

Developing a Scale to Measure the Attitudes of Primary School Teacher Candidates' towards Performance Tasks

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ABSTRACT: The objective of this study is to develop an attitude scale to determine the impact of performance tasks (homework, presentation, project, research, field work, etc..) introduced into primary school programs on students' learning processes. First, the relevant literature was reviewed, and a five-point, 26item Likert-type scale was developed. The first 16 items were aimed to measure the impact of performance tasks on students' learning processes, and the rest ten items aimed to measure the problems that may arise during the implementation of performance tasks in and out of classroom. The survey sample was consisted of 274 first, second, and third-year students from the Faculty of Education-namely the Department of Science Teaching, Department of Primary School Teaching, and Department of Social Sciences Teaching-at Bartın University located in the center of Bartın province in Turkey. SPSS 22.0 statistics package program was used to analyse the data collected in the study. The reliability of the scale was tested by calculating its item-total and item-discrimination indices. When the validity of the scale was caculated, three factors were resulted in. The Cronbach's Alpha coefficient of the scale was calculated as 0.846. These findings suggested that this scale is highly valid and highly reliable in determining the impact of performance tasks in primary school programs on students' learning processes.

KEYWORDS: Performance task, attitude scale, student.

I. INTRODUCTION

Attitudes can be measured only after they are specified. The most popular approach adopted in measuring attitudes is to develop and implement a relevant scale. Attitude scales are, generally, paper-and-pencil self-report tools used to determine the direction and intensity of an individual's attitude on a one-dimensional or multidimensional level. An attitude scale involves a set of statements related to an attitude to be measured (a group of people, an institution/organization, or concept etc...). These scales can be developed according to different techniques. There are a number of techniques ranging from one-dimensional scaling to multidimensional scaling based on diverse and less/more complicated procedures. The most widely used technique is Likert-type scales that are called "summative rating scale" model[1].

In today's world where individuals have information at their fingertips, one of the main objectives of Turkey's most recent approach towards education is to develop and implement education systems that aim at raising individuals who do not store information but have access to information when they need it. The constructivist learning and teaching approach that involves changing, transferring, and reconstructing meaning and knowledge as needed is becoming more and more widespread at all levels of education in Turkey as is the case in many countries. The Turkish Board of Education under the Ministry of National Education introduced new primary school programs based on the constructivist approach during the 2005-2006 school years. The constructivist learning theory that laid the foundation

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for new primary school programs is not teacher-centered, but focuses on learners' learning processes. It involves learners' constructing/reconstructing and applying information. It does not promote repetition of information, but the transfer and reconstruction of information [2].

In new primary school programs, a student-centered approach rather than a teacher-centered approach was incorporated into teaching and learning strategies, and the established understanding of assessment was tailored to the new approach. In this scope, the Ministry of National Education (MoNE) introduced performance tasks [3]. Performance tasks are one of measurement and assessment tools in the constructivist-approach-based primary school programs [4]. Performance tasks are used to measure students' higher order cognitive skills, and show students how to address and solve their problems in life, and how to use information and skills they already have to solve their problems [5].

Performance tasks form a method of assessment in the constructivist approach [3]. It can be alleged that teachers are not adequately equipped in this assessment method, as it is relatively new. Thus, it becomes significant to define the attitudes that teachers have towards performance tasks integrated into new programs. A review of literature reveals studies about teachers' views on, perceptions of, and expectations from performance tasks [6]; [7]; [8]; [4]; [9]; [10]; [11]. However there is no scale that defines the impact of performance tasks on students' learning processes, and that specifies teachers' attitudes towards the problems that arise during the implementation of these tasks in classrooms, hence the need to develop such a scale.

II. METHOD

Survey Sample

The survey sample consisted of 274 first, second, and third-year students from the Faculty of Education at Bartın University in the fall semester of the 2012-2013 academic year. The breakdown of the sample is as follows: 104 students from the Department of Science Teaching, 90 students from the Department of Primary

School Teaching, and 80 students from the Department of Social Sciences Teaching.

Out of 274 students, 177 were female and 77 were male. One hundred and five students were first-year, 97 were second-year, and 72 were third-year students.

Developing Test Form of the Scale

The development process involved five stages:

First Stage: The Attitude Scale for Science that was previously utilized in a study by Akpınar [12], the Biology Attitude Questionnaire prepared by Prokop et al. [13] in a study conducted to specify students' attitudes towards biology, and the Attitude Scale for Science developed by Doopken, Lawsky, and Padwa [14] based on the Fennema-Sherman Attitude Scale provided the basis for this study. The questionnaire items formulated in a study by Arslan [15] to designate teachers' views on computer-assisted education were analyzed and adapted to biology. The statements from all the aforementioned assessment tools and the statements formulated by the researchers of this study were combined, and tailored to the focus of the study, thus establishing a pool of items.

Second Stage: Three randomly selected students from each of the aforementioned departments were asked to interpret these statements of attitudes. The statements that these students found difficult to interpret or understand were reformulated. The scale was reviewed in terms of content validity based on an expert's opinion.

Third Stage: Twenty-six items included in the test form were formulated in the form of five-point Likert-type rating, and ten items contained negative statements. The format of the five-point rating was as follows: 5: completely agree, 4: strongly agree, 3: moderately agree, 2: slightly agree, 1: disagree.

Fourth Stage: Eleven test forms of the scale applied to 274 students in the study were not assessed, as they did not conform to the implementing directive. In order to determine to what extent the items of the scale, which was

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developed to identify the impact of performance tasks (homework, presentation, project, research, field work, etc...), had on students' learning processes, measure students' similar attitudes, the relation between the scores earned and the total score of the scale (item-total correlation) was calculated.

Fifth Stage: The reliability of the Likert-type scale was tested by calculating the

Cronbach's alpha coefficient. Furthermore, in order to determine how adequate each item was in discriminating between respondents in terms of the level of attitudes, the significance of difference between the scores of the lower group in the top 27% bottom by assessment score, and upper group in the top 27% [16]. Finally a factor analysis was performed in order to test the construct validity of the scale.

III. FINDINGS

Item-Total Score Correlation

The item-total score correlation, which explains the relation between the scores earned from test items and total score of the test, should be higher than 0.25 on a positive basis [17]. According to the results of the analysis, the item-total score correlation values varied between 0.152 and 0.637. In the relevant literature, it is suggested that the item-total score correlation be higher than 0.30. However, this does not strictly apply to the scales that include fewer items. Accordingly, the items with item-total score correlation values lower than 0.30 (S7, O1, O2, O5, O6) were tested through a factor analysis (Table 1).

Table 1. Item-Total Score Correlations.

Item No	Item-Total Correlation	Item No	Item-Total Correlation	Item No	Item-Total Correlation
S1	0.571	S10	0.482	O3	0.310
S2	0.637	S11	0.585	O4	0.348
S3	0.563	S12	0.591	O5	0.279
S4	0.552	S13	0.609	O6	0.283
S5	0.579	S14	0.550	O7	0.305
S6	0.478	S15	0.557	O8	0.424
S7	0.267	S16	0.437	O9	0.352
S8	0.518	O1	0.242	O10	0.316
S9	0.628	O2	0.152		

Item Analysis based on the Difference between Lower and Upper Group Averages

In order to determine the range of discrimination of all 26 items in the Likert-type scale, item scores were sorted in an ascending order, t values of the average scores of the groups that formed the lower 27% and upper 27% were calculated, and the discriminant validities of each item were found. The t-test results proved that each item of the scale was satisfactorily discriminant ($p < 0.005$) (Table2).

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Table 2. T-test results related to the discriminant validity of the test.

Item No	Group	N	X	S.S.	t value	p
S1	lower	74	4.6757	0.49954	8.478	0.000*
	upper	74	3.3919	1.20294		
S2	lower	74	4.527	0.54914	10.989	0.000
	upper	74	3.1216	1.10097		
S3	lower	74	4.5811	0.47132	7.464	0.000
	upper	74	3.5135	1.10097		
S4	lower	74	4.6757	0.47132	9.086	0.000
	upper	74	3.3919	1.12039		
S5	lower	74	4.6351	0.58694	9.16	0.000
	upper	73	3.3562	1.04576		
S6	lower	74	4.1507	0.82784	10.180	0.000
	upper	74	2.5135	1.10097		
S7	lower	74	5.2297	5.89764	2.56	0.011
	upper	74	3.4459	1.07451		
S8	lower	74	4.3649	0.78643	9.355	0.000
	upper	74	2.9054	1.08752		
S9	lower	74	4.6757	0.55166	11.105	0.000
	upper	73	3.1781	1.01847		
S10	lower	74	4.5541	0.6853	7.213	0.000
	upper	74	3.5811	0.93643		
S11	lower	74	4.7027	0.48905	10.816	0.000
	upper	74	3.3514	0.95706		
S12	lower	73	4.5479	0.62452	8.293	0.000
	upper	74	3.3514	1.06543		
S13	lower	74	4.5811	0.57354	8.773	0.000
	upper	73	3.3836	1.02239		
S14	lower	74	4.527	0.62424	9.262	0.000
	upper	73	3.2877	0.96436		
S15	lower	74	4.5676	0.59865	8.352	0.000
	upper	74	3.4189	1.02043		
S16	lower	74	4.527	0.601895	5.773	0.000
	upper	74	3.7297	1.02432		

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O1	lower	74	2.3919	1.01789	4.858	0.000
	upper	72	1.6389	0.84429		
O2	lower	74	2.9324	1.18589	4.197	0.000
	upper	72	2.125	1.13755		
O3	lower	74	3.1622	1.08574	5.054	0.000
	upper	71	2.2535	1.0786		
O4	lower	74	3.1892	1.11865	6.244	0.000
	upper	72	2.0833	1.01745		
O5	lower	74	2.7297	1.27459	4.747	0.000
	upper	72	1.8194	1.0254		
O6	lower	73	2.2877	1.20738	3.558	0.001
	upper	72	1.625	1.02693		
O7	lower	74	2.3378	1.24171	4.678	0.000
	upper	72	1.5	0.88811		
O8	lower	74	3.1486	1.01607	6.954	0.000
	upper	72	2	0.97865		
O9	lower	74	2.4865	1.16152	5.276	0.000
	upper	72	1.5833	0.88413		
O10	lower	74	3.027	1.11002	5.784	0.000
	upper	71	2.0141	0.99273		

* P<0.000

Testing the Reliability of the Scale

The scale to determine two-dimensionality used the principal component analysis method. The analysis revealed five factors with eigenvalues equal to 1 and greater than 1. The scale was retested after S7, O1, O2, O3, O4, and O10 that were found at the third, fourth, and fifth levels were excluded, and the items were observed to be grouped under three factors – ten items under the first factor, five items under the second factor, and five items under the third factor – as a result of the varimax rotation (Table 3).

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Table 3. Rotated Component Matrix.

Items	Factors		
	F1	F2	F3 - F4 - F5
S16	0.757		
S12	0.750		
S13	0.698		
S14	0.669		
S11	0.629		
S10	0.623		
S15	0.618		
S9	0.581		
S6	0.556		
S8	0.499		
S4		0.793	
S2		0.765	
S3		0.735	
S1		0.734	
S5		0.637	
O7			0.786
O6			0.764
O9			0.736
O5			0.685
O8			0.664

While the first factor (eigenvalue 7.934) explains 39.670% of the variance, the second factor (eigenvalue 2.764) explains 13.821% of the variance, and the third factor (eigenvalue 1.004) explains 5.019% of the variance. These factors explain

58.510% of the total variance. The first, second and third factors contributed by 39.670%, 13.821%, and 5.019% to the variance, respectively. The items under the first factor had factor loadings between 0.499 and 0.757; those under the second factor had factor loadings between 0.637 and 0.793; and those under the third factor had factor loadings between 0.664 and 0.786. If there is a cluster formed by the items that display high-level relationship with the relevant factor, then high factor loadings that items generate under their respective factors in a factor analysis suggest that these items measure a concept/structure/factor together[18]; [19].

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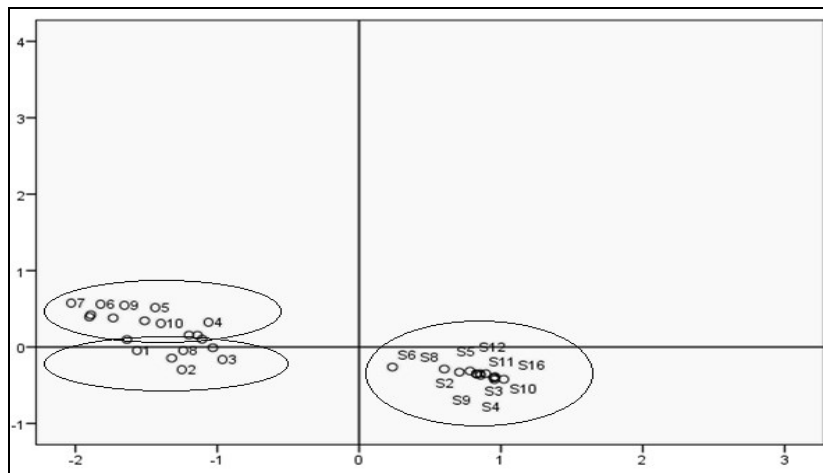


Diagram1 . Matrix model of the items in the scale

Testing the Adequacy of the Sample

The Kaiser-Meyer-Olkin (KMO) coefficient determines whether the data matrix is adequate for factor analysis. As for factorability, a factor analysis cannot continue if the KMO coefficient scores under 0.50. A factor analysis can be performed only after the KMO coefficient value is greater than 0.60. The KMO coefficient value was found to be 0.929 in this study, and the sample size of 274 persons was considered to be adequate [20]. This value demonstrates that the correlation matrix is adequate for a factor analysis (Table4).

The Bartlett's test that is used to determine whether the relevant data result from a multivariate normal distribution produces χ^2 (chi square) value. The value of significance (p value) is checked. If it is less than 0.05, data are considered to emanate from a multivariate normal distribution, and the analysis continues. However, if the value is greater than 0.05, it is not possible to perform a factor analysis. In this study, the p value was 0.000, and thus was significant. As a result, the relevant data in this study can be considered to have a normal distribution [20].

Table 4. KMO and Bartlett's test results.

Bartlett's Sphericity Test	Chi-square value	2654.609
	Degree of freedom (sd)	190
	Level of significance (p)	0.000
KMO		0.929

Results of the Factor Analysis

An eigenvalue must be greater than 1 at the end of a factor analysis. Three factors with eigenvalues greater than 1 emerged from the test in this study. These three factors explain the variance by 39.670%, 13.821%, and 5.019% respectively. These factors helped to explain 58.510% of the total variance (Table5).

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Table 5. Percentages of Factors' Variance Explanations.

Factors	Eigenvalues	Percentage of Variance Explanation (Total)
F1 (First Factor)	7.934	39.670
F2 (Second Factor)	2.7644	13.821
F3 (Third Factor)	1.004	5.019

Variables should be related to one another not at a very low or very high level, but at a specific level (0.25-0.90). In order to determine to what extent the individual factors interact with each other and with the scale in general, the correlations of the factors were calculated. The first factor was found to have a high-level relationship with the second factor and the scale in general, but a low-level relationship with the third factor. The second factor displayed a low-level relationship with the third factor, and the third factor had a more than moderate-level relation with the scale in general (Table 6).

Table 6. Correlation coefficients between the factors.

FACTORS	F1	F2	F3	FG
F1	1			
F2	0.787*	1		
F3	0.078*	0.073*	1	
FG	0.913*	0.847*	0.420*	1

* P<0.05

Reliability Testing

The reliability of the scale was tested by calculating its Cronbach's Alpha value. As a result of the factor analysis, ten items, five items, and five items were grouped under the first factor, second factor, and third factor respectively. The scale was a three-factor scale, and internal consistency coefficients (Cronbach's Alpha) were calculated to test the reliability of each sub-factor. The internal consistency coefficients were calculated as 0.904 for the first factor, 0.881 for the second factor, and 0.780 for the third factor. The Cronbach's Alpha coefficient for the scale in general was 0.846. The scale was considered as highly reliable in that regard (Table7).

Table 7. Number of items and internal consistency coefficients of the factors.

Factors	Number of Items	Internal consistency coefficients
F1: Impact of performance tasks on students' learning processes	10	0.904
F2: Problems likely to arise during the implementation of performance tasks in class	5	0.881
F3: Problems likely to arise during the implementation of performance tasks out of school	5	0.780
Scale total	20	0.917

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IV. CONCLUSION AND DISCUSSION

The objective of this study was to develop a Likert-type scale that intended to determine the impact of performance tasks (homework, presentation, project, research, field work, etc...) introduced into primary school programs on students' learning processes. To this end, a 26-item-scale was prepared based on expert opinions and the relevant literature. Through an item analysis that was performed on the data collected in the study, item-total and item-discrimination indices were evaluated separately for all the items. Six items that were considered to impair the scale reliability and factor content as a result of the item analysis were excluded from the scale. The first ten items intended to measure the impact of performance tasks on students' learning processes, whereas five items intended to measure the attitudes towards problems likely to arise during the implementation of performance tasks in class, and the last five items intended to measure the attitudes towards problems likely to arise during the implementation of performance tasks out of school (at home).

As a result of the principal component analysis performed on the remaining 26 items in order to test the construct validity of the scale, the KMO coefficient value was 0.929, and the sample size of 274 persons was considered adequate. The Bartlett's test value was measured as 2654.609 ($p < 0.05$), which showed that the correlation matrix was adequate for a factor analysis. Three factors that were considered as statistically significant, and accounted for 58.510% of the total variance resulted from the factor analysis. The reliability coefficients of these factors varied between 0.780 and 0.904, whereas that of the scale in general was 0.846. This value proved that the scale is a highly reliable measuring instrument.

The five-point Likert-type scale that was developed as a result of this study can help teachers and teacher candidates measure impacts of performance tasks (homework, presentation, project, research, field work, etc...) in primary school programs on their students' learning processes.

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