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An Investigation of the Programme for International Student Assessment 2012 in Terms of Formative Assessment Use: Turkey Example *

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Abstract

The purpose of this research is to determine whether student oriented teaching, experience oriented teaching, teacher support and the class size predict the usage of formative assessment in mathematics. This study is designed as a predictive research that falls in the correlational survey model, one of the general survey models. The sample of the study consists of PISA 2012 Turkey data (4848 students). The data were obtained from the students and school questionnaires used within the scope of PISA 2012. The data were analyzed by using ordinal logistic regression analysis. The variables of the study consist of two group (predicted and predictor) variables. The predicted variable is formative assessment use and the predictor variables are student oriented teaching, experience oriented teaching, teacher support and the class size, respectively. This study has proved that while the variables "student oriented teaching" and "teacher support" are significant predictors of how much formative assessment is used, the variables "experience oriented teaching" and "class size" are not significant predictors of how much formative assessment is used. Nevertheless, the logistic regression model designed proved to be meaningful as a whole. The rate of the classification accuracy of the model is 58%.

Keywords

Formative assessment

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Introduction

Enactment of No Child Left Behind (NCLB) Act of 2001 resulted in a reform in education, and since that time, the understanding of achievement has changed and assessment of proficiency has gained importance. Accordingly, assessment policies were revised in many countries. Specifically, the use of formative assessment in teaching has gained importance and prevalence. The Council of Chief State School Officers (CCSSO) has recently started a major strategic initiative to explore formative assessment with the goal of familiarizing educators with its characteristics, and also helping educators to understand the necessary components to make formative assessment genuinely effective. October 2006 CCSSO meeting in Austin, Texas, a collaborative of more than 20 states, defined the formative assessment as follows: "Formative assessment is a process used by teachers and students during

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instruction, which provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes". This definition notes that formative assessment is a process rather than merely a particular kind of test. This process can be formal or informal. That is, the process may involve the use of formal tests, or it might rely on informal observations like teacher-student interviews (Popham, 2007). Brookhart (2009) also highlights that formative assessment refers to the ongoing process both students and teachers engage in when they focus on learning goals, take stock of current student work in relation to the learning goals using formal or informal assessment processes and take action to move students closer to the learning goals (i.e., teachers adjust teaching methods or students adjust learning methods). As we understand from these definitions, the feedbacks given in formative assessment process contribute to the use of measuring results as teaching and learning tools. The formative assessment concept was also used in the last implementation of the Program for International Student Assessment (PISA) organized by the Organization for Economic Co-operation and Development (OECD), in 2012. PISA is a triennial international survey which aims to assess 15-year-old students' skills in math, reading and science literacy internationally, and to test education systems worldwide. The assessment is forward-looking: rather than focusing on the extent to which these students have mastered a specific school curriculum, it assesses their ability to use their knowledge and skills to meet real-life challenges. This orientation reflects a change in curricular goals and objectives, which are increasingly concerned with what students can do with what they learn at school (OECD, 2014).

PISA 2012 survey focuses on mathematical literacy. Because of this focus, a large number of new mathematical literacy items were created and tracked for 2012, and the Framework which specifies the nature of the assessment was revised. Mathematics will be emphasized in the questionnaires for students and schools. Since mathematics has a hierarchical structure, the feedback is important for new learning to occur (Skemp, 1987). For this reason, the use of formative assessment in mathematics lessons contributes to development of mathematical thinking skills (OECD, 2014).

In today's world, it is necessary to provide students with an education that will help them become individuals with higher-order thinking skills that will allow them to apply their knowledge to real life situations and to efficiently use it to sort out the problems they confront (Arıcı & Altıntaş, 2014). On the other hand, there is a great deal of studies about formative assessment in the literature particularly in the foreign body of literature. However, these studies have generally focused on either the description of the formative assessment or its relationship with achievement (Bennet, 2011; Black & Wiliam, 1998; Köller, 2005; Liang, 2010; Stern, 2009). Unfortunately, studies focusing on the use of formative assessment and/or the factors that may influence formative assessment are limited. It is indicated in most studies formative assessment might be a factor that boosts student success (Bennet, 2011; Black & Wiliam, 1998; Köller, 2005; Stern, 2009).

In a study conducted by Köller (2005) in Germany, video records of math classes were taken to study the assessment approaches adopted by teachers, and the approaches of teachers were coded. Then, students were asked to give information about their motivation and other social variables, and all variables were tested for correlations among them. The results indicated that formative assessment was linked to the success and motivation of students. However, the researchers highlighted the lack of studies about formative assessment in Germany. The researchers also suggested that formative assessment needed to be studied further. Black and Wiliam (1998) also sought a relationship between formative assessment and students' levels of success. The effect of formative assessment on students' learning was reported to be between .40 and .70. They also stated that the effect size should not be interpreted merely as a metric measure since such approaches might improve the ranks of countries in exam practices. However, Bennett (2011) discussed formative assessment critically, trying to determine the definition, restrictions and advantages of this method, and underlining that this approach requires a significant level of teacher support.

Stern (2009) conducted a long-term research and development project called Innovations in Mathematics and Science Teaching- IMST which aimed to create an effective supporting system for schools in Australia. In this project, the effect of formative assessment on independent learning and reflective teaching was sought. This project also enabled researchers to make case studies because of being long-term project. In addition, the project indicated that independent learning and reflective teaching were enhanced. Meanwhile, Liang (2010) investigated the relationship between the role of formative assessment, success in mathematics and the personal factors of students by using 2003 PISA data and made a comparison between the United States, Canada, Finland. It was investigated whether the higher mathematics performance in Canada and Finland could be explained by the use of assessments in schools as an instructional tool to influence the mathematical self-efficacy, efforts and achievement of students, in comparison to the practice in US schools. Unfortunately, the results did not confirm the hypothesis as none of the school assessment variables were significant in explaining student mathematics performance for Finland. The total school assessment practices only accounted for about 5.35% of the variance in mathematics performance of students; the relatively high ranking of students' mathematics performance had very little relationship with how schools used assessment in Finland. In contrast, controlling for school assessment practices, all student individual level variables (gender, family socio-economic status, expected educational level, foreign language at home, etc.) were significantly related to mathematics performances the same way across all three countries despite the much higher rankings of student mathematics performance in Finland and Canada. It was specified and discussed that the USA and Canada have a more heterogeneous population of students, while Finland has a largely homogeneous population with fewer differences in education income levels than in the USA.

In formative assessment studies in Turkey, Konur and Konur (2011) investigated whether teachers tend to use formative assessment beside traditional assessment and evaluation methods. They investigated these questions in three steps: which assessment and evaluation methods primary school teachers used; whether primary school teachers used formative assessment or not; and if primary schools teachers did not use formative assessment, the possible reasons behind that. The results were that primary schools teachers used formative assessment beside traditional assessment and evaluation methods. However, they highlighted that it was more difficult for teachers to use formative assessment because of lack of time and resources.

A comparative review of the studies in the literature reveals that although formative assessment which is considered an important point bringing students to a desired point is largely discussed in the international literature, one can see that this is not studied sufficiently in Turkey especially when it comes to practices. In addition, while the existing studies focus on the effect of formative assessment on such variables as academic achievement and motivation, there is a limited number of studies on the concepts related to formative assessment, and the potential advantages and disadvantages of its implementation. Considering the Turkish education system and its practices, even the classroom assessment practices are usually result-oriented. In this sense, a study on determination of formative assessment and its frequency in practice is thought to contribute to the practices both in Turkey and in the literature.

The purpose of this study is to see whether student-oriented teaching, association of teaching with life situations, teacher support, and class size predict the use of formative assessment in math classes. The following questions are sought to be answered for this purpose:

1. Do the variables of student-oriented teaching, association of teaching with life situations, teacher support, and class size predict the use of formative assessment in math classes?
2. What is the relative order of importance of predictive variables?

Method

Research Model

This study is designed as a predictive research that falls in the correlational survey model, one of the general survey models.

Population and Sample

Turkey population of PISA 2012, 1.266.638 students are included in total who are at the age of 15. The sample of the study consists of PISA 2012 Turkey data (4848 students). However, the students who did not obtain the form which contained the items related to the variables examined under the study were not included in the sample. At the final instance, the sample group had 1382 students.

Data Collection Tools

PISA uses a Student Questionnaire to collect information about various aspects of the houses, families and educational backgrounds of students, and a School Questionnaire to collect information about various aspects of organizational structure and educational decisions of a school. Also the Parent Questionnaire which is conducted on the parents of students who participate in PISA only in 11 countries. Regarding the variables of interest in this study, only the data obtained from the Student Questionnaire were resolved. There are three forms (Form A, B, and C) in the Student Questionnaire used in PISA 2012. The items related to the variables used in the study are common in any two of these forms. All items related to the variables addressed in this study are in Form C.

Analysis of Data

Logistic regression analysis was used to test whether student-oriented teaching, association of teaching with life situations, teacher support and classroom size predict the use of formative assessment in maths classes for the Turkey sample of PISA 2012. If the predicted variables are made up of categorical data with three or more levels, lotistic regression models are used for estimation of the effects of predictor variables on the variable that is predicted (Agresti, 2010). Also known as logit models, the logistic regression models are used when there are binary responses and they are distributed binomially (Agresti, 2013). However, ordinal logistic regression analysis is used to predict a single ordinal predicted variable when there are one or more predictor variables (Hosmer, Lemeshow, & Sturdivant, 2013).

Before conducting the analysis, the assumptions were tested. Ordinal logistic regression analysis has three assumptions: (1) the number of individuals in each category, (2) extreme values and (3) parallel curves. For the assumption of the number of individuals in each category, the frequency should be higher than 1 and the number of the cells in which the expected frequency is lower than 5 should not exceed 20%. Otherwise, this analysis might produce very wide parameter estimations and standard deviation. As a solution, combining categories or leaving the problematic category out for categorical variables could be attempted (Tabachnick & Fidell, 2007). Hosmer et al., 2013) asserted that for achieving more consistent and reliable results in logistic regression analysis, the groups should have at least 50 people for the predictor variables. The expected frequencies of the variables handled in this study were examined by means of cross tabulation. As the results of this examination suggest, none of the cells had an expected frequency smaller than 5. Both univariate and multivariate extreme values were analyzed. For the assumptions related to the univariate extreme values to be tested, z-values were checked and no values below -3.00 or above +3.00 were observed. For the assumptions relating the multivariate extreme values to be tested, the Mahalonobis Distance was checked. It was assured that the values did not exceed the critical Chi-square value on the table. Lastly, the parallel curves assumption was tested. This assumption is based on the assumption that regression coefficients are equal for all the categories of the ordinal categorical variable. For this purpose, it was found that the regression coefficients for all the subcategories of the predicted variable were equal and met the parallel curved assumption (χ^2= 12.53; sd= 8 p > 0.05).

The variables of the study consist of two group (predicted and predictor) variables. The predicted variable is formative assessment use (TCHBEHFA) and the predictor variables are respectively, student oriented teaching (TCHBEHSO), experience oriented teaching (EXAPPLM), teacher support (TEACHSUP) and the class size (CS). The predicted variable, teacher behavior when conducting formative assessment, was measured by four items in the Main Survey of PISA 2012. Response categories were "Every lesson", "Most lessons", "Some lessons", "Never or hardly ever". The first predictor variable, teacher behavior when performing student orientation, was also measured by four items in the questionnaire. Response categories were ranged from "Every lesson" to "Never or hardly ever". Association of teaching with life situations from predictor variables (assigning students tasks that they may encounter in real life situations) was measured by six items, and the response categories were "Frequently", "Sometimes", "Rarely" and "Never". Five items measuring teacher support in mathematics classes were used in the questionnaire. Response categories ranged from "Every lesson" to "Never or hardly ever". The class size variable was measured by open-ended questions. In accordance with the open-ended responses from students, this variable is transformed into a categorical variable that consists of three levels by using the literature (Chingos, 2013; Ehrenberg, Brewer, Gamoran, & Willms, 2001; Kornfeld, 2010; Krueger & Whitmore, 2001).

The predicted variable TCHBEHFA and the predictor variables TCHBEHSO, EXAPPLM and TEACHSUP originally consisted of four categories. However, as the frequency for all the cells belonging to the category "Rarely" was low, the categories "Rarely" and "Sometimes" were combined and the categories were renamed as "Frequently (2)", "Sometimes (1)" and "Never (0)". Additionally, the open-ended responses given to the variable "the size of the class" which is among the predictor variables were combined in reference to the literature (Bingley, Jensen, & Walker, 2007; Ehrenberg et al., 2001; Schanzenbach, 2014). The recoded categories were defined as "small" (0) for clases including 0-15 students, "middle-size" (1) for classes including 16-30 students and "big" (2) for classes including 31-53 students.

Results

In the testing of model-data fit, Pearson and deviance statistics were used. Table 1 presents goodness-of-fit values of these statistics.

Table 1. Goodness of Fit

	Chi-square	**df**	**Sig.**
Pearson	147.84	130	0.14
Deviance	153.59	130	0.08

An examination of the values on Table 1 reveals that the regression model designed with the predictor variables in relation to the predicted variable has a perfect model-data fit ($p > 0.01$).

The -2 log likelihood values relating the consistency of the model designed excluding the predictor variables and the model designed including the predictor variables are presented on Table 2.

Table 2. Model Fitting Information

Model	**-2 log likelihood**	**Chi-squre**	**df**	**Sig.**
Intercept only	922.55			
Final	391.91	530.64	8	0.00

An examination of the values on Table 2 reveals that the model designed including the predictor variables is significant in contrast to the model designed excluding the predictor variables ($p < 0.01$). In other words, addition of predictor variables in the model is significant and it increases the model fitting.

In this study, the Pseudo R^2 values (Cox & Snell and Nagelkerke) showing how much of the variance in the predicted variable can be explained by the predictor variables were calculated. Cox & Snell and Nagelkerke values represent the presence of two ways for estimating the variance in the predicted variable which can be explained by the model and is interpreted similarly with the R^2 values in multilinear regression (Field, 2005). In other words, both values show the variance which can be explained by the logistic model and 1.00 indicates that the goodness-of-fit for a model is perfect. A higher value means a better model. Therefore, a model with a higher value is interpreted as having a better goodness-of-fit (Hair, Black, Babin, Anderson, & Tatham, 2006). Pseudo R^2 values are known to indicate that the goodness-of-fit of the model is satisfactory (Field, 2005). An examination of the Pseudo R^2 values reached within the scope of this study (Cox & Snell $R^2 = 0.32$ and Nagelkerke $R^2 = 0.36$) reveals that the goodness-of-fit of the model is satisfactory.

The parameter estimations for all the subcategories of each predictor variable (beta coefficients, standard deviation, Wald statistics and Odds ratios) are presented in Table 3. While the subcategories were being interpreted, the category "Frequently", which was coded as 3 for all predictor variables, was taken as the reference category. Furthermore, the Odds ratio was calculated by the Formula "Exp (-β)" and the results were added on the table. Odds ratio can be explained as the ratio of the odds of an event to the odds of another event, and enables the comparison of the probability of the two events to occur.

Table 3. Parameter Estimates

		β	Std. Error	Wald	df	Sig. (p)	Odds Ratio ($e^{-\beta}$)
TCHBEHSO	Never (0)	-2.82	0.22	167.47	1	0.00	16.73
	Sometimes(1)	-1.23	0.13	90.62	1	0.00	3.41
TEACHSUP	Never (0)	-2.10	0.21	95.48	1	0.00	8.20
	Sometimes(1)	-0.83	0.22	14.54	1	0.00	2.30
EXAPPLM	Never (0)	-0.36	0.20	3.16	1	0.07	1.43
	Sometimes(1)	-0.21	0.12	3.18	1	0.07	1.23
CS	Small (0)	-0.21	0.17	1.41	1	0.23	1.23
	Middle (1)	-0.30	0.15	3.72	1	0.06	1.35

As can be seen in Table 3, "never" using the student oriented teaching – one of the predictor variables – changes the amount of the use of formative assessment by teachers by 16.73 times when compared to using student oriented teaching is "frequently", and this is a significant change. Using the student oriented teaching "sometimes" changes the amount of the use of formative assessment by teachers by 3.41 times when compared to the condition that student oriented teaching is "frequently" used, which is also a significant change.

"Never" providing teacher support – one of the predictor variables – changes the amount of the use of formative assessment by teachers by 8.20 times compared to providing teacher support "frequently", and this change is significant. Providing teacher support "sometimes" changes the amount of the use of formative assessment by teachers by 2.30 times compared providing teacher support "frequently", and this change is significant.

"Never" using the experience oriented teaching changes the amount of the use of formative assessment by teachers by 1.43 times compared to using the experience oriented teaching "frequently". Using the experience oriented teaching "sometimes" changes the amount of the use of formative assessment by teachers by 1.23 times compared to using the experience oriented teaching "frequently". However, these two changes are not significant. Similarly, a "small" class for the number of students changes the amount of the use of formative assessment by teachers by 1.23 times compared to a "big" class. A "middle-size" class, on the other hand, changes the amount of the use of formative assessment by teachers by 1.35 times compared to a "big" class. These two changes are not significant either. The

probability values estimated for the intersections of the subcategories of all predicted and predictor categories are presented both cumulatively and separately in Table 4.

Table 4. Estimated Probabilities

			TCHBEHFA		
			Never (0)	**Sometimes (1)**	**Frequently(2)**
Reference Category [Frequently (2)]		Cumulative Logit	-	-4.35	-1.66
		Cumulative Odds	-	0.01	0.19
		Cumulative Proportion	1.00	0.99	0.84
		Category Probability	0.01	0.15	0.84
TCHBEHSO*	1	Cumulative Logit	-	-3.11	-0.42
		Cumulative Odds	-	0.04	0.65
		Cumulative Proportion	1.00	0.96	0.60
		Category Probability	0.04	0.35	0.60
	0	Cumulative Logit	-	-1.34	1.34
		Cumulative Odds	-	0.26	3.83
		Cumulative Proportion	1.00	0.79	0.21
		Category Probability	0.21	0.59	0.21
TEACHSUP*	1	Cumulative Logit	-	-3.51	-0.82
		Cumulative Odds	-	0.03	0.44
		Cumulative Proportion	1.00	0.97	0.69
		Category Probability	0.03	0.28	0.69
	0	Cumulative Logit	-	-2.24	0.45
		Cumulative Odds	-	0.11	1.56
		Cumulative Proportion	1.00	0.90	0.39
		Category Probability	0.10	0.51	0.39
EXAPPLM	1	Cumulative Logit	-	-4.35	-1.66
		Cumulative Odds	-	0.01	0.19
		Cumulative Proportion	1.00	0.99	0.84
		Category Probability	0.01	0.15	0.84
	0	Cumulative Logit	-	-4.09	-1.41
		Cumulative Odds	-	0.02	0.24
		Cumulative Proportion	1.00	0.98	0.80
		Category Probability	0.02	0.18	0.80
CS	1	Cumulative Logit	-	-4.03	-1.35
		Cumulative Odds	-	0.02	0.26
		Cumulative Proportion	1.00	0.98	0.79
		Category Probability	0.02	0.19	0.79
	0	Cumulative Logit	-	-4.16	-1.47
		Cumulative Odds	-	0.01	0.23
		Cumulative Proportion	1.00	0.98	0.81
		Category Probability	0.01	0.17	0.81

*$p < 0.01$

For the teachers choosing "frequently" for all the predictor variables, the probability to make use of formative assessment "frequently" is 84%, the probability to make use of formative assessment "sometimes" is 15% and the probability to make use of formative assessment "never" is 1%. When cumulative percentages of the probability values are checked, it is found that for the teachers choosing "frequently" for all the predictor variables, the probability to make use of formative assessment "frequently or sometimes" is nearly 99%.

A detailed examination of the data for independent values reveal that in classes where student oriented teaching is "sometimes" used, the probability of using formative assessment "frequently" is 60%, while the probability of using formative assessment "sometimes" is 35% and the probability of using formative assessment "never" is 4%. On the other hand, in classes where student oriented teaching is "never" applied, the probability of using formative assessment "frequently" is 21%, the probability of using formative assessment "sometimes" is 59% and the probability of using formative assessment "never" is 21%.

In classes where teacher support is "sometimes" provided, the probability of using formative assessment "frequently" is 69%, the probability of using formative assessment "sometimes" is 28%, and the probability of using formative assessment "never" is 3%. In classes where teacher support is "never" provided, the probability of using formative assessment "frequently" is 39%, the probability of using formative assessment "sometimes" is 51% and the probability of using formative assessment "never" is 10%.

In classes where experience oriented teaching is "sometimes" applied, the probability of using formative assessment "frequently" is 84%, while the probability of using formative assessment "sometimes" is 15% and the probability of using formative assessment "never" is 1%. In classes where experience oriented teaching is "never" applied, the probability of using formative assessment "frequently" is 80%, while the probability of using formative assessment "sometimes" is 18% and the probability of using formative assessment "never" is 2%.

In "middle-size" classes in terms of the number of students included, the probability of using formative assessment "frequently" is 79%, the probability of using formative assessment "sometimes" is 19% and the probability of using formative assessment "never" is 2%. In "small" classes where there is a limited number of students, however, the probability of using formative assessment "frequently" is 81%, the probability of using formative assessment "sometimes" is 17%, and the probability of using formative assessment "never" is 1%.

In general, when the probability of using teacher support and student oriented teaching, which are two significant predictors of the use of formative assessment in education, increases, the probability of using formative assessment in education also increases. However, an increase in the use of experience oriented teaching or student number, which are two variables that are not significant predictors of the use of formative assessment in education, does not make a significant contribution to the probability of using formative assessment in education.

The crosstab prepared for a comparison of the frequency values of the categories in the predicted variable which includes individuals in reality and through the analyses, in order to determine the correct classification rates of the model, is given in Table 5.

Table 5. Classification Frequencies

		Predicted Response Category			**Total**
		Never (0)	**Sometimes (1)**	**Frequently (2)**	
	Never (0)	91	188	11	290
TCHBEHFA	Sometimes (1)	35	427	154	616
	Frequently (2)	2	187	287	476
Total		128	802	452	1382

Table 5 presents the frequency values which indicate the consistency between the actual condition and the estimated condition by the model. The accuracy of the classification made by the model designed by using the data presented on Table 5 was calculated as shown above.

$$\text{The accuracy rate of the classification} = \frac{91 + 427 + 287}{1382} = 0.582$$

The accuracy rate of the model's classification is around 58%.

Discussion, Conclusion and Suggestions

This study examines whether the variables of the use of student oriented teaching by the teacher, teacher support provided to students, association of teaching with daily life, and class size, and the use of formative assessment approach by teachers in classes are significant predictors and tests the significance of the model created by these variables. As was expected, the model was significantly related to formative assessment. The rate of the classification accuracy of the model was 58%. However, when the predictors were separately analyzed the results were varied. Student oriented teaching and teacher support significantly predicted formative assessment while experience oriented teaching and class size were not found to be predictors of formative assessment.

When all predictor variables are considered, those who chose "frequently" for all variables were 84% likely to use formative assessment "frequently", 15% likely to "sometimes" use formative assessment and 1% likely to "never" use formative assessment. When the predictors were tested separately, the likelihood of using of formative assessment varied between significant predictors and insignificant predictors. Student-oriented teaching and teacher support, which were significant, caused vital changes in the percentage of using formative assessment. Insignificant predictors did not lead to vital changes in the percentage of using formative assessment. In the literature, class size is specified in three categories, namely small size (0-15 pupils), medium size (16-30 pupils), and big size (31-53 pupils). However, in the current study, medium size class was relatively more representative than small and big size class in the current sample. This heterogenic variation of class size in the sample might be the reason of the insignificant result of class size.

A review of the literature reveals that the studies mostly focus on the effect of formative assessment use on achievement (Bennet, 2011; Black & Wiliam, 1998; Köller, 2005; Liang, 2010; Stern, 2009). Among these studies, all except Liang (2010) agree on positive effect of formative assessment on academic achievement. Apart from this, no study was found to take formative assessment as predicted variable and identify the predictor variables related to the use of this method as in the case in this study. However, Bennett (2011) discusses formative assessment critically, laying stess on the definition, boundedness and advantages of this method, underlining that this approach requires a significant level of teacher support. This is consistent with the finding of this study that teacher support provided to students is a significant predictor of the use of formative assessment. Stern (2009) studied the role of formative assessment in promoting independent learning and reflective teaching. He conducted long-term assessment studies for this purpose and found that such studies improve independent learning skills. These findings bear resemblance to the finding of this study that student-oriented teaching is a significant predictor of formative assessment. In the domestic literature, Konur and Konur (2011) determined whether primary school teachers make use of formative assessment approaches in their assessment practices, and the reasons if they do not. For this purpose, they asked for the opinions of teachers about their utilization of formative assessment. They made the conclusion that teachers made use of formative assessment approaches in addition to conventional assessment practices. However, they stated that this approach is very difficult to implement in schools due to time- and resource-related challenges. While this finding creates an expectation that class size variable would turn out to be a significant predictor, it was not found to be so in this study. Examination of class size alone revealed

that small (0-15 students) and large (31-53 students) class sizes are represented less than medium-sized (16-30 students) in the sample group. It is thought that prevalence of medium-sized classes which are identified as ideal may cause this variable not to turn out as a significant predictor.

Based on the findings of this study it is suggestible to identify different variables about formative assessment approach and conduct more studies about the use of this approach in classrooms. In addition, qualitative studies may be conducted on the teacher group to collect information about the possible cases that may affect the use of this assessment approach in classrooms. Also, formative assessment practices may be emphasized in undergraduate courses to give information about how to use this approach in classroom and what advantages they may have to offer. Practices may be made more practical and quickly implementable by making use of the developments in the approaches where technology is widely used in the use of formative assessment. The predictive effect of this approach on academic achievement was calculated on the basis of the grade point average. In future studies, students' level of competence may also be taken into consideration to make a detailed examination of its impact on the use of formative assessment and the academic achievement of students at lower and upper levels of competence.

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