



The educational and career interest scale in science, technology, and mathematics: Validity and reliability study¹

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Abstract

The aim of this study is to examine the psychometric features of Educational and Career Interest Scale (ECIS) developed by Oh et al. (2013) in order to assess the high school student's own interests in the fields of Science, Technology, and Mathematics (STEM) on Turkish sample. The scale consists of three sub dimensions called career interest in Science, career interest in Technology and career interest in Mathematics as well as 9 items. The sample of the study comprises of 588 students who study at three different high schools. The studies of internal consistency, item and factor analysis and criterion cohesion validity were performed to examine the psychometric features of the scale. The values obtained from the internal consistency analyses of the scale was .89 for SCI sub dimension; .81 for TCI sub dimension; .88 for MCI sub dimension and .87 in total, and it was shown that the scale has sufficient reliability levels. The results of item discrimination and confirmatory factor analysis showed that the original three-factor structure of the scale is suitable for Turkish sample. So, it is thought that the scale is a valid and reliable tool to be used for determining the educational and career interest levels for Turkish sample group.

Keywords: Science, Technology, Mathematics, Career interest, validity and reliability.

Introduction

The development of technology has affected many fields of human life deeply. The most important effect of technology has been on the occupational and personal lives of the individuals. Factors such as rapid changes in the occupational and personal lives of the individuals in relation with the developing technology, differences in the business market or family, inner circle, school

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environment and social lives of the individuals has affected the career and occupational choice of the individuals. Griffin and Hesketh (2003) stated that the fact that individuals were able to accommodate themselves to these rapid changes in the individual's career progress was an important factor in the protection of emotional health (Kalafat, 2012). The fact that individuals choose their future occupation in the field in which they are interested make right and accurate decisions about the occupation they choose affect their quality of life and happiness. The first step in being happy in occupational and personal life is to have an occupation in the area in which the individuals are interested and achieve a successful career. Therefore, the interest, as mentioned above, is one of the most important concepts affecting individuals' chooses such as occupation, achieve a successful career, and becomes happy in occupational and personal life. Moreover, the interest is considered to be an important incentive of learning and success. The studies have assessed the interest in both philosophical and psychological aspects. Dewey stated that philosophical and pedagogical approaches the interest is a motive for choosing an occupation and gaining experience (Jackson, 1990). Atkinson stated that the interest psychologically was an incentive value (Oh et al., 2013). The researchers handled the concept of interest from different aspects and suggested various definitions to this concept. Krapp et al. (1992) stated that the interest has three basic structures; personal, situational and psychological; Parsons and Goff (1980) conceptualized the interest in four structures as achieving, internal, benefit and cost. Some psychologists define the interest as behaviors that are learned, determined as the emotion of liking or not liking and that meets a need of the individual (Özoğlu, 1983). According to Savickas (1999), the interest is a state of consciousness that becomes clear by reacting to a certain circumferential stimulus or to thoughts about such stimulus. Hansen (2005) defined the interest as the explanation of the activities that are liked or not liked (Koç, 2006). In addition, Eccles and Wigfield (1995) as two of pioneers of expectancy-value theory defined the interest in two different areas as internal and external interest. Accordingly, the joy that an individual experiences while performing an activity is defined as internal interest; the belief in the benefit of a duty in individual's achieving the goals about the future, such as getting into university or an occupation is defined as external interest (Oh et al., 2013; Ormrod, 2006; Schunk et al., 2007; Wigfield, 1994). It is important in the educational environment that internal and external interest levels are understood by both students and teachers. The boundaries of this are that the student learns a certain subject, achieves a career in a certain field and apply to university for a certain department. The researchers, educators and politicians have stated that internal and external interests are important in learning information and skills, achieving a career and studying at university in the fields related to science, technology and

mathematics so that students can be competitive (Oh et al., 2013; Tyler-Wood et al., 2010). The fear that comes along with getting into the occupational life and business markets becoming more and more complex in our country worries the high school students and decreases their hopes of achieving an occupational career in the fields in which they are interested for a good future. As getting close to graduation from the high school, students' most important worry becomes to get into a department in which they are interested at university and become successful in that field. Therefore, internal and external interests of high school students should be known for success in the fields related to science, technology and mathematics during the education. It is important that the educators have the tools to measure students' internal and external interests for developing appropriate pedagogical approaches or optimizing the content in order to provide success. A reliable and valid tool must be used to measure students' internal and external interests in the fields of science, technology and mathematics appropriately. Kanten (2012) in his study have conducted to adapt an international measurement model in Turkey which is known as career adaptabilities scale. Moreover, Kalafat (2012) carried out the initial results on the adaptation and validation of the Career Futures Inventory (CFI) to Turkish language in his study. Büyükgöze-Kavas (2012) adapt the Career Decision Scale in Turkish culture. The studies that measure the general interests cannot measure high school students' internal and external interests especially in the fields of science, technology and mathematics. Therefore, it is thought that Educational and Career Interest Scale (ECIS) developed by Oh et al. (2013) can greatly contribute to both researchers and science educators as a tool that performs measurements related to determining high school students' educational and career interests in the fields of science, technology and mathematics in our country. From this point of view, the aim of this study is to adapt STEM into Turkish and test compliance of the psychometric features of its three-factor original structure with Turkish sample group.

Method

Research Model

This study is a scale adaptation and carried out with “screening model”. Turkish form of Educational and Career Interest Scale (ECIS) was applied to students in the second semester of 2013-14 academic year. The population of this study is composed of the high school students studying in the central districts of Sakarya province. The sample is total 588 students, 305 (51.9%) of which are girls and 283 (48.1%) of which are boys who are in the central districts and study in grades 9, 10, 11, and 12 at three different Anatolian high schools selected randomly.

Data Collecting Tool

Educational and Career Interest Scale (ECIS): This measuring tool was developed by Oh et al. (2013) is composed of three sub dimensions called career interest in Science, career interest in Technology and career interest in Mathematics. The scale was prepared in 7-point Likert type, and the items are graded from 1 to 7. Factor loads of ECIS are between .76 and .94. The highest score that can be possibly obtained from the scale is 63, the lowest is 9. There is no reverse-graded item in the scale.

Process Steps

For the adaptation study of the scale, Oh et al. that developed the scale was made contact with via e-mail, and necessary permit was obtained to adapt the scale. ECIS was first translated to Turkish by three academics at the department of English Teaching, and the translations were reviewed and corrected when necessary. Then the same group translated the Turkish forms back to English, reviewed the consistency between two forms, and the final Turkish form was generated by discussing over the Turkish forms. The Turkish form was corrected after being reviewed from the aspects of meaning and grammar, and the template Turkish form was generated. The Turkish form was reviewed by 4 academics who are expert in the field of measurement and assessment, and some corrections were made according to their views. Before starting the validity and reliability studies, linguistic equivalence studies were carried out to determine the consistency between the Turkish and English forms of ECIS, and validity and reliability analyses were performed after it was seen that there was a linguistic equivalence. ECIS' validity of structure was examined as the validity study. Confirmatory factor analysis (CFA) was performed for structure validity. The reliability of ECIS was examined through internal consistency and test-retest methods; its item analysis was examined with corrected item-total consistency. SPSS 13.0 and LISREL 8.54 (Jöreskog & Sorbom, 1996) software were used for validity and reliability analyses.

Findings

Item Analysis and Reliability

As a result of the analysis, the internal consistency-reliability coefficient of ECIS was found to be .87 for the whole scale; .89 for sub dimension of career interest in science; .81 for sub dimension of career interest in technology; and .88 for sub dimension of career interest in mathematics.

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Item analysis was performed in order to determine the discrimination power of ECIS items. As a result of the analysis, it was seen that the corrected item-total correlation coefficients of the scale were between .51 and .67. The findings can be seen in Table 1.

Table 1: ECIS'CorrectedItem-Total Correlations

Items	Item-Total Correlation(r_{ik})
1 I am interested in taking courses that help me learn more about SCIENCE.	.67
2 I am interested in working in a career that allows me to use SCIENCE-related skills or knowledge.	.62
3 I would like to learn SCIENCE-related knowledge and skills because they can be useful to help me be prepared for college.	.66
4 I am interested in taking courses that help me learn more about TECHNOLOGY.	.54
5 I am interested in working in a career that allows me to use TECHNOLOGY-related skills or knowledge.	.51
6 I would like to learn TECHNOLOGY-related knowledge and skills because they can be useful to help me be prepared for college.	.56
7 I am interested in taking courses that help me learn more about MATHEMATICS.	.63
8 I am interested in working in a career that allows me to use MATHEMATICS-related skills or knowledge.	.59
9 I would like to learn MATHEMATICS-related knowledge and skills because they can be useful to help me be prepared for college.	.57

Structure Validity

Structure validity of ECIS was examined with CFA. As a result of the CFA, it was found that the scale had three dimensions as in the original form. Fit index values were found to be $\chi^2 = 56.85$, $df = 24$, $RMSEA = .048$, $NFI = .99$, $CFI = .99$, $IFI = .99$, $RFI = .98$, $GFI = .98$, and $SRMR = .031$ in the confirmatory factor analysis performed for three-dimension model. Factor loads of the confirmatory factor analysis are shown in Figure 1.

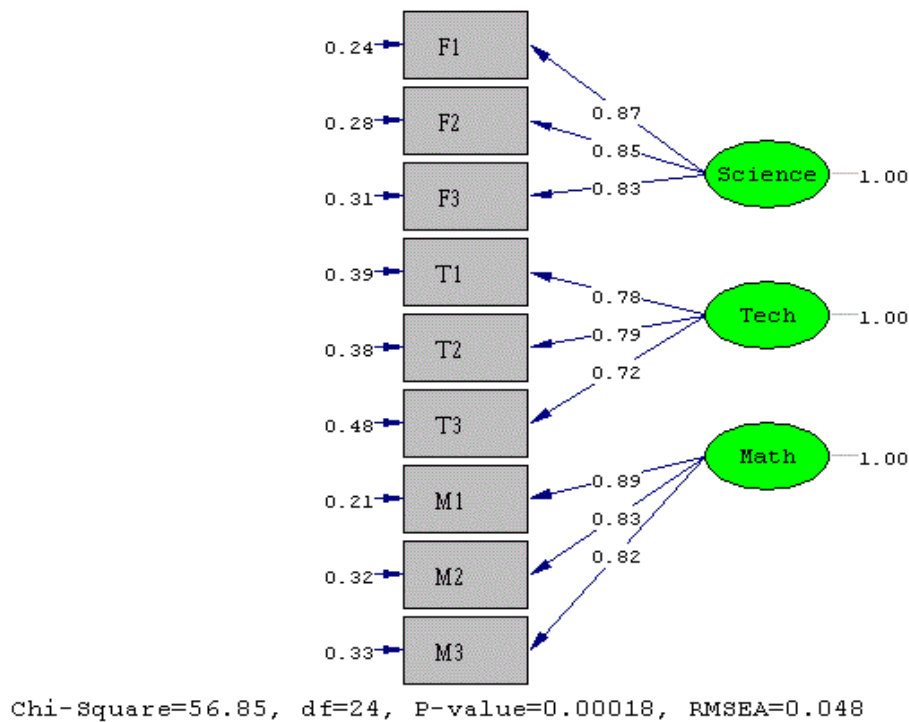


Figure 1. Factor loads of the confirmatory factor analysis. (F=Science items; T= Technology items; M= Mathematics items)

Discussion and Conclusion

In this study, it was aimed that ECIS developed by Oh et al. (2013) is adapted to Turkish and the Turkish form is examined for validity and reliability. Groups on which the validity and reliability studies were performed are quantitatively satisfactory in accordance with the statistical analyses. Structure validity of ECIS was examined with CFA. As a result of the CFA, it was found that the scale had three dimensions as in the original form. If it is considered that the fact that the explained variance rate is over 30% is considered to be satisfactory in the scale development and adaptation studies in behavioral sciences (Büyüköztürk, 2007), it is seen that scale's validity structure is achieved. When fit index limits are considered for CFA, it can be said that the model shows a good fit and the original factor structure of the scale complies with factor structure of the Turkish form. The fact that ECIS' reliability coefficients were found to be high shows that the reliability is at a satisfactory level. If it is considered that reliability level proposed for measuring tools that can be used in researches is .70 (Sipahi, Yurtkoru, & Çinko, 2008), it can be said that ECIS' reliability is achieved. It was seen as a result of the item analysis that scale's item-total correlation coefficients meet the standard of .30. When it is considered that the items of .30 or above discriminate the individuals from the aspect of the feature measured at a good level in the interpretation of item-

total correlation coefficients (Özdamar, 2004), it is seen that item-total correlation coefficients are at a high level. According to the findings from ECIS' validity and reliability studies, it can be said that the scale is ready to use. However, the fact that the validity and reliability studies were carried out on high school students makes studies on different groups necessary for scale's validity and reliability. The results of the confirmatory factor analysis showed that the scale is in parallel with its original form from the aspect of structure validity. According to the values obtained from the reliability studies, it can be said that the scale has a high level of reliability. To sum up, according to the findings obtained from the validity and reliability studies on the sample consisting of high school students, it can be said that the scale is ready to use and can be used in a valid and reliable way for determining students' educational and career interest levels in the fields of science, technology and mathematics.

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Eğitim Kariyer İlgi Ölçeği	
1	Fen bilimlerini daha iyi öğrenmeme yardımcı olacak dersleri almakla ilgilenirim
2	Fen bilimleri ile ilgili bilgi veya becerilerimi kullanmama izin veren bir işte çalışmakla ilgilenirim
3	Fen bilimleriyle ilgili bilgi ve becerileri öğrenmeyi isterim, çünkü bunlar üniversiteye hazırlanmama yardımcı olabilecek bilgi ve becerilerdir
4	Teknolojiyi daha iyi öğrenmeme yardımcı olacak dersleri almakla ilgilenirim
5	Teknolojiyle ilgili bilgi veya becerilerimi kullanmama izin veren bir işte çalışmakla ilgilenirim
6	Teknolojiyle ilgili bilgi ve becerileri öğrenmeyi isterim, çünkü bunlar üniversiteye hazırlanmama yardımcı olacak bilgi ve becerilerdir
7	Matematiği daha iyi öğrenmeme yardımcı olacak dersleri almakla ilgilenirim
8	Matematik ile ilgili bilgi veya becerilerimi kullanmama izin veren bir işte çalışmakla ilgilenirim
9	Matematik ile ilgili bilgi ve becerileri öğrenmeyi isterim, çünkü bunlar üniversiteye hazırlanmama yardımcı olacak bilgi ve becerilerdir