**CREATING a SELF EFFICACY SCALE**

**Adem AKKUS[[1]](#footnote-1)**

**Abstract:** Self efficacy measures might be used for teachers and students for different purposes. However present self efficacy scales rely on their respective cultural values. For that reason aim of this study to create a new self efficacy scale (SES). Self Efficacy Scale (SES) is prepared with 27 items. Prepared SES consists items with likert type. Sample of the study consist of 154 college students who study at teaching departments. Principal axis factoring with orthogonal rotation (varimax) is used for exploratory factor analysis. Initial analysis revealed three factors. However reliability of two factors turned out to be low so they are omitted. Factor analysis with same procedure is reconducted and emerged with one factor leaving SES with 14 items along with Cronbach’s alpha =.930 Finalized SES consists of 20 items with six (6) filler and nine (9) reverse coded items. It is decided that created SES might be used for future studies to be used in cultures which have similar values.

**Key Words:** self efficacy, scale construction, students, teachers

1. **INTRODUCTION**

Self efficacy is defined as someone’s belief in her/himself on being capable of doing or engaging tasks. Thus self efficacy plays an important role in future oriented perspectives/aims (Karwowski & Kaufman, 2017). Since social sciences include human behaviors, researchers heavily use questionnaires to collect data and understand human psychological attributes which might be understood clearly through items representing the domain of interest (Hinkin, 1998; Gözüm & Aksayan, 1999; Wong & Lian, 2003). So, using and creating effective measures for educational purposes becomes essential (Hinkin, 1998; Hinkin, Tracey & Enz, 1997).

Students, who have high self efficacy, may take responsibilities of their own learning, can regulate their long and short term aims, and develop learning strategies. However teachers play important role for students in developing those skills since students do not have much experience on structuring their efforts in proper ways. Most effective teachers are the ones who model positive perspectives of self learning regulations for each student they interact. This may be done through class discussions, giving the feeling of self respect and self worth. Activities to increase self efficacy are not only limited to those listed. For example a cooperative writing activity not only enhances learning but also increases self efficacy of the students (Troia, Harbaugh, Shankland, Wolbers & Lawrence, 2013; Zimmerman, Bonner and Kovach, 1996). However it should be noted that teachers are not only supposed to know and apply instruction methods and techniques but also exhibit positive attitudes and feelings. Teachers should know supportive ways and education faculties should also focus on training teacher candidates (students) and teaching how to have and exhibit supportive ways. (Larry G & Iris M, 1990). Through that, hopefully, teachers will know how to have their own source of efficacy and then will create supportive environment for their students. Studies point out that teachers who have high self efficacy values are eager to try different and new techniques in the classroom and are eager to learn different approaches. On the other hand teachers with low self efficacy values tend to avoid using new approaches or techniques and keen to use traditional approaches where they can also avoid taking responsibilities (i.e avoid risks) (Bursal, 2010; Berg & Smith, 2016; Karabatak & Turhan, 2017). Thus teachers should master their students’ time management by helping them to create their own learning strategies. However, lack of improvement of self efficacy or making students to believe that they will have immediate results may have catastrophic effects on self confidence. (Zimmerman et al., 1996). Thus teachers should be aware of the fact that they will not always have solid data on increase of self efficacy since the progress itself may take a while to reveal itself (Köseoğlu, 2010). Even motivation itself may have direct effect on achievement and have impact on self belief (Lovelace & Brickman, 2013) where quantitative measures are used as a representation of abstract construct (Hinkin, 1998). But self efficacy beliefs may vary across cultures which include both personal and interpersonal experiences such as beliefs, faiths, socioeconomic status and school achievement. Then it is obvious to indicate that each self efficacy scale is a reflection of its applied culture (Berg & Smith, 2016; Bandura, 2006). As a consequence, self efficacy scales must have derive upon its applied culture (Karwowski & Kaufman, 2017) since it will give information on one’s psychological position on a specific subject (Brinkman, 2009). For that reason purpose of the study is to create a self efficacy scale proper to its applied culture.

1. **METHOD**

**Creating new self efficacy scale:** To achieve purpose of the study, literature research has been done for different self efficacy scales and obtained scales were analyzed. To create a new scale some guide lines are determined. Created guideline is based on suggestions acquired from literature (Brinkman, 2009; Johanson & Brooks, 2010; Hinkin, 1998; Hinkin et.al., 1997; Kato, 2013; Schwarzer & Jerusalem, 1995; Yeşilay, Schwarzer & Jerusalem, 1996 ; Muris, 2001; 2002; Bandura, 2006; Gözüm & Aksayan, 1999; Wong & Lian 2003; Larry G & Iris M, 1990). Those guidelines are;

1. Language should be clear and appropriate to respondents
2. No to cause any bias, content must be familiar with students’ culture (schemes)
3. Respondents should not feel that they rate their feelings but place themselves at a position. Thus scale is created a 5 level likert type. However, instead of marking ratings they choose the place they feel right. For that reason letter points from A to E is used for rating.
4. Items must include a single topic and asses a single behavior or response
5. Items used must not sound abstract or vague so that questions could not be interpreted in different ways.
6. Leading questions should be avoided
7. Language and expected knowledge should be familiar for the target group
8. Sensitive questions or sentences, double negative questions should be avoided
9. Intervals between the questions should not remind the respondents their previous answers (i.e control questions should not awake the feeling for the respondents that their answers are being/will be checked)

Thus maximum information would have been gathered with minimum cost. Although a qualitative study might reveal more in depth idea regarding the students’ ideas and attitudes. A quantitative study might reveal a direct result and might be completed in much shorter time since it ensures easy compilation and generalize the scale to population. Obtained scales are analyzed for their harmony with Turkish culture and a new scale is created based on guideline. For the best practice for analysis and interpretation of data some measures are taken account such as different scale preparation advisements, regarding but not limited to assessing values, beliefs, cultural values of students, possible different instructor effects, instructional methods used for education, number of questions asked, appropriateness to common usage, item degree, respond type and lengthy design. (Lovelace & Brickman, 2013; Brinkman, 2009; Johanson & Brooks, 2010). So, among Thurstone’s method of equal-appearing intervals, Likert scale, Semantic differential scales it is determined that a likert type scale would be more beneficial for the purpose of the study.

Candidate pool of items are selected for the scale and then maximum number of items is determined so that respondents will not get bored and will respond the scale within attention time to ensure content adequacy. Item degree is determined to ensure that respondents will not make grading like from 1 to 10 but instead place themselves in a position. For that purpose sentences “I completely agree” or “I completely disagree” are given at the beginning of the scale as information but scale itself marked those sentences from A to E. A is the strongest confirmation signal while E is the least confirmation signal. By placing 5 level of response for an item it is ensured that internal consistency reliability is increased and sufficient variances are obtained since a four (4) point value would be beneficial for the purpose. Hinkin (1998) points out that most respondents tend to choose options at the edges thus reversed coded sentences are appropriately used to trigger vigilance of respondents (Hinkin, 1998; Lovelace & Brickman, 2013; Brinkman, 2009; Hinkin et al., 1997). Thus created scale is a Likert type scale since it is regarded as most useful in behavioral research and suitable for factor analysis (Hinkin, 1998; Hinkin et al., 1997).

**Created Self Efficacy Scale:** Created scale applied to a small group of teacher candidates for pilot study. Response rate of the created scale (items) and their response to scale is determined (i.e questions whose meanings asked by the respondents are immediately omitted from the scale since it is determined that those sentences are vague or abstract to respondents). After that prepared scale was analyzed by instructors and educators who have the experience of teaching and have researches on related issues since specialists could value the prepared scale on content domain (Hinkin et al., 1997). After determining the items, their number and its content, scale is finalized. Created Self Efficacy Scale (SES) consists of 27 questions (Q). A possible value of high number of the items included in the scale to ensure scale catches its purpose. Benefit of increasing the questions is that the reliability increases with the number of questions. However it should be noted that it has been also tried to ensure that respondents will not have the feeling of replying same/similar questions directed to them in different sentences. By doing so, it is ensured that respondents will not get bored and they reply the questions willingly (Brinkman, 2009). SES consists of 8 filler questions and 10 are reverse coded questions. Filler questions are Q1, Q6, Q7, Q13, Q20, Q22, Q25 and Q26. Reverse coded questions are Q3, Q5, Q8, Q9, Q11, Q12, Q17, Q19, Q21 and Q27.

**Determining the sample size and sampling:**

Finalized scale is applied to college students who are studying at teaching departments which is suitable for the purpose (Hinkin, 1998). Reason for selecting teaching departments is that nature of the sample has the largest impact on accuracy of parameter estimates in order to avoid measurement errors. It is important to choose adequate sampling, by doing this unrepresentative sample will not be used in the study. Through that, it is decided that sample represents the population of interest for larger study (Johanson & Brooks, 2010; Hinkin, 1998). In order to ensure the anonymity, (i.e. avoiding conflict of interest) no information is required from the students. After applying the scale, control questions were run and students’ scales whose responses did not fit in the control questions’ range are omitted from the study thus leaving 154 data of students. Purpose of running control questions is to reduce/eliminate the chance factor of someone who gives wrong answer about his/her idea on the subject/topic. For that reason sample of the study consists of 154 students.

Choosing a sample size is controversial debate. Some researchers argue about arbitrary sampling which presents high communalities without cross loadings. So sampling may be determined by nature of data i.e stronger the data smaller the sampling, while others argue on item-ratio. Debate on item-ratio suggests proportion from 1:2 to 1:10 for item and sampling (Anthoine**,** Moret, Regnault, Sébille & Hardouin, 2014; Hinkin, 1998; Hinkin, Tracey & Enz, 1997). For example Johanson & Brooks (2010) point out that literature on social researches suggest N between 10 and 30 for creating scales and pilot studies might be useful with benefits such as simplicity, easy calculation and the ability to test hypotheses. In addition researchers also point out N=100 for sampling also suggested in literature. For a comprehensive item analysis N=100 to 200 also should be conducted since (suggested) standard errors for Cronbach’s alpha increases as the sample size decreases. However it is also noted that regardless the number of items (might be even two items), mean inter-item correlation is nominal between N= 30 to 200. Yet, researchers conclude in their study that N=30 would be reasonable enough for pilot studies when the purpose is preliminary survey or scale development. Additionally, Hinkin (1998) and Hinkin et al., (1997) suggest N=150 to obtain sufficient data for exploratory factor analysis as long as item inter-correlations are reasonably strong and for confirmatory factor analysis N=100 is recommended. However researchers also mention difference between statistical and practical significance must be noted since attaining statistical difference increases as the sample size increases. Larger samples are in fact useful to detect small fluctuations. However as sample size increases practical meaning of the results may distort so decision on sample size must be taken with caution. Having 1:8 item-ratio and number of participants (154), it is decided that sample of the study is adequate for the research.

**Exploratory Factor Analysis:** a principal axis is conducted on the 19 items with orthogonal rotation (varimax) through SPSS program to reveal the factors within the created scale. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis as KMO=.89 (“meritorious” according to Kalaycı, 2005) which is above the acceptable limit of .5 and Bartlett’s test of sphericity (x2(171) = 1474.381, p = .00 < .05) is to be found significant. An initial analysis is run to obtain eigenvalues for each factor in the data. Three factors emerged having eigenvalues over Kaiser’s criterion of 1 and in combination explained %56,857 of the variance. The scree plot (Figure 1) is obtained and it is decided that scale has three factors with respect to convergence of scree plot and Kaiser’s criterion on this value.

Figure 1 *Scree Plot*

Eigenvalue of the factors are 7,7749; 1,681; 1,372 respectively for factor 1, 2 and 3. In addition, variances shared by the factors are 40,786; 8,850 and 7,222. The three factors share % 56,857 of the total variance. Table 1 shows the factor loadings after rotation.

Table 1 *Factor Loadings*

|  |  |  |  |
| --- | --- | --- | --- |
|  | Factor 1 | Factor 2 | Factor 3 |
| Q15 | ,890 |  |  |
| Q21 | ,816 |  | ,342 |
| Q4 | ,774 |  |  |
| Q24 | ,751 |  |  |
| Q12 | ,710 |  |  |
| Q9 | ,704 |  |  |
| Q5 | ,681 |  |  |
| Q14 | ,617 |  | ,370 |
| Q11 | ,613 | ,331 |  |
| Q17 | ,611 | ,305 |  |
| Q2 | ,586 | ,301 |  |
| Q19 | ,538 | ,361 |  |
| Q27 | ,535 |  |  |
| Q8 | ,476 |  |  |
| Q10 |  | ,657 |  |
| Q23 |  | ,573 |  |
| Q3 |  |  | ,518 |
| Q16 |  |  | ,342 |
| Q18 |  |  | ,341 |

\* Factors loadings are ordered in order of magnitude

It is clear from Table 1 that Q10 and Q23 are under factor 2 where Q3, Q16 and Q18 are under factor 3 while rest of the questions are under factor 1. For further analysis reliability of each factor is calculated as suggested (Field, 2013) and shown in Table 2.

Table 2 *Reliability*

|  |  |  |
| --- | --- | --- |
|  | Cronbach’s Alpha | Number of items |
| Factor 1 | ,930 | 14 |
| Factor 2 | ,505 | 2 |
| Factor 3 | ,377 | 3 |

Since the reliability of factor 2 is low and factor 3 not reliable, and there is no chance of increase in reliability after removing items, factor 2 and factor 3 are omitted from the scale along with their items. Thus, leaving factor 1 and its items. A principal axis is reconducted on the 14 items with orthogonal rotation (varimax) through SPSS program to reveal the factors within the created scale. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO=.913 (“marvelous” according to Kalaycı, 2005) which is above the acceptable limit of .5 and Bartlett’s test of sphericity is to be found significant x2(91) = 1266.423, p= .00 < .05). An initial analysis is run to obtain eigenvalues for possible factors in the data. One factor emerged as having eigenvalue over Kaiser’s criterion of 1 and explained %49,297 of the variance. The scree plot (Figure 2) is obtained and it is decided that scale has one factor with respect to convergence of scree plot and Kaiser’s criterion on this value. Factor loadings of the items and shared variances are shown in Table 2

Figure 2 *Scree Plot*

Table 2 *Factor loadings*

|  |  |  |
| --- | --- | --- |
|  | Factor  | h2 |
| Q15 | ,854 | ,730 |
| Q21 | ,839 | ,705 |
| Q4 | ,785 | ,616 |
| Q24 | ,778 | ,605 |
| Q12 | ,747 | ,559 |
| Q9 | ,688 | ,473 |
| Q5 | ,680 | ,462 |
| Q14 | ,677 | ,459 |
| Q17 | ,668 | ,447 |
| Q2 | ,660 | ,436 |
| Q11 | ,653 | ,426 |
| Q27 | ,608 | ,370 |
| Q8 | ,556 | ,310 |
| Q19 | ,554 | ,306 |

\* Factors loadings are ordered in order of magnitude

For further analysis reliability of the factor is calculated as suggested (Field, 2013) and SES’ Cronbach’s α=.930 found as “highly reliable” (Kalaycı, 2005). For detailed analysis an independent t samples test is run for each item. Reliability analysis item-total correlation and tup-down(%27) results are shown in Table 3.

Table 3 *Item-total correlation and tup-down(%27) results*

|  |  |  |  |
| --- | --- | --- | --- |
| Item code | New item code | Corrected-item total correlation | tup-down(%27) |
| Q2 | SES2 | ,637 | 12,497\* |
| Q4 | SES3 | ,749 | 16,370\* |
| Q5 | SES4 | ,659 | 14,792\* |
| Q8 | SES7 | ,537 | 8,310\* |
| Q9 | SES8 | ,659 | 11,028\* |
| Q11 | SES9 | ,634 | 11,765\* |
| Q12 | SES10 | ,720 | 13,980\* |
| Q14 | SES12 | ,648 | 10,446\* |
| Q15 | SES13 | ,816 | 22,196\* |
| Q17 | SES14 | ,646 | 13,603\* |
| Q19 | SES15 | ,537 | 10,996\* |
| Q21 | SES17 | ,806 | 21,291\* |
| Q24 | SES19 | ,751 | 17,418\* |
| Q27 | SES20 | ,585 | 9,188\* |

\* p < .05

Since SES validates that it might be used, filler questions are replaced between questions with respect to pilot scale order. SES consists of six (6) filler and nine (9) reverse coded items thus finalized scale consists of 20 questions (Appendix A). Filler questions are SES1, SES5, SES6, SES11, SES16 and SES18. Reversed coded items are SES4, SES7, SES8, SES9, SES10, SES14, SES15, SES17 and SES20. For international readers an English translation of SES also is given in the Appendix B.

**DISCUSSION**

Created SES has one factor structure and assesses a general self efficacy attitude. However a detailed look upon the t values of %27up-down will reveal more insight. Lowest t value obtained from SES7 (t = 8,310) which is “I hardly accomplish my my goals when I set them” and SES20 (9,188) “I trouble to overcome obstacles that I encounter in life”. Low t values of SES7 and SES20 imply that individuals who can set goals and accomplish them may overcome obstacles they encounter. In another aspect it may be also said that individuals who are having troubles in overcoming obstacles also are having difficulties in achieving set aims. In fact, SES7 targets “action planning” where SES20 targets “coping planning” and studies demonstrates that although action planning is effective in long term behavioral change, “coping planning” is a hidden and strong factor which is effected by experience and hence effective on action planning (Snieehotta, Schwarzer, Scholz & Schuz, 2005). Effect of experience on cognitive skill development is already accepted by many researchers thus cooperation among the students are encouraged at every opportunities (Hesse, Care, Buder, Sassenberg & Griffin, 2015). For example, cooperative learning model encourages learning groups and creates heterogeneous groups in which students encounter difficulties, different ideas and obstacles. However through experience it is aimed that every single student will learn how to overcome obstacles and establish long term planning. It should be also noted that instructors play a key role in dramatic increase of experience and problem solving skills (Crouch & Mazur, 2001; Hakkinen, Jarvela, Makitalo-Siegl, Ahonen, Naykki & Valtonen, 2017).

The highest t values obtained from SES13 (t= 22,196) and SES17 (21,291) already confirms that argument. SES17 shows that students with lower low self efficacy values “give up trying/learning” if they fail to accomplish the task. In other words, students with high self efficacy values do not easily give up and focus on the task. This case, is approved in t value of SES13 which is “If I decide to do something, I focus on it” and show that students with high self efficacy values also do not easily give up. Both SES13 and SES17 confirm each other and validate each other. Self efficacy is one’s believe in his/her capability of doing something and it is shaped by past experience. Thus, learning/knowing what to do and how to do is an essential component in self efficacy (Nguyen, Johnson, Collins & Parker, 2017). In fact, several researches already indicate that self efficacy values are related with past experiences (Nissen & Shemwell, 2016; Robnet, Chemers & Zurbriggen, 2015).

**CONCLUSION**

Clark & Watson (1995) report that a good scale through factor analysis should reflect unidimensionality. Created SES having both one factor structure and high internal consistency (α=.930) proves itself a powerful scale for the purpose. As a result of analyzes, it is concluded that created self efficacy scale will be helpful to researchers and educators who want to use it in educational and social purposes. For further analysis SES might be used in different region of Turkey and neighborhood regions/states which have similar cultural content. Thus, SES with different samples is also welcome to compare results and to validate its purpose. For that purpose created SES is given in the Appendix A.

In addition SES might be used in different states since an English translation is provided. However, reliability and factor structure of the scale should be restudied. Thus, SES with different international samples is also welcome to compare results and to validate its purpose. For that purpose created SES is given in the Appendix B.

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**APPENDIX A:** Öz yeterlik ölçeği

|  |  |
| --- | --- |
|  | **ÖZ YETERLİK** |
| **1** | Kendi meyve/sebzemi yetiştirmek isterim | **A** | **B** | **C** | **D** | **E** |
| **2** | Plan kurduğum zaman, uygulayabileceğimden eminim | **A** | **B** | **C** | **D** | **E** |
| **3** | Eğer bir işi ilk seferde yapamazsam, yapmak için tekrar tekrar uğraşırım | **A** | **B** | **C** | **D** | **E** |
| **4** | Yeni arkadaşlıklar edinmekte zorlanırım | **A** | **B** | **C** | **D** | **E** |
| **5** | Genetik/kalıtım bir kişinin karakter yapısını etkiler | **A** | **B** | **C** | **D** | **E** |
| **6** | Yemek pişirmekten hoşlanırım | **A** | **B** | **C** | **D** | **E** |
| **7** | Kendime bir hedef kurduğumda onları **nadiren** gerçekleştirebilirim | **A** | **B** | **C** | **D** | **E** |
| **8** | Bir şeyleri tamamlamadan yarım bırakırım | **A** | **B** | **C** | **D** | **E** |
| **9** | Zorluklarla yüzleşmekten **kaçınırım** | **A** | **B** | **C** | **D** | **E** |
| **10** | Eğer bir şey çok karışık görünüyorsa, çözmek için çaba **harcamam** | **A** | **B** | **C** | **D** | **E** |
| **11** | Herkes özünde iyidir | **A** | **B** | **C** | **D** | **E** |
| **12** | Hoşuma gitmeyen bir işle karşılaşırsam, o işi halletmek için tüm gayretimle çalışırım | **A** | **B** | **C** | **D** | **E** |
| **13** | Bir şeyi yapmaya karar verirsem, o iş üzerine yoğunlaşırım | **A** | **B** | **C** | **D** | **E** |
| **14** | Yeteneklerime olan güvenim azdır | **A** | **B** | **C** | **D** | **E** |
| **15** | Kolayca sosyalleşemem | **A** | **B** | **C** | **D** | **E** |
| **16** | Ressam olsaydım çocukların resmini çizmek isterdim | **A** | **B** | **C** | **D** | **E** |
| **17** | Yeni bir şey öğrenmeye başladığımda, eğer ilk başta öğrenemezsem, çalışmaktan/öğrenmekten vazgeçerim | **A** | **B** | **C** | **D** | **E** |
| **18** | Akvaryumda balık beslemek isterim | **A** | **B** | **C** | **D** | **E** |
| **19** | Kendime güvenim yüksektir | **A** | **B** | **C** | **D** | **E** |
| **20** | Hayatta karşılaştığım problemlerin üstesinden gelmekte zorlanırım | **A** | **B** | **C** | **D** | **E** |

**APPENDIX B:** Self Efficacy Scale

|  |  |
| --- | --- |
|  | **SELF EFFICACY** |
| **1** | I would like to grow my own vegetables/fruits | **A** | **B** | **C** | **D** | **E** |
| **2** | I am sure that I am capable of executing my plans | **A** | **B** | **C** | **D** | **E** |
| **3** | If I can’t do something first time, I try over and over  | **A** | **B** | **C** | **D** | **E** |
| **4** | I hardly establish friendship | **A** | **B** | **C** | **D** | **E** |
| **5** | Genetics/heredity affects the character | **A** | **B** | **C** | **D** | **E** |
| **6** | I like to cook | **A** | **B** | **C** | **D** | **E** |
| **7** | I **hardly** accomplish my goals when I set them  | **A** | **B** | **C** | **D** | **E** |
| **8** | I leave things uncompleted  | **A** | **B** | **C** | **D** | **E** |
| **9** | I **avoid** to encounter the obstacles  | **A** | **B** | **C** | **D** | **E** |
| **10** | I **don’t** spend effort if it seems very complicated  | **A** | **B** | **C** | **D** | **E** |
| **11** | Everyone is essentially good  | **A** | **B** | **C** | **D** | **E** |
| **12** | If I encounter an obstacle which I don’t like, I try to overcome it with all my efforts | **A** | **B** | **C** | **D** | **E** |
| **13** | If I decide to do something, I focus on it  | **A** | **B** | **C** | **D** | **E** |
| **14** | I hardly believe in my capability | **A** | **B** | **C** | **D** | **E** |
| **15** | I can’t socialize easily | **A** | **B** | **C** | **D** | **E** |
| **16** | If I was an artist then I would want to paint picture of children | **A** | **B** | **C** | **D** | **E** |
| **17** | When I start to learn something new and can’t learn at first then I give up studying/try learning | **A** | **B** | **C** | **D** | **E** |
| **18** | I would like to have fish as pet | **A** | **B** | **C** | **D** | **E** |
| **19** | My self confidence is high | **A** | **B** | **C** | **D** | **E** |
| **20** | I trouble to overcome obstacles that I encounter in life | **A** | **B** | **C** | **D** | **E** |

1. Muş Alparslan University, Education Faculty, Science Education Department, Mus-Turkey; ademakkus@gmail.com , ORCID: 0000-0001-9570-3582 [↑](#footnote-ref-1)