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# Development of Science Laboratory Entrepreneurship Scale

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## ABSTRACT

The concept of entrepreneurship is a relatively recent concept introduced into educational programs and educational literature and the current study was conducted to determine the entrepreneurship characteristics possessed by pre-service teachers who are expected to educate future generations. The study employed the descriptive survey model. The sampling of the study is comprised of 239 pre-service science teachers from the universities of Kırıkkale and Amasya. The collected data were subjected to exploratory factor analysis (EFA) through SPSS program package and KMO value was found to be .910 and α reliability value of each factor was calculated to be ranging from .76 to .92. The exploratory factor analysis revealed that the scale is made up of four factors and then confirmatory factor analysis was carried out to confirm the factor structures of the scale. The results of the confirmatory factor analysis conducted by using maximum likelihood technique without putting any restrictions, the values of goodness of fit indices were found as follows; $\chi 2sd=344= 650.1$, $p<.001$, $\chi 2/d = 1.89$, RMSEA= 0.061, GFI= 0.89, AGFI= 0.91, CFI= 0.9 and IFI= 0.89. As a conclusion, 28-item Science Laboratory Entrepreneurship Scale explaining 52.136% of the total variance was developed.

**Keywords:** Science Laboratory; Entrepreneurship; Pre-service Teachers.

## INTRODUCTION

When the literature on entrepreneurship is examined, it is seen that there are many definitions made for it and the research and definitions mostly focus on entrepreneurship in the field of administration and economics (İşcan & Kaygın, 2011; Keleş, Özkan & et al., 2012; Bilge & Bal, 2012; Yılmaz & Sünbül, 2009; Ercan & Gökdeniz, 2009; Korkmaz, 2012; Kılıç, Keklik & Çalış, 2012). In addition to this research, there are some studies conducted in the field of education (Argon & Selvi, 2013; Bacanak, 2013). If the definitions of entrepreneurship given in this research are subsumed under a single roof; then, it is seen that the person who is aware of the current situation, making effort to turn negative states into positive, adapting to changing conditions, having courage to take risk, open to novelties and having creative thinking skill and activating past experiences to find solutions to new situations is called entrepreneur and his/her actual activities are called entrepreneurship.

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When the literature is examined, it is seen that there are some common characteristic of entrepreneurs: a) They are tolerant to ambiguity, b) They have a need for independence, c) They can take risk, d)They are open to novelties, e) They have self-confidence, f)They are open to cooperation, g) They have inner control, h) They have creative thinking skill, i) They are in need of achievement, j) They are proactive, k) They can take initiatives, l) They are open to solutions and opportunities, m) They are courageous, n) They are ambitious (Hisrich & Peters, 1998; Cansız, 2007; Avşar, 2007; Curth, 2011; Bozkurt & Alparslan, 2013). Considering these characteristics, it is clear that social and cultural milieu, personal experiences and education are basic determinants of entrepreneurship (Lee, Chang & Lim, 2005).

The general purpose of entrepreneurship education is to impart attitudes, information and skills to students so that they can behave like an entrepreneur. This process can be incorporated into general education in different ways (European Commission, 2012). According to Heinonen (2006), the main goal of entrepreneurship education should be to uncover some hidden traits in the personality of an individual that would remain latent otherwise and to make the individual aware of these traits. An entrepreneur can prevent wrong actions and make more effective use of resources (cited, Bozkurt & Alparslan, 2013). Thus, characteristics of entrepreneurship can affect economic and social developments of a society and educational programs should be adjusted to nurture these characteristics.

In today's educational programs, students are defined as individuals who can think analytically, learn by means of inquiry and research, find effective solutions to existing problems and work in cooperation. While skills aimed to be imparted to students in science program are being explained, life skills as well as scientific process skills are emphasized. These life skills are divided into sub-groups that are analytical thinking, decision making, creative thinking, entrepreneurship and team work (MEB, 2013). In Elementary Education Science Programs put into effect in 2013 by The Board of Education and Discipline of The Ministry of National Education, it is stated that the characteristics of entrepreneurship should be possessed by teachers and pre-service teachers to educate enterprising individuals in the classroom environment, strengthen and reinforce students' characteristics of entrepreneurship and create environments suitable for students to come up with innovative ideas.

The lack of the above-mentioned skills and competencies in pre-service teachers to teach science courses including science, technology and society is a subject of greater interest because science programs offered to students at high school and university cover key concepts needed by students to understand the world around them (Deveci & Çepni, 2014).

Entrepreneurship is a relatively new concept dealt with in educational programs; thus, there is not much research to make its applications widespread and this has increased the research interest in the concept.

The current state requires teachers to assume some responsibilities to create opportunities for students to develop their reasoning, discovery and application skills so that they can be more advantageous and successful in settings whose borders are quite uncertain (Neck & Greene, 2011). In the visions of teacher training programs, the necessity of promoting scientific process skills and life skills of pre-service teachers through active learning methods is clearly stated. For effective teaching of the concept of entrepreneurship in the classroom environment, pre-service teachers should be provided with adequate theoretical and applied information. It can be argued that teachers not gaining enough information and experience on entrepreneurship during their undergraduate education or through in-service trainings may experience some problems in giving entrepreneurship instruction to their students (Deveci & Çepni, 2014).

Teachers should be able to use various materials and equipments to make students active for the acquisition of the skill of entrepreneurship and this should be taken into

consideration in the training of pre-service teachers. In this regard, activities promoting the development of cooperative skills at schools, encouraging students to make independent decisions, supporting alternative inquiries and solutions and enabling students to struggle with difficulties and disappointments they are confronted with should be incorporated into teaching programs (Entrepreneurship Education, 2012).

Seikkula-Leino (2011) state that there is a need for activities promoting students' interactive learning and reflective thinking and involving problem-based learning, cooperative learning, group and peer works, team works, drama and learning diaries for entrepreneurship education. In this connection, it seems to be important to determine the extent to which life skills are involved in science instruction through laboratory activities. Thus, the main focus of the current study is to develop a scale to determine the effect of science laboratories on pre-service teachers' entrepreneurship skills.

## METHODOLOGY

### a) Study Group

The study group of the current research consists of 102 fourth-year pre-service science teachers from the Education Faculty of Kırıkkale University in 2014-2015 academic year and 137 fourth-year pre-service science teachers from the Education Faculty of Amasya University; thus, totally 239 pre-service teachers participated in the study. In the determination of this sampling, one of the probabilistic sampling methods, purposive sampling selection method was employed in the current study (Çepni, 2014). The results of the literature review showed that the sampling size should be 5-10 times bigger than the number of items. Moreover, sampling size smaller than 100 is considered to be inadequate and unreliable (Şencan, 2005). Comrey and Lee (1992) categorized the sampling size as follows: 50 "very small", 100 "small", 200 "suitable", 300 "good", 500 "very good" and 1000 and more "perfect" (cited from Yiğit, Bütüner & Dertlioğlu, 2008; Şencan, 2005).

### b) Data Collection Instrument

The study was conducted by using descriptive survey model. Descriptive survey method is a method used to collect numerical data related to a given variable and to describe the characteristics of the trial (study) group in the variable. (Büyüköztürk, 2012).

The current study was conducted to develop a scale and during the process of scale development, the following stages were pursued (Tezbaşaran, 2008; Azaltun, 2008; Karasar, 2014; Balcı, 2009);

1. *Literature review stage:* When a literature review in relation to "Science Laboratory Entrepreneurship Scale" was conducted, it was found that there is no study dealing with such a scale in the field of education. Thus, the literature review focused on the research conducted and the scales developed in the field of administration and economics in relation to the concept of entrepreneurship (Avşar, 2007; Cansız, 2007; Karabulut, 2009; Çarıkçı & Koyuncu, 2010; Yılmaz & Sünbül, 2009; Florian, Karri & Rossiter, 2007).
2. *Stage of determination of the characteristics to be measured:* Inquiries were carried out to determine the characteristics on which entrepreneurship was built, which characteristics should be observed in pre-service teachers to call them entrepreneurs; the characteristics reported in the literature of administration and economics to be possessed by entrepreneurs were determined and these characteristics were adapted to the field of science and thus, the characteristics to be measured were collected under 8 headings. These headings are; a) Tolerance to ambiguity, b.) Need for independence, c.) Risk taking, d.) Innovativeness, e.)

Self-confidence, f.) Cooperation, g.) Inner control, h.) Creativity (Avşar, 2007; Cansız, 2007; Karabulut, 2009; MEB, 2009).

3. *Stage of item pool construction:* Following the completion of the literature review related to entrepreneurship, the scales found in the literature were examined, the items of the scales found in the filed of administration and economics were adapted to the field of science and then by considering the laboratory setting and student behaviors in this setting, the items were written (Avşar, 2007; Cansız, 2007; Florian, Karri & Rossiter, 2007). In this way, an item pool comprised of 47 items was constructed. The distribution of these items across the above-mentioned characteristics to be measured is as follows: Six items for tolerance to ambiguity; 6 items for need for independence, six items for risk taking, six items for innovativeness, six items for self-confidence, six items for cooperation, five items for inner control and six items for creativity.

4. *The stage of seeking expert opinions:* While developing the draft of the scale, opinions of three experts were sought. Feedbacks were taken from the experts about the suitability of the items, the extent to which the items measure the target characteristics, comprehensibility of the items by the reader and possible corrections to be made (Tezbaşaran, 2008).

5. *Revision and editing of the scale:* In light of the feedbacks taken from the experts, 2 items were changed and 4 items were rearranged. Following these corrections, final form of the 47-item five-point Likert scale (1: Strongly Disagree, 2: A Little Bit Agree, 3: Agree, 4: Strongly Agree, 5: Completely Agree ) was given.

6. *Administration stage:* The developed scale consisting of 8 dimensions and 47 items was administered.

**c) Data Collection**

The participants of the study are fourth-year pre-service science teachers and they took the course of "Science Laboratory Applications" for two terms in their third-year. As they already completed the course of Laboratory Applications, fourth-year students were selected to administer the scale.

**d) Data Analysis**

Both exploratory and confirmatory factor analyses were conducted to establish the construct validity of the "Science Laboratory Entrepreneurship Scale". Factor analysis is used to establish the construct validity. It is a statistical method aiming to bring related variables together and thus, to reduce the number of factors (Seçer, Halmatov & Gençdoğan, 2013). Exploratory Factor Analysis (EFA) examines the connected basic constructs contained by a data set and aims to elicit the factor by looking at the correlation between variables (Büyüköztürk, 2012). Confirmatory factor analysis is grounded on the principle of taking the relationships between observed variables and latent variables (items and factors) as hypotheses and testing them. In other words, confirmatory factor analysis is a structural equation model addressing the relationships between observed variables and latent variables (Korkmaz, 2012). In the confirmatory factor analysis, maximum likelihood technique was employed.

The suitability of the data for factor analysis can be investigated with Kaiser-Meyer-Olkin (KMO) coefficient and Barlett test (Büyüköztürk, 2012). Kaiser-Meyer-Olkin (KMO) coefficient offers information about whether the data are suitable for factor analysis and suitability of the data for deriving factor. It is expected to be higher than .60. Barlett test investigates the correlation between variables and it is expected to be lower than .005. If the

results of KMO and Barlett tests satisfy these criteria, then it means that the study is suitable for conducting factor analysis.

The following three criteria need to be taken into consideration for sorting out the items that do not measure the same construct;

1- Factor loading value should be >.45. When the number of items is low, then this value can be taken as >.30 (Şencan, 2005).

2- High factor value in a single factor: the difference between two high loading values should be at least .10. According to Büyüköztürk, in a multi-factor construct, an item giving a high loading value in more than one factor is overlapped and should be discarded from the scale. Following the operation of exclusion, EFA needs to be repeated (Durmuş, Yurtkoru & Çinko, 2013; Tavşancıl, 2002)

3- Common factor variance should be converging to 1.00 or higher than 0.66.

Following the completion of factor analyses, reliability analysis for each factor should be conducted. The reliability coefficient (α) calculated should be .70 or higher (Durmuş, Yurtkoru & Çinko, 2013; Şencan, 2005; Tavşancıl, 2002 ).

## FINDINGS

In the study, exploratory factor analysis (EFA) was employed to test the construct validity of the scale to be developed (AFA). In order to test the suitability of the data for factor analysis, Kaiser-Meyer-Olkin (KMO) coefficient and Barlett test were used. The findings obtained are presented below;

**Table 1.** *KMO and Barlett Test Results for the Scale*

| KMO and Barlet Test Values | | |
|---|---|---|
| Kaiser-Meyer-Olkin Sampling Adequacy | | 0,91 |
| Barlett Sphericity test | $\chi^2$ | 2896,236 |
| | Sig. | .000 |

As the result of KMO test was found to be higher than .60 and also be suitable for Barlett test results, factor analysis was started.

First, the factor analysis was administered to 47 items. In the first administration, KMO value was found to be .920, Barlett test data 5504.911 were found to be explaining 45.364% of the total variance and α reliability coefficient is .951. According to the data, 9 items having a factor loading value lower than .30 (E5.2; E5.1; D4.4; D4.3; A1.5; G7.3; D4.2; A1.6; C3.2) and five items having a loading value in a single factor lower than .10 and giving loading values to more than one item (B2.6; H8.1; E5.3; A1.1; C3.1) were excluded; thus, a total of 14 items were excluded from the scale in the first stage. Then, the remaining 33 items were subjected to factor analysis once more.

The results of the second EFA revealed that KMO value is .914, Barlett test data 3630.475 were found to be explaining 50.587% of the total variance and α reliability coefficient is .937. According to the data, 3 items having a loading value in a single factor lower than .10 and giving loading values to more than one item (G7.1; F6.5; B2.1) and 1 item having a factor loading value lower than .30 (C3.5); thus, totally 4 items were discarded from the scale. Then, the remaining 29 items were subjected to factor analysis once more.

The results of the third EFA revealed that KMO value is .912, Barlet test data 3024.466 were found to be explaining 51.654% of the total variance and α reliability coefficient is .927.

According to the data, 1 item having a loading value in a single factor lower than .10 and giving loading values to more than one item (G7.5) was excluded from the scale and final factor analysis was conducted on the remaining 28 items.

According to the results of the fourth EFA, KMO value was found to be .910, Barlett test data 2896.236 were found to be explaining 52.136% of the total variance and α reliability coefficient is .924. In the structure constructed in this way, the contribution of the first factor to the explained variance is 17.241% and its eigenvalue is 4.827; the contribution of the second factor to the explained variance is 14.525% and its eigenvalue is 4.067; the contribution of the third factor to the explained variance is 10.353% and its eigenvalue is 2.899 and the contribution of the fourth factor to the explained variance is 10.018% and its eigenvalue is 2.805. Although some other factors having an eigenvalue higher than 1 are observed, eigenvalue curve reaches a plateau after the fourth factor. Therefore, it was thought that four-factor structure would be more suitable.

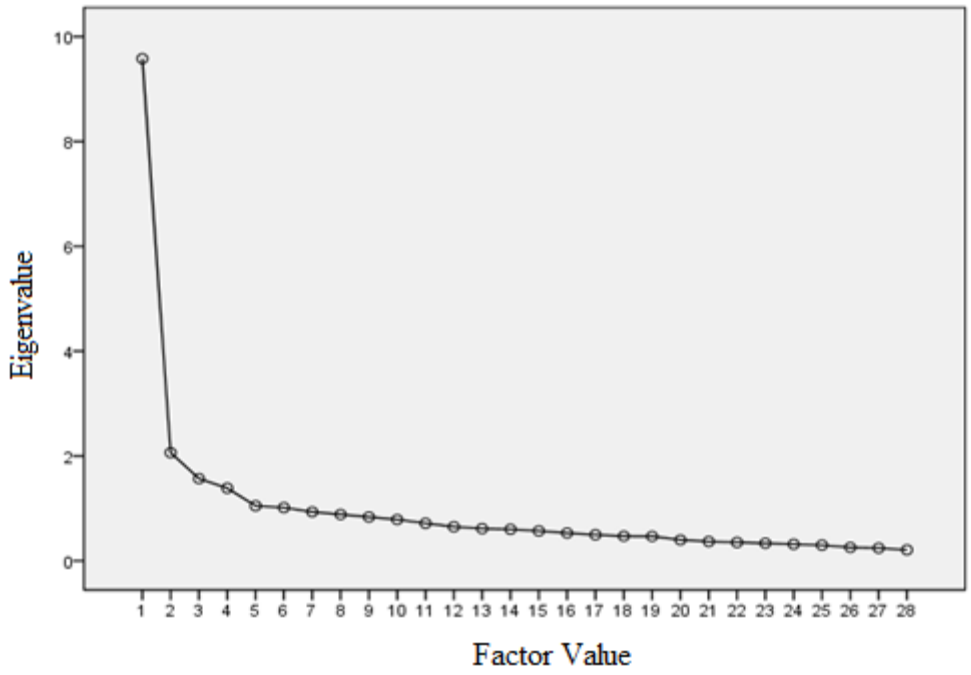


**Figure 1.** *Scree Graph*

When the line graph belonging to the factors is examined, it is seen that breakages occurred in 4 points. As it was observed that values at the fourth breakages and at the following ones are close to each other and low, from the results of EFA, it was concluded that the scale consists of four factors. Bu using Varimax vertical rotation technique, the factors were more clearly separated and the obtained EFA results are presented in Table 2.

As can be seen in Table 2, item D4.6 gives factor values to items 2 and 4 and item C3.4 gives factor values to items 1 and 3. As the factor values given to both factors are not lower than .10, they were not excluded from the study (Büyüköztürk, 2012).

The data presented in Table 2 in relation to EFA results and item contents were examined and then expert opinions were sought. In light of the feedbacks given by the expert, factor names representing the items were determined as follows; the name of the first factor is "Communication-Self-efficacy", the name of the second factor is "Creativity", the name of the third factor is "Risk Taking" and the name of the fourth factor is "Need for Achievement".

**Table 2.** *EFA Results*

| Item | Factor | | | |
|---|---|---|---|---|
| | Factor -1 | Factor -2 | Factor -3 | Factor -4 |
| F6.2 | .750 | | | |
| F6.1 | .687 | | | |
| F6.4 | .671 | | | |
| E5.5 | .669 | | | |
| F6.3 | .661 | | | |
| E5.4 | .661 | | | |
| E5.6 | .645 | | | |
| G7.2 | .481 | | | |
| D4.5 | .463 | | | |
| H8.4 | | .787 | | |
| H8.3 | | .758 | | |
| H8.5 | | .662 | | |
| H8.6 | | .628 | | |
| H8.2 | | .600 | | |
| D4.1 | | .544 | | |
| D4.6 | | .519 | | .407 |
| C3.6 | | .461 | | |
| G7.4 | | .421 | | |
| A1.2 | | | .641 | |
| A1.4 | | | .617 | |
| C3.3 | | | .602 | |
| C3.4 | .420 | | .599 | |
| A1.3 | | | .563 | |
| F6.6 | | | .471 | |
| B2.3 | | | | .743 |
| B2.4 | | | | .722 |
| B2.5 | | | | .630 |
| B2.2 | | | | .579 |

Confirmatory factor analysis was conducted to confirm the factor structures of the scale determined to be consisting of four factors as a result of exploratory factor analysis. The goodness of fit values obtained as a result of confirmatory factor analysis conducted by using maximum likelihood technique without imposing any restrictions are as follows; $\chi 2sd=344=650.1$, $p<.001$, $\chi 2/d = 1,89$, RMSEA= 0.061, GFI= 0.89, AGFI= 0.91, CFI= 0.9 and IFI= 0.89. These values show that $\chi 2/d$ value exhibits a perfect fit and the values of the other goodness of fit indices are acceptable. That is, the model obtained proves that the factors are confirmed by the data. Factorial model of the scale and values related to factor-item correlation are given in Figure 2.

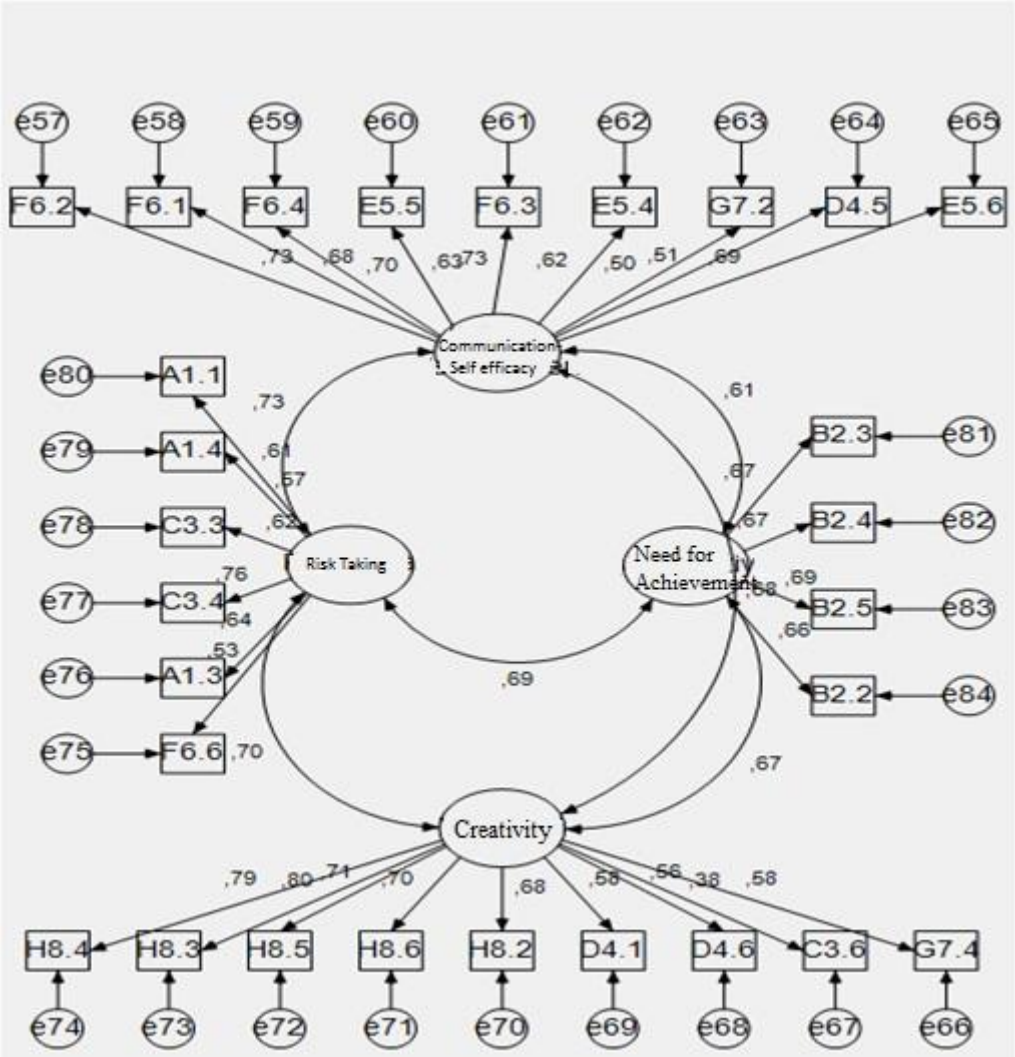


**Figure 2.** *Confirmatory Factor Analysis Correlation Diagram*

Following the factor analyses, correlations between scores obtained from each item and scores obtained from the factors were calculated via total correlation method and thus, the extent to which each item can contribute to the general purpose was tested. Item-factor correlation values found for each item are presented in Table 3.

**Table 3:** *Item – Factor Correlation Analysis Results*

| F1 | | F2 | | F3 | | F4 | |
|---|---|---|---|---|---|---|---|
| **I.** | **r** | **I.** | **r** | **I.** | **r** | **I.** | **r** |
| F6.2 | ,722(**) | H8.4 | ,805(**) | A1.2 | ,676(**) | B2.3 | ,783(**) |
| F6.1 | ,748(**) | H8.3 | ,807(**) | A1.4 | ,703(**) | B2.4 | ,780(**) |
| F6.4 | ,707(**) | H8.5 | ,734(**) | C3.3 | ,672(**) | B2.5 | ,760(**) |
| E5.5 | ,698(**) | H8.6 | ,710(**) | C3.4 | ,738(**) | B2.2 | ,742(**) |
| F6.3 | ,743(**) | H8.2 | ,705(**) | A1.3 | ,726(**) | | |
| E5.4 | ,689(**) | D4.1 | ,649(**) | F6.6 | ,586(**) | | |
| E5.6 | ,721(**) | D4.6 | ,619(**) | | | | |
| G7.2 | ,595(**) | C3.6 | ,535(**) | | | | |
| D4.5 | ,586(**) | G7.4 | ,631(**) | | | | |

N=239; **=p< .001

As can be seen in Table 3, item test correlation coefficients vary between 0.586 and 0.722 for the first factor; between 0.535 and 0.805 for the second factor; between 0.586 and 0.738 for the third factor and between 0.742 and 0.783 for the fourth factor. Each item is in a positive and significant correlation with the general factor ($p<0.001$). Thus, it can be argued that each item serves the function of its factor. General reliability coefficient of the scale is $\alpha=.924$. Reliability values and item numbers of each factor are given in Table 4.

**Table 4.** *The Number Items in Sub-dimensions and Reliability Values of the Factors*

| Dimension | Item Number | α-Reliability Value |
|---|---|---|
| Communication-Self-confidence | 9 | ,859 |
| Creativity | 9 | ,853 |
| Risk Taking | 6 | ,766 |
| Need for Achievement | 4 | ,764 |
| Total | 28 | ,924 |

## DISCUSSIONS and RESULTS

Within the current study, a scale consisting of 4 dimensions; communication-self-confidence, creativity, risk taking and need for achievement, and 28 items was developed to determine the pre-service teachers' entrepreneurship skills in a laboratory setting. There are 9 items in the communication-self-confidence dimension, 9 items in the creativity dimension, 6 items in the risk taking dimension and 4 items in the need for achievement dimension. Florian, Karri and Rossiter (2007) developed a scale to test the development of entrepreneurship orientation in business environment with the participation of 220 people and their scale is comprised of 42 items and 5 dimensions. They reported that the scale can explain 45.88% of the total variance. The dimensions in their scale are; proactive tendency, innovativeness, self-efficacy, achievement motivation and unconformity. The dimensions reported in their study and in the current study are in compliance with the literature; yet, the characteristics may be placed in different dimensions. According to Erkuş (2012) human traits are inherently in association with each other; thus, in some cases, it might not be suitable to reduce them into a single dimension. Accordingly, a specific feature should not be separated from the others. Instead, it should be seen as a component. What is more important is that the intersection areas in the structure of the component should not be ignored. In the current study, it was found that though they support the dimensions of entrepreneurship, the associated items were collected within four dimensions.

The statistically significant results of the current finding are as follows; KMO value .910, Barlett test values 2896.236, significance value .000, explains 52.136% of the total variance, α reliability coefficient .924. These results concur with the literature findings (Büyüköztürk, 2012; Şencan, 2005; Tavşancıl, 2002; Durmuş, Yurtkoru & Çinko, 2013).

When the literature on entrepreneurship is examined, it is seen that totally 7-8 characteristics of entrepreneurship are mentioned (Cansız, 2007; Avşar, 2007). These are; tolerance to ambiguity, need for independence, risk taking, openness to innovation, self-confidence, openness to cooperation, inner control and creative thinking skill. When EFA results and dimensions emerging in these results were compared to the factors in light of expert opinions, the items were decided to be collected under four factors. In this regard, the study concurs with the literature.

The study was conducted with the participation of university students. This sampling can be expanded by including elementary and secondary school students. The scale developed within the current study is assumed to evaluate the current state and development of the entrepreneurship skills of pre-service teachers by means of laboratory activities. This scale can be used as a data collection instrument in research dealing with the effects of various teaching models and laboratory approaches on individuals' learning outcomes. When the scale is used together with different demographic features of students, it may serve different purposes.

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# APPENDIX

| DIMENSION | CHARACTERISTIC | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| COMMUNICATION-SELF-EFFICACY | I can do my part in a group work | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I show respect to different opinions expressed in discussions involved in an experimental process | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can make co-decisions in cooperation with my group members | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I feel happy when experimental data comply with the hypothesis | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can motivate my group members in laboratory activities | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I do an experiment to learn something rather than just for the sake of conducting it | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I feel confident while defending my ideas | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I want to be successful for myself not for others | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I prefer to make use of technologies in experiments | ( ) | ( ) | ( ) | ( ) | ( ) |
| CREATIVITY | By evaluating existing solutions, I come up with new solutions | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can find original solutions to problems | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can reach a solution by seeing the positive sides of negative situations | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can make synthesis by combining my daily life experiences with the newly learned information | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I capitalize on my prior experiences to find a solution to a problem | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can propose new ideas that can lead to the solution of a problem | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can adopt a point of view of a problem different from the viewpoints of others | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I work spontaneously without making plans | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can motivate myself | ( ) | ( ) | ( ) | ( ) | ( ) |
| RISK TAKING | I do not feel hopeless in the face of failure | ( ) | ( ) | ( ) | ( ) | ( ) |
| | If there are external interventions while conducting an experiment, I can go on without feeling distracted | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I immediately test the hypothesis I have constructed for the problem | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I do not hesitate to test the variables involved in the hypothesis | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can produce alternative solutions to the problem involved in the experiment | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can complete the works left uncompleted by my team mates | ( ) | ( ) | ( ) | ( ) | ( ) |
| NEED FOR ACHIEVEMENT | I can myself provide the equipments and tools required for an experiment | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can test my opinions without the approval of others | ( ) | ( ) | ( ) | ( ) | ( ) |
| | When I encounter a problem, I can motivate myself to find a solution | ( ) | ( ) | ( ) | ( ) | ( ) |
| | I can make decisions on my own in the laboratory | ( ) | ( ) | ( ) | ( ) | ( ) |