

## **Adaptation of Chemistry Motivation Questionnaire-II to Turkish: A Validity and Reliability Study**

Cemal TOSUN \*

### **Abstract**

The purpose of this study is to adapt “*Chemistry Motivational Questionnaire- II-CMQ-II*”, developed by Glynn, Brickman, Armstrong and Taasobshirazi (2011), into Turkish and investigate validity and reliability of the Turkish version of the scale. The original version of the scale was composed of 25 items gathered under five factors (intrinsic motivation, self-determination, self-efficacy, career motivation and grade motivation). Firstly permission from the developers of the scale was sought. Thereafter, the items of the scale were translated into Turkish by researcher. The translation validity of the scale was examined by referring to the views of English and Turkish language experts. Once the final form of the scale had been derived, an English language expert translated the items of the scale from Turkish to English. The results obtained from this translation indicated that the Turkish scale closely approximated the original English scale. Turkish version of the scale was administered to total of 306 high school students from Anatolian Teacher High School and Anatolian Imam and Preacher High School and 266 university students from Education Faculties of Bartın and Ataturk Universities. The item-total correlations were calculated, and items which had negative or low correlation with the total scale score were excluded from the scale. The construct validity of the scale was examined by exploratory and confirmatory factor analysis. Varimax rotation technique was used due to the separation into irrelevant factors. Finally the scale was constructed from 20 items gathered under five factors to university students and 19 items gathered under five factors to high school students. The reliability coefficient (Cronbach-Alpha) for the whole scale was calculated as .894 for university students and as .840 for high school students.

**Keywords:** Chemistry Motivation-II, CMQ-II, motivation, validity and reliability, exploratory factor analysis and confirmatory factor analysis

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\*\* Yrd. Doç. Dr., Bartın Üniversitesi, Eğitim Fakültesi İlköğretim Bölümü Fen Bilgisi Eğitimi ABD, Bartın, cemaltosun22@gmail.com

### **Extended Summary**

#### ***Purpose:***

The purpose of this study is to adapt “*Chemistry Motivational Questionnaire-II - CMQ-II*”, developed by Glynn, Brickman, Armstrong & Taasobshirazi (2011), into Turkish and investigate validity and reliability of the Turkish version of the scale.

#### **Method**

In this study, general scanning model has been employed. Before starting the adaptation of the scale into Turkish, necessary permissions from the developers of the scale, were taken via e-mails. After the permission was taken, the scale items were translated into Turkish by the researcher and the English-Turkish compatibility grading form was made using “Google Drive” program and translation compatibility ratings were demanded for each scale item from English language experts. Following the English-Turkish compatibility phase of the translated items, Turkish experts rated the items in the Turkish form in terms of their compatibility to Turkish grammar and their levels of understandability. To ensure, concept and language equivalence of the scale, Turkish items were translated back into English by an English language expert. The researcher examined the similarities of each item by comparing each item’s original English version and its translation back into English. Finally, retranslated English items were translated into Turkish. Thus, the translation and language validity of the scale was completed and the Turkish version of the form was finalized.

The scale whose translation and language validity was ensured, was first applied in English and one month later it was applied in Turkish to the same group of students and the consistency level between the two forms were analysed. In these phase in which 17 students participated the results were subjected to Wilcoxon Signed Ranks Test. Finally, validity and reliability of the translated scale was examined.

The reliability of student data collected by the scale was examined Cronbach’s

Alpha. To test the construct validity of student data, the items of scale were subjected to explanatory and confirmatory factor analysis. Subsequent to verifying the linguistic equivalence of scale, the validity and reliability analyses have been conducted via SPSS 15 and LISREL 8.8 programs

#### **Result**

The results showed that there was a high level of agreement between the English and Turkish items. The Turkish scale was found to be sound in its language structure and was rated as understandable by the raters. Correlations between the English and Turkish scale scores showed that there was a high level of agreement. The item-total correlations were calculated on the data collected as evidence of validity of scale. The suitability of data for factor analysis was determined by KMO

(Kaiser-Meyer-Olkin) parameter and Bartlett's Sphericity test. The results showed that the obtained data was suitable for exploratory factor analysis and then the construct validity of the scale was examined by exploratory factor analysis. Varimax rotation technique was used due to the separation into irrelevant factors and five items which were excluded from the scale to university students and six items which were excluded from the scale to high school students. Finally the scale was constructed from 20 items gathered under five factors to university students and 19 items gathered under five factors to high school students.

The first factor was named as "intrinsic motivation" and second factor was named as "self-determination" and third factor was named as "self-efficacy" and fourth factor was named as "career motivation" and fifth factor was named as "grade motivation". The findings obtained from the confirmatory factor analysis and reliability analysis showed that there was a good fit between the hypothesized model and observed data to university students and high school students. The standardized factor loadings were reasonable and statistically significant. Fit indices generated by the LISREL 8.8 program showed that the model fitted the data well ( $X^2/df=2.29$ ; GFI=.88; AGFI=.84; CFI=.96; NNFI=.95; RMR=.052; RMSEA=.059) to university students and ( $X^2/df=2.65$ ; GFI=.88; AGFI=.85; CFI=.96; NNFI=.95; RMR=.099; RMSEA=.059) to high school students. The reliability coefficient (Cronbach-Alpha) for the whole scale was calculated as .894 for university students and as .840 for high school students. Analysis of the data showed that the Cronbach-Alpha values of the five subscales varied between .656 and .831 for university students and .340 and .849 for high school students. Hence, the adapted scale not only managed to produce reliable data, but also valid information about the multidimensionality of data.

### *Conclusion and Suggestion*

As a result it could be argued that a valid and reliable Turkish version of the CMQ-II was composed of 20 items gathered under five factors to university students and 19 items gathered under five factors to high school students were developed. In this way, the Turkish version of the scale acquired capability measuring of the Turkish university students' and high school students' motivation towards chemistry lessons. The sample of the study is limited to 266 university students and 306 high school students in two different universities and in two different high school. Detailed data could be collected, if the Turkish scale is administered on a larger sample group. It is believed that data from different students sample would provide more evidences related to the validity and reliability of the Turkish scale.

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