EFFECT OF PERFORMANCE BASED STATUS DETERMINATION TECHNIQUES ON SELF-EFFICACY, CONCERN AND PERMANENCE IN PRIMARY SCHOOL SCIENCE AND TECHNOLOGY COURSE

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Introduction

Measurement and evaluation which is part and parcel of education and teaching process is used to decide whether predefined education targets have been attained or not. Another objective of assessment is to develop and support learning of student. Sensitive, correct, appropriate and supportive measurement and assessment is a necessity for learning (Coskun, 2007). Therefore assessment activities to be applied require that learning process should be structured in a way to allow measurement and various measurement tools should be used (Baki and Birgin, 2002).

Changes in learning theories are reflected on assessment activities (Shephard, 2000). Measurement and assessment activities that are conducted in line with this theory are criteria based tests, standard multiple choice tests and IQ test used in measuring the intelligence of student. Consequently, through traditional measurement and assessment activities basic level knowledge and skills related to student's learning are explored, and it falls down on measuring important and complex knowledge and skills (Stiggins, 1999; Ryan, 1998).

Contrary to this, in constructivist learning theory, in addition to classical measurement and assessment methods utilization of new measurement and assessment methods loom large. When one looks at the Program Development studies of Board of Education and Discipline it is envisioned that activities should be planned towards assessing and directing of students' individual skills and their performance differences and independent thinking, developing their reasoning and decision making skills and providing education that is suitable to different environments (Ministry of Education, 2006). The new assessment approach defines an approach which

Abstract. *As supportive of traditional measurement and assessment approaches in 7th Grade Science and Technology course's "Light" chapter, the purpose of this research is to test the effect of performance based status determination on students' perception of self-efficacy, their course related concerns and permanence levels. As supportive of traditional measurement and assessment approaches the performance based status determination has been applied to the experiment group while control group has been applied only traditional measurement and assessment approaches by the researcher. Analysis of the data obtained in the research have been evaluated by single factor analysis of covariance (ANCOVA) and two factor (repeated measures) ANOVA for repeated measurements on single factor. As a result, while significant difference has been found between experiment and control groups from the perspective of self efficacy perceptions, no significant difference has been found between course related concerns and permanence levels.*

Key words: *fear of science and technology, permanence, performance based situation determination, self-efficacy perception.*

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is reliable, performance based, build on cooperation, reflecting learnings in related to effective and real life, realistic and practicable (Spady and Marshall, 1991). At present, in determination of to what extent students achieve the goals envisioned in school programs such new assessment ways as Performance Based Situation Determination, Real Life Situations Based Situation Determination and Portfolio Based Situation Determination are used (Ekinci and Koksal, 2011).

Performance measurement takes place when the students perform an activity to show what they learned or produce a product (Kutlu, 2004). Performance assessment which is one of the alternative assessment methods can be defined as by taking individual differences of students into account making assessment through situations and duties that would allow students to turn their knowledge and skills into action and transfer to real life. Performance measurement wants the student to show how he will solve the daily life problems in regards to achievement of course as well as how he will use his knowledge and skills to solve the problems (Ministry of Education, 2006) It is particularly important that students should be assessed in real life conditions, that it should contain high levels thinking and sometimes he should come up with a product (Airasian, 2001).Another advantage of performance based status determination is that it takes the student to the center of things and it is in harmony with modern learning theories which facilitate being closely involved with education and assessment process. Because this assessment approach necessitates to benefit from graded scoring keys (Rubrik) and assessment forms (like self assessment, peer assessment and group assessment).According to Popham, graded scoring key is a scoring design which is developed and defined under the guidance of a teacher or another assessor to assess character of answers a student gives to questions or to assess the student works (Kutlu, Karakaya and Dogan, 2008). Students' joining the assessment process is facilitated by self assessment (student's assessing his self performance with respect to a scale), peer assessment (student's assessing performances of his friends) and group assessment (group members' assessing their own group; each group's assessing itself or other groups; each student's assessing groups separately (Falchikov, 2004). According to Dogan and Okan these applications also motivate students for the course; they facilitate increase in their interest, curiosity and self-confidence and affect students' studying habits positively (Ekinci ve Koksal, 2011).

The scientific studies conducted in the field of science education in recent years show that factors like learning – teaching models, student-teacher relations and measurement-assessment methods are the primary factors affecting students' success at science course (Korkmaz, 2001; Asan and Tahran, 2002; Mc Donald, 2003; Demircioglu, Demircioglu and Ayas, 2004).

Cetin and Cakan (2010) determine that performance duties ensure students' better understanding of Science and Technology subjects, they develop research and development skills, they allow them to see their deficient aspects through assessments made and that students are more successful in exams. Pajares (2003) underlines that self-confidence perceptions have also effect on students' academic achievement and performance.

When education process is taken into account development of students' self-efficacy perceptions would surely enhance their success at the courses. When one looks at education research it is seen that in order to trace development of student achievement usually classical test methods are used. But testing students' self-efficacy perceptions is also important situation for tracing and understanding the success (Coskun, 2007). According to Pajares (2003) the individuals who have high self-efficacy perception can be more comfortable and efficient when they encounter works with high level of difficulty. Those individuals with low self-efficacy perception however, believe that the works they will do are harder than they actually are. While this type of thinking enhances the fear and stress it also narrows person's perspective necessary to solve the problem in the best possible way. Therefore self-competency belief affects success and fear levels of individuals in a very strong way (Yenilmez and Kakmaci). In performance based status determination, students' joining assessment process and making self- assessment activities allow them to make some determinations about their own knowledge and success levels. And this situation allows the students to take control of their own learning and reduces the fear (Kutlu et. al, 2008).

Many development studies are performed to better test and assess the learning environments. In this study, with the idea that performance based assessment which is one of the alternative assessment models developed for measuring the performance provides many gains from the perspective of learn-

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ing individuals, a performance focused study has been conducted. Accordingly objective of the study is to analyze the effect of performance based status determination in Science and Technology course on students' self-efficacy perceptions, course related fears and permanence levels.

To this end, an answer has been sought to the question of "Does performance based status determination have an effect on self-efficacy perceptions, fear and permanence levels of 7th grade student in Science and Technology course ?" Accordingly, sub problems of this study have been identified as the following:

1. Is there a significant difference between self-efficacy perceptions of students of the class where performance based status determination was used and student of the class where these type of methods were not used?
2. Is there a significant difference between Science and Technology fears of students of the class where performance based status determination was used and students of the class where these type of methods were not used?
3. Is there a significant difference between permanence levels of students of the class where performance based status determination was used and students of the class where these type of methods were not used?

Methodology of Research

Study Model

In this research, a design with pretest-post test control group, which is one of the experimental designs, has been used. The design with pretest- post test control group is a design which involves related and unrelated (repeated) measurements and called split-plot or complex design. Due to the fact that unbiased assignment could not be performed in the selection of subjects the design of this study can be characterized as quasi- experimental study (Buyukozturk, 2010).

Study Group

This research has been applied for 6 weeks to total of 33 students, who were divided into an experiment class (n=16, Girl=8, Boy=8) and control group (n=17, Girl=10, Boy = 7) and who were carrying on their studies in second semester of 2010-2011 education year in 7th grade at a private school in Antalya. These groups have been randomly assigned as one being experiment group while the other being the control group.

In regards to ensuring the equivalence of experiment and control groups, students' previous education year grades have been taken as the base and differences between averages have been tested by using t-test. Analysis results are presented in Table 1 and it is found that both groups are equal to each other (p> 0.05).

Table 1.   Grade averages of experiment and control group students – t-test with independent groups.

Group	N	$\overline{X}$	S	SD	t	p
Control	17	87.86	9.98	31	0.436	0.666
Experiment	16	89.26	9.70	30.76		

Data Collection Tools

Self-efficacy Scale for Science and Technology (SSST)

The SSST has been developed by Tatar (2009) and his colleagues to assess self-efficacy of primary school second level students toward science and technology. The SSST which comprises of 27 items has

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a three factor structure. Benefiting from the literature these three factors have been called "confidence towards science and technology", "ability to overcome Science and Technology related difficulties" and "confidence in science and technology performance".

Internal consistency coefficients of factors in the scale are 0.93, 0.75 and 0.80, respectively. Croanbach alpha coefficient for entire scale is 0.93. The 5 point Likert type scale items are graded from 5 to 1 with answers ranging from "I totally agree" to "I definitely don't agree" (Tatar et al., 2009).

Science and Technology Fear Scale (STFS)

The scale which has 28 items and two factors has been developed by Guzeller and Dogru (2011) to assess science and technology related fears of primary school second level students. Cronbach Alpha internal consistency reliability coefficient of the scale is 0.77 for the first factor and 0.942 for the second factor, making the total coefficient 0.964.

The positive items for fear in the 5-point likert scale have been graded from 1 to 5 with answers ranging from "I definitely don't agree" to "I totally agree" and the negative items for fear have been graded from 5 to 1 (Guzeller and Dogru, 2011).

Science and Technology Course Academic Achievement Test (AAT)

The test has been developed by Dogru, Seker and Gencosman (2011) to assess achievement of students in regards to "Light" chapter of Science and Technology course. In the first stage of development process of the test goals of light chapter in the primary school 7th grade science and technology program have been taken into account. Meeting each of goals two multiple choice questions have been constructed, making the total 36. The constructed questions have been analyzed by science and technology teachers, two academicians specialized in science field and measurement and assessment specialist. In forming the question items development levels of 7th grade students have been taken into account. Before the pretest application, four 8th grade students read it loudly.

Pretest application of the test has been realized with 150 students whose socio–economic levels are similar. Pre application analyses have been made and one for each goal total of 18 items with low distinguishing power has been omitted from the test. The remaining 18 items have been found to be high in validity, with average strength of 0.65 and average reliability of 0.94. Resulting test is relatively easy and its distinguishing power is high.

Application

Because of such reasons as application process should not be interrupted, continuity should be secured in work group's joining the process and reliable results should be obtained the "Light" chapter has been chosen with the thought that it is suitable for experimental processing from the time perspective. With pre test, experimental activity and application of final test, the application has been completed within 6 weeks. In order to determine the effect of experimental activity on students' self-efficacy and fears towards Science and Technology SSST and STFS have been applied as pretest, and to determine their remembering levels AAT has been applied as pretest. After pretest measurements are made experimental activities have been started and the process has been started simultaneously with both groups.

At the beginning of the chapter experiment group students have been divided into 4 groups comprising of 4 people. In regards to performance based status assessment process groups have been given performance duties involving the chapter, before starting to the chapter by receiving the opinions of the course teachers rubrics have been constructed and distributed to students and students have been provided information about how they will gain points at the end of the process. In preparation of performance duties, priority has been given to choose those subjects that would draw the attention of students, that would facilitate their participation with high motivation level and that would make them get prepared through research. To this end opinions of teachers have been taken and 4 different

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performance duties have been prepared. Performance duty has been designed as a research question that would put forward students' high level cognitive skills.

At the end of the process students have been asked to provide reports and electronic record pertaining to performance duties they prepared. Rubrics have been graded by the researcher. After the practices related to performance duties have been completed assessment forms for performance duties process (self assessment, peer assessment and group assessment forms) have been distributed to the students and they have been asked to give points by taking the process into account, as well.

In control group on the other hand, the "Light" chapter has been taught for 6 weeks with 4 hours a week following the Science and Technology education program which is based on 2010-2011 education year constructive approach.

After the experimental practice SSST, STFS and AAT have been reapplied to experiment group and control group final test points have been obtained. In order to determine students' permanence levels in regards to "Light" chapter, after end of the research AAT has been reapplied to all groups as a permanence test.

Analysis of Data

In order to test the sub problems of the study pretests and post tests have been applied. As a result of these test, whether the experimental practice was effective or not has been determined by the difference of both groups' Pretest – Post Test points. In this comparison for the first two sub problems, if the difference between post test point averages corrected with respect to pretest results are significant has been tested with one factor covariance analysis (one factor ANCOVA). ANCOVA's basic advantages are that it reduces error variance therefore provides greater statistical power and in the beginning of experiment when there are intergroup differences it reduces the bias in the experiment (Buyukozturk, 2010). In order to test the groups' Science and technology course permanence levels pretest, posttest and permanence average points two factors ANOVA (repeated measures) has been used for repeated measures on one factor.

Results of Research

Findings Related to First Subproblem

The first subproblem of the research has been determined as "Is there a significant difference between self-efficacy perceptions of students of the class where performance based status determination was used and student of the class where these type of methods were not used? To see whether students' pre measurement – post measurement points from self-efficacy scale show significant difference with respect to groups' data have been analyzed with one factor covariance (ANCOVA) analysis. Findings about covariance analysis are presented in Table 2 and Table 3.

Table 2.   Descriptive statistics of self-efficacy scale points with respect to groups.

Learning Style	N	Mean	Adjusted Mean
Experiment	16	3.6435	3.663
Control	17	3.1046	3.086

When students' average points with respect to Science and Technology Related Self-efficacy pre measurement – post measurement are analyzed; for experiment group students it is calculated as 3.6435 and for control group students it is 3.1046 When premeasurement points are checked, adjusted average points are calculated as 3.663 for experiment group and 3.086 for control group. On the other hand equivalence of variances pertaining to groups' self-efficacy posttest points has been checked with Leven test and it has been found that their variances are the same (F=0.758; p=0.391>0.05). According

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to these results all assumptions of covariance analysis are met. The ANCOVA results related to whether observed differences between groups' adjusted attitude scale average points are significant or not are presented in Table 3.

Table 3. **ANCOVA results pertaining to difference between self efficacy perception post test averages adjusted with respect to pretest points.**

Source of Variance	Total of Squares	df	Average of Squares	F	p	η2
Pre measurement	7.527	1	7.527	24.921	0.000	0.454
Group	2.745	1	2.745	9.089	0.005	0.233
Error	9.061	30	0.302			
Total	18.982	32				

When Table 3 is analyzed it is observed that there is a statistically significant difference (F= 9.089; p< 0.05) between post test self-efficacy averages adjusted with respect to pretest self-efficacy points of students in experiment and control groups. The fact that difference is in favor of experiment group is understood from adjusted averages ($\bar{X}\bar{X}_{experiment}$=3.363; $\bar{X}\bar{X}_{control}$=3.086) Based on this finding it can be said that performance based status determination affects students' Science and Technology self-efficacy perceptions. Eta-square value has also been supporting the result attained for post test points. Obtained eta-square values of "0.01", "0.06" and "0.14" have been interpreted as "small", "medium" and "large" effect size, respectively. Eta-square values between 0.01-0.06 show small effect magnitude, between 0.06-0.14 show medium and over 0.14 show large effect magnitude (Buyukozturk et al, 2009; Gren, Salkind and Akey, 2000). Given this, when the obtained eta-square value (η^2=0.233) is taken into account from the perspective of applied technique performance based status determination has a wide effect on students' self-efficacy.

Findings Related to Second Subproblem

The second sub problem of the research has been determined as: Is there a significant difference between Science and Technology fears of students of the class where performance based status determination was used and students of the class where these type of methods were not used? In order to see whether pre measurement – post measurement points that the students get from fear scale show significant difference with respect to groups data have been analyzed with one factor covariance (ANCOVA) analysis. Results of covariance analysis are presented in Table 4 and Table 5.

Table 4. **Descriptive statistics of science and technology fear scale points with respect to groups.**

Learning Style	N	Mean	Adjusted Mean
Experiment	16	2.4040	2.330
Control	17	2.3773	2.447

In Table 4, when the average points of students' Science and Technology Fear Scale pretest and post test results are analyzed, it is seen that it is calculated as 2.4040 for experiment group and as 2.3773 for control group. When the pre-measurement points are checked adjusted average points are calculated as 2.330 for experiment group and as 2.447 for control group. On the other hand equivalence of variances related to groups' fear post test points has been checked with Leven test and it has been found that variances are the same (F=0.210; p=0.650>0.05). According to these results all assumptions of covariance analysis are met. The ANCOVA results related to whether observed differences between groups' adjusted attitude scale average points are significant or not are presented in Table 5.

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Table 5. ANCOVA results pertaining to difference between science and technology fear post test averages adjusted with respect to pretest points.

Source of Variance	SS	sd	MS	F	p	η2
Pre measurement	10.856	1	10.856	21.735	0.000	0.420
Group	0.112	1	0.112	0.225	0.639	0.007
Error	14.984	30	0.499			
Total	25.845	32				

When Table 5 is analyzed it is observed that there is not a statistically significant difference (F= 0.225; p>0.05) between post test fear point averages adjusted with respect to pretest fear points of students in experiment and control groups. The fact that difference is in favor of experiment group is understood from adjusted averages ($\bar{X}\bar{X}_{experiment}$=3.363; $\bar{X}\bar{X}_{control}$=3.086). However, when one looks at the adjusted averages ($\bar{X}\bar{X}_{experiment}$=2.330; $\bar{X}\bar{X}_{control}$=2.447) it is seen that average of control group is higher than that of experiment group. Based on this finding, despite lack of significant difference performance based status determination affects Science and Technology fears of students in the way of experiment group.

Findings Related to Third Subproblem

The third subproblem of the research has been determined as "Is there a significant difference between permanence levels of students of the class where performance based status determination was used and students of the class where these type of methods were not used?" In the analysis of the problem primarily arithmetic average (X) and standard deviation (S) have been calculated. For the repeated measurements related to whether observed post experiment values have significantly changed with respect to pre experiment two factor variance analysis (ANOVA) has been applied. Findings related to average and standard deviation values of experiment and control groups' success test pretest, post test and permanence test points are presented in Table 6.

Table 6. Average and standard deviation values of experiment and control groups' success test pretest, post test and permanence test points.

Groups	Success Test Pretest			Success Test Post Test			Permanence Test		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Experiment	16	6.9375	2.59	16	11.1250	3.91	16	14.4375	2.53
Control	17	8.1176	2.69	17	11.1765	2.60	17	13.1176	4.18
Total	33	7.5455	2.67	33	11.1515	3.25	33	13.7576	3.50

When Table 6 is analyzed there seems difference between averages of study groups. In order to identify whether this difference is significant or not variance analysis has been employed. The results of ANOVA which is applied to test whether students' academic achievement test pretest, post test and remembering points show significant difference with respect to different assessment methods used or not are presented in Table 7.

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Table 7. ANOVA analysis results of students in experiment I and control group with respect to permanence points.

Source of Variance	SS	df	MS	F	p	η2
Between Groups	468.060	32				
Group (Experiment/Control)	.021	1	27.96	34.938	0.970	0.000
Error	468.039	31	15.098			
Within Groups	1137.818	66				
Measurement(Success)	649.394	2	324.697	43.519	0.000	0.584
Group*Measurement	25.838	2	12.919	1.732	0.185	0.053
Error	462.586	62	7.461			
Total	1605.878	98				

When Table 7 is analyzed, no significant differentiation from the perspective of groups have been found in comparing achievement test averages of experiment and control groups without taking pre-test, post test and permanence test measurement into account (F=34.938, p=0.970>0.05). On the other hand, in the analysis which is conducted only between pretest, posttest and permanence test points without taking group variable into account, significant difference (F=43.519; p=0.00<0.05) has been found at wide effect (η^2= 0.584) level. In the analysis that takes both pretest, post test and monitoring test results and experiment and control group interaction into account no significant difference has been found (F=1.732; p=0.185>0.05).

According to these results it can be said that compared to control group, performance based status determination method applied in experiment group has not increased students' success. On the other hand, in group post test average points and permanence test average points are higher than pretest average points. However, the difference between post test and permanence test points has not been found significant. This finding shows that permanence levels of students taking science and technology course which was developed in compliance with performance based status determination method have significantly increased after the application and in measurements made afterwards, that their permanence levels after the application have not differentiated from measurement results in the monitoring studies conducted afterwards, meaning that effect of the application persists.

Discussions

It has been determined that there is a difference between self-efficacy perceptions of primary school students who have joined performance based status determination application and who have not joined the application and this difference is in favor of experiment group. This finding can be interpreted as the result of affective characteristics gained by students who join assessment process in performance based status determination applications and see their deficiencies and who get the opportunity of taking control of their own learning. Besides, students' self-efficacy in one subject is a structure they form as a result of making self assessment in a certain process (Seijts, Latham & Whyte, 2000). In his study where he analyzed the effect of using a portfolio of alternative assessment techniques on students' cognitive and affective characteristics, in addition to portfolio Bahceci (2006) has also used self and peer assessment forms. According to results he analyzes he has determined that using portfolio affects students' exam fears, affective characteristics like self-efficacy and attitude positively. In addition to that it can be said that working in cooperation during performance duties has also effect on increasing students' self-efficacy. Effect of cooperative learning is quite high on performance experience which is the most important identifier of self-efficacy (Johnson & Johnson, 1997). This finding is in parallel with Coskun (2007)'s study which analyzes the effect of performance based status determination (assessment) on primary school 7th grade students' success in mathemat-

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ics course, their attitudes and self-competencies. The researcher has found out that in performance based status determination process students assume self learning responsibility and their interactions with other students in their groups increase. Hamayan (1995), Conradie and Frith (2000), Olina and Sullivan (2002), Janisch et all (2007), Mihladiz (2007), Alsadaawi (2008), Wen and Tsai (2008), Bahceci (2009), Bulus, Kirikkaya and Vurkaya (2011), Chang and Wu (2011)'studies which state that alternative assessment activities can cause positive increase in such affective characteristics as students' exam fear, attitude, self-efficacy, work behaviors also point to similar results.

In their course related fears a significant difference has not been found between experiment and control groups. This finding shows parallelism with Izgi (2007)'s study results. The researcher has researched if using portfolio of complementary assessment approaches in primary school 8th grade "Genetics" chapter had any effect on students' exam fear levels and permanence in their learning and he did not find any statistically significant difference between experiment group students' exam fear levels and control group students' exam fear levels. However, according to analysis results of conducted research when the averages are analyzed fear has been found to be decreasing somewhat in the experiment group. Oludipe ve Awokoya, (2010) explains concern about being successful with the relation between students' work behaviors and academic achievement. Although objective of new assessment methods is to change students'negative attitudes particulary towards quantitative courses (Coskun, 2007) ; the fact that these methos are not used frequently and students who grow up in an exam oriented education system have concerns about becoming successful seem to be a probable case. In addition to this, according to studies of Acad and Guvey (2009) parents' helping to project and performance duties continiously leads to decrease in children's habits of doing their homeworks and having fear about becoming successful.

Between the experiment group that was applied performance based status determination method and the control group no significant difference has been found from the perspective of permanence levels. On the other hand within the groups, post test average points and permanence test average points are higher than pretest average points. The two important drawbacks of traditional assessment approaches are that it puts the student in a passive role and it is inadequate in ensuring permanence (Ural et al, 2008). Breault (2004) and Zou (2002) on the other hand have determined that assessment based on development file is more effective, genuine and permanent than traditional assessment. When one looks at the studies related to remembering learned things which is determinant of academic success and students' permanence levels; despite studies claiming that complementary measurement and assessment approaches have no effect on academic success (Bahceci and Kuru, 2006; Coskun, 2007; El Koumy, 2001; Erdin, 2010; Gomleksiz and Koc, 2010; Olina and Sullivan, 2002; Uysal, 2008; Seker, 2012)   there are also studies stating that it increases the success (Alsadaawi, 2008; Chang and Wu, 2011; Cihanoglu, 2008; Guven and Aydogdu, 2009; Mihladiz, 2007; Moheidat and Baniabdelrahman, 2011; Tasdemir, Tasdemir and Yildirim, 2009; Yalaki, 2010)

Conclusions

In the assessment process, statistically significant differences have been determined between Science and Technology course related self –competence perception of experiment group students who were applied performance based status determination supportive of traditional measurement and assessment approaches and control group students who were only applied traditional measurement and assessment. Right along with this no significant differences have been found between Science and Technology fears and permanence of learned things of experiment and control group students. Based on these results it is considered that in order to enhance academic success of students' measurement and assessment should be applied from the very beginning and with long interactions. Besides, in regards to success; it is also known that such factors as student's perception of success and failure, fear, self-efficacy, permanence, attitude and planning learning related processes can also be increased this way. In today's world where constructive education understanding is prevalent it is necessary to use new measurement and assessment approaches that allow transferring of knowledge to daily

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life. Therefore it is recommended that more research around new measurement and assessment approaches should be conducted and they should provide more contribution to the solution. Besides, thinking that results of this research are limited to peer assessment, self assessment and group assessment which is types of complementary measurement and assessment approaches similar studies can be made by using other complementary measurement and assessment approaches.

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