in the flow of life.	1	2	3	4	5
2. With the help of my knowledge in chemistry, I am able to interpret the events happening around me (effects of the toothpaste, whitening effect of the bleacher.	1	2	3	4	5
3. I like using my knowledge in chemistry outside the classroom.	1	2	3	4	5
4. Chemistry becomes important to me when I am able to attribute scientific meanings to the chemical events I come across in my daily life.	1	2	3	4	5
5. I would like to give scientific explanations for chemistry related events with which I encounter in everyday life.	1	2	3	4	5
6. I wish the topics in chemistry would help me in solving the problems I came across in my life.	1	2	3	4	5
7. I would like to carry out the experiments that I learnt from chemistry lessons at home with the equipment used in daily life.	1	2	3	4	5
8. The more chemistry is related to the daily life, the more meaningful it becomes for me to explain the events I come across.	1	2	3	4	5
9. The science of chemistry is important to me as long as I am able to attribute meanings to the events I come across in my daily life.	1	2	3	4	5
Efficacy					
10. I like this subject; because, chemistry topics include events that I come across in my daily life.	1	2	3	4	5
11. I can relate the daily events which I hear from the media and internet with the chemistry.	1	2	3	4	5
12. I am interested in chemistry; because, the development is chemistry contributes to the development of technology.	1	2	3	4	5
13. I can explain chemical reasons of the events which I encountered everyday life with my chemistry knowledge.	1	2	3	4	5
14. I am able to keep the chemistry topics in my mind through relating each of them with the events I come across in my daily life.	1	2	3	4	5
15. My knowledge in chemistry allows me to interpret the daily life from various perspectives.	1	2	3	4	5

Performance					
16. I understand the chemistry subjects more quickly when the teacher tells these subjects by linking them with everyday life.	1	2	3	4	5
17. Teaching of chemistry through giving examples from daily life would be interesting for me.	1	2	3	4	5
18. Chemistry classes are fun if I am able to relate the chemistry topics with my life.	1	2	3	4	5
19. Performing experiments in the classroom with materials from daily life (glass, tea spoon, etc.) would increase the level of my interest towards the lesson.	1	2	3	4	5
20. I would like the questions of the chemistry test to be prepared using the real life events.	1	2	3	4	5

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