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A measure of the attitudes of faculty members at the Middle East University in Jordan towards electronic tests according to the method of Thurstone

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Abstract

This study aimed at building a measure of the attitudes of faculty members at the University of the Middle East towards electronic tests, according to the Thurstone method for categories that appear to be equal. In order to achieve the objectives of the study, (30) items measuring attitudes toward electronic tests were presented to (15) arbitrators with expertise and specialization, in order to classify each item in terms of severity of preference or lack of preference for the topic of attitudes. The gradual values of the items were calculated, and (20) items were selected, distributed with equal dimensions of the gradual values. There were indications of validity and reliability of the measure.

Keywords: Electronic tests, Thurstone method for outwardly equal categories, Attitudes toward electronic tests, Faculty members' attitudes, Attitudes measures.

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Una medida de las actitudes de los miembros de la facultad de la Universidad del Medio Oriente en Jordania hacia las pruebas electrónicas de acuerdo con el método de Thurstone

Resumen

Este estudio tuvo como objetivo construir una medida de las actitudes de los miembros de la facultad de la Universidad del Medio Oriente hacia las pruebas electrónicas, de acuerdo con el método de Thurstone para categorías que parecen ser iguales. Para lograr los objetivos del estudio, se presentaron (30) ítems que miden las actitudes hacia las pruebas electrónicas a (15) árbitros con experiencia y especialización, para clasificar cada ítem en términos de severidad de preferencia o falta de preferencia por el tema de actitudes Se calcularon los valores graduales de los ítems y se seleccionaron (20) ítems, distribuidos con dimensiones iguales de los valores graduales. Hubo indicaciones de validez y fiabilidad de la medida.

Palabras clave: Pruebas electrónicas, método Thurstone para categorías externamente iguales, actitudes hacia las pruebas electrónicas, actitudes de los miembros de la facultad, medidas de actitudes.

1. INTRODUCTION

Comprehensive process that aims to ensure that the desired goals are achieved. Preparing examinations is one of the major tasks for a faculty member at the university. He may not be able to give this task its right because he is busy and has limited time for him. In order to consolidate the concept of e-learning and its applications and

accompany this interest, the development of programs related to modern theoretical applications in measurement, which led to the emergence of electronic tests that provide the possibility of storage and application for examinations (Odeh & Obaidat, 2013).

Salameh (2004) pointed out the advantages of electronic tests as they help in individualizing education, where the student reads the questions alone and then answers them alone. This increases his self – confidence, enhances his ability to take responsibility and increases his inclinations and his desire to search and curiosity. These tests also consider individual differences among students, as the student moves from one question to another according to his abilities, the student becomes an active participant. They also provide student with immediate feedback, which increases his motivation to learn and help him to correct his mistakes. Also, the student does not feel embarrassed when he makes a mistake.

Matti, Markus, and Mikko (2014) added other characteristics such as: Electronic tests are characterized by their speed in providing the final mark of the test, which save a great time for the teacher who takes time in correction analysis, and reduce the student's anxiety to wait for his mark in the test. The timetable for the examinations also enable the teacher to distribute the students to the examination according to a timetable to avoid the large number of students. They also provide the teacher with the necessary statistics for examinations such as: mathematical means, the highest score, the lowest score, the number of successful students, and the percentage of proficiency. It can also attack additional materials that can be included in the

evaluation process, such as video presentation, audio clips, graphs etc. Also, electronic tests have higher reliability rates than traditional tests.

Despite the many advantages of electronic tests, there are obstacles facing the use of these tests mentioned by Al – Toddari (2004), including: High costs of standardized electronic tests. They take a long time and a lot of effort to prepare them. The teacher may not have the skill to prepare them.

Jabr (2006) also mentioned some obstacles, including: the weak ability of some teachers to deal with these programs, whether in preparing them or employing them in a way that achieve the desired goals. Also, the lack of awareness among some teachers about the importance of employing them in education plays an important role in employing them. In addition to this, there are a few computerized programs that were prepared in the Arabic language to teach children the various academic subjects, as well as obstacles related to the physical equipment from the availability of adequate devices and laboratories to conduct these tests.

Bridgeman (2009) mentioned that the most important problems facing the implementation of electronic tests are computer malfunctions during the test. Also, electronic tests need a large cost to start implementing them. Computer competencies affect students' performance in general, and their safety score is lower than traditional tests.

The study of attitudes is one of the basic and important matters in the interpretation of human behavior. The importance of measuring attitudes lies in the role that they play as directors of behavior, as it is

possible to rely on attitudes in predicting the type of behavior that individuals perform in different situations. Therefore, the teaching staff members' attitudes toward electronic tests enable us to predict the role played by a faculty member during the preparation of the electronic test in a way that meets the specifications of the good test recommended by experts in the psychological and educational measurement.

The researchers' view varied regarding the nature and concept of attitudes, as there is no definition unanimously agreed upon by specialist in the field of attitudes. Allport's definition of the attitude has been accepted by the majority of researchers. The attitude has been defined as a state of mental and nervous readiness that is organized through the experience of the individual and that has a dynamic guiding effect in the response of the individual to all the topics that this response provokes (Oskamp & Schultz, 2005: 233).

Given the importance of attitudes, there is a need to develop effective tools for measuring them, as building measures of attitudes requires a high degree of validity and reliability. Likewise, good thinking on the topic of attitude and accuracy in item formulation and analysis, and the use of appropriate techniques for grading (Christenesn & Robinson, 2003). Among the most popular measures used to measure attitudes are the Thurstone scale, Likert scale, the Getman scale and the Coombs scale (Allam, 2002: 250). Thurstone is one of the first to care about developing methods for measuring attitudes. Thurstone's methods for measuring attitudes are summarized in the following:

1. Determining precisely the subject of the attitude.

2. Writing a large number of items related to the subject of attitude.

3. Presenting the items to a group of arbitrators to classify them items in a specific number of categories related to the measured feature. As the arbitrator in the first category puts all items that he considers very contradictory to the attitude, and puts in the second category all the items that follow in the intensity of the opposition and puts in the middle category all the items that he deems neutral and puts in the last category all the items that he considers very supportive of the attitude.

4. The gradual values for each item are calculated by calculating the median or the mean of the arbitrators' estimates.

5. Calculating the values of standard deviations or half range of quartile, for each item.

6. Items with high standard deviations are deleted, because this indicates that these items are vague or unclear.

7. A number of items are chosen to cover the attribute continuum, and they are about equal dimensions.

8. The randomly selected items are placed in the attitude scale without writing the values of the gradual items.

Thurstone's methods differ from each other in how date are collected from arbitrators with the aim of measuring the progressive values of the items. Thurstone's methods include two – way comparisons, a seemingly equal period's style, and the successive period's style (Edward & Gonzalezz, 1993).

Some studies have been interested in building measures of attitudes toward different topics using the Thurstone method. Among these studies are the following: Rainey (2002), Petal & Chauhan (2012), McDaniel, et.al. (2012), and Hijazin & Al – Sharifin (2013). Among the studies that examined the electronic tests are the following: Al – Khayat (2017), Jadeaa (2017), Abdul Rahim (2018) and Al – Enezi (2018).

It is noted from the review of previous studies that there is a dearth of Arab studies – according to the researcher's knowledge – that dealt with building a measurement of the attitudes of faculty members in university toward electronic tests, using the Thurstone method for periods that appear to be equal in particular, as well as an agreement in the results of previous studies that the use of the |Thurstone method for seemingly equal categories provides measuring instrument that has good psychometric properties in addition to its ease of use.

Problem of the study

Through her work as a faculty member, the researcher noticed the lack of use of electronic tests by the university's faculty members, despite the university's emphasis on employing all electronic learning methods, as it set policies and procedures for this use such as e – learning policy, website policy, and examinations policy, which included procedures for computerizing examinations, and procedures for storing and retrieving electronic examinations. Realizing the importance of dealing with the attitudes of faculty members toward electronic tests, which may lead to some important results, as well as the scarcity of studies in Jordan – according to the knowledge of the

researcher – who used the Thurstone method for ostensibly equal categories in building metrics. This study came as an attempt to build a measure of attitudes to reveal the attitudes of faculty members at the Middle East University toward electronic tests using the Thurstone method for seemingly equal categories. As this scale can later be used to measure the attitudes of faculty members at the university toward electronic tests in order to confront the influences that work on forming negative attitudes and reinforce the influences that develop their positive attitudes.

Questions of the study:

1. What are the progressive values for the items that were selected according to the Thurstone method for categories that appear outwardly equal?

2. What are the implications of the validity and reliability of the scale of attitudes of faculty members at the Middle East University toward electronic tests according to the method of Thurstone for the categories that seem outwardly equal?

Objective of the study

The current study aimed at building a scale that has good psychometric characteristics to measure the attitudes of faculty members at the Middle East University toward electronic tests according to the Thurstone method for categories that seem outwardly equal.

Importance of the study:

The importance of this study comes from the presence of a scarcity in Arab studies – according to the researcher's knowledge –

that dealt with building a measure of the attitudes of faculty members in universities toward electronic tests using the Thurstone method for categories that seem outwardly equal.

Limitations of the study:

This study was limited to Thurstone's method of outwardly categories. It was applied to a sample of faculty members at the Middle East University in Jordan during the first semester of the academic year 2019/2020.

Definition of terms:

Attitude towards electronic tests: It is a group of feelings, thoughts, beliefs and personal inclinations of the faculty members toward electronic tests, and it's measured by calculating the mean value of the gradual values of the scale items that the faculty member agrees to be among the scale items presented to him.

Thurstone's method for outwardly equal categories: The oldest Thurstone's method for measuring attitudes. It is based on giving a number of arbitrators a set of items and asking them to issue preferential rulings on these items within a grade consisting of (11) categories, so that the lengths of these categories are equal to the connected feature. Category (11) indicates high degree of preference. Category (6) indicates the point of neutrality. Category (1) indicates a high degree of lack of preference. In this method, each item has a repetition distributed over the eleven categories and is arranged in a cumulative repetitive table. The median is calculated as a gradual value, and the items are chosen according to the gradual values, so that

they cover the conductor of the attribute (Mueller, 1986; Edwards & Gonzales, 1993).

2. METHODOLOGY

The researcher used the descriptive analytical research method. The study population consisted of (177) faculty members during the first semester of the academic year 2019/2020, and the number of the sample subjects is (150) faculty members. To achieve the goals of the study, the researcher wrote (30) items covering issues related to electronic tests. The items were presented to (15) specialized arbitrators.

In light of the arbitrators' observations, the researcher has modified the wording of some items linguistically and deleted items that are not related to the subject of attitude, and (20) items were retained covering most issues related to the topic of attitude towards electronic tests. The items of the scale were written in their initial form according to Likert's pentagon style (Strongly agree, agree, not sure, strongly opponent, strongly opposed) for positive items. As for the negative items, the scores were reflected on them.

The scale was applied in its initial form to a pilot sample of (40) faculty members outside the study sample. To find out the strength of the resulting correlation coefficient, the correlation coefficient was calculated for each scale item with the overall score. Values ranged between (0.46 – 0.69). All values were significant at ($\alpha \leq 0.01$). This

indicates that the prepared scale is internally consistent. The reliability coefficient of the scale was calculated. The value of the reliability coefficient obtained using Cronbach – Alpha equation was (0.89). This value is acceptable for the purposes of this study.

The factor analysis of the scale was carried out in its initial form using the Principal Components Analysis with the Varimax Rotation of the factors. The analysis yielded (11) factors, the value of the latent root of each was more than one. These factors are explained (71.40%). The latent root value for the first factor was (15.80) and explains (28.80%) of the total variance. This is an indication that the combined items measure one feature that can be considered the attribute of attitudes toward electronic tests because what is explained by the first factor is more than (20%) (Reckase, 1979).

3. RESULTS and DISCUSSION

Results related to the first study question and discussion: What are the progressive values for the items that were selected according to the Thurstone method for categories that appear outwardly equal?

In order to scale the items of the measure, the researcher presented (30) items to (15) arbitrators who hold a doctorate in measurement and evaluation, and educational technology, who were asked the classify the content of each item in one of the categories on the connected feature of (11) equal category according to the degree of their preference or lack of preference for electronic tests. After

obtaining the responses of the arbitrators, a table of frequencies and cumulative frequencies has been built for the categories in which each scale item was classified. The median category was also determined. It is the first category whose cumulative frequency is equal to or more than half the number of arbitrators, and then calculating the gradient values (the median) for each item of the scale by finding the percentile (50). For the purpose of differentiating between the scale items, the standard deviation of the estimates for each item was calculated, and the selection of the items with the least dispersion in the case of items having the same gradual value. The median value was calculated from the following formula:

$$Si = L + \frac{(n/2 \quad CF)}{F} \times W$$

Where:

Si: The gradual value for the item.

L: Minimum median class (category that includes item median).

n: Number of arbitrators.

CF: Cumulative frequency of a category that precedes the median class.

F: Frequency of median category.

W: The median class length. It equals (1) true.

Table (1) shows the gradual values and standard deviations for the scale items.

Table 1: Gradual values and standard deviations for the items of attitudes scale toward electronic tests

Item Number	Gradual value	Standard deviation	Item Number	Gradual value	Standard deviation
1	10	1.01	16	10	0.81
2	3	1.40	17	9.5	1.29
3	9	1.03	18	3	1.11
4	6	0.77	19	3	1.26
5	4	1.10	20	1	0.57
6	4	0.98	21	7.5	1.22
7	1	0.00	22	4	1.34
8	11	0.38	23	5	1.07
9	5	1.02	24	10	1.40
10	2	0.80	25	8	1.06
11	9	1.19	26	4	1.12
12	4	1.06	27	10	1.39
13	2	0.75	28	1	0.62
14	9.5	0.45	29	8.5	0.83
15	3	1.01	30	9.5	1.23

It is noted from the result of Table (1) that all values of standard deviations for the items are less than (1.50). This indicates that there was no significant differences between the estimators for the gradual values of the scale items. The homogeneity of these estimates indicates the clarity of the scale items in their preference or lack of preference

for electronic tests. Table (1) shows the distribution of the scale items towards the electronic tests among the gradual categories.

Table 2: Distribution of items of the scale of attitudes toward electronic tests among the gradual categories

Category	**Number of items**
1	7, 29, 16
2	10, 13, 30
3	2, 15, 18
4	5, 6, 12, 22
5	4, 23
6	9
7	17
8	21, 25, 26, 27
9	1, 14, 19, 24, 28
10	3, 11, 29
11	8

It is noted from Table (2) that the mode category is the ninth category, as it is classified into five items. It is also noted that there are very few items in the middle categories (5, 6, and 7) around (13.3%) of items. The lower categories include (43.3%) of the items, while the higher categories include (43.3%) of the items.

Depending on the distribution of gradual values, the researcher chose (20) items covering the attribute of the feature, half of which are

from the upper categories, and the other half of the lower categories, as the scale has been divided into two halves in light of the gradual values, each of which includes ten items. What are the implications of the validity and reliability of the scale of attitudes of faculty members at the Middle East University toward electronic tests according to the method of Thurstone for categories that seem outwardly equal?

The researcher wrote the selected items (20 items) in one list without mentioning the gradual values for them and in a random order. The scale (Attitudes toward electronic tests) was applied to a sample of (150) faculty members in the Middle East University. Each of the members was asked to choose the items that express his/ her attitude towards electronic tests. The factor analysis was applied, using the principal Components Analysis method with Varimax Rotation of the factors. The analysis resulted in two factors whose latent root value exceeded one, and Table (3) shows the results of factor analysis.

Table 3: The results of factor analysis for the scale of attitudes in its final form

Factor number	**Latent root**	**Interpreted variance ratio**	**Cumulative interpreted variance ratio**
1	16.70	53.40	53.40
2	3.60	17.40	70.80

It is noted from Table (3) that the two factors have an explanation of (70.80%) of the total variance. The latent root value of

the first factor was (16.70) and explains (53.40%) of the total variance. This is an indication that the scale one – dimensional because what is explained by the first factor is more than (20%) (Reckase, 1979). In the sense that the items measure a feature of one dimension: It is "attitudes toward electronic tests". The items of the first factor were (12) items, and the number of items of the second factor was (8) items, as the saturation to which they belong exceeded (0.40). When reviewing the content of the saturated scale items on the two factors, the first factor can be named: the content of the test, and the second factor name: the procedures for applying the test. Table (4) shows the values of the saturation of the scale items on the two factors.

Table 4: Values of the saturation of the scale items on the two factors after the Varimax Rotation

Item Number	**The First factor: Content of the test**	**The second factor: The Procedures for applying the test**
19	0.65	
18	0.63	
4	0.60	
2	0.59	
3	0.57	
5	0.54	
11	0.43	
9	0.41	

17	0.61	
12	0.51	
8	0.41	
15	0.69	
16		0.60
1		0.53
6		0.49
20		0.45
14		0.41
13		0.43
7		0.51
10		0.64

To find out how much each item contributes to what the factor to which it belongs measures the values of the correlation coefficients between the items and the factor to which they belong are calculated. The coefficients for the items with the first factor ranged between (0.41 – 0.69). The coefficients for the items with the second factor ranged between (0.41 – 0.64). All values were significant at ($\alpha \leq 0.01$). This indicates that the items are consistent with each other in measuring a general feature. Table (5) shows the values of correlation coefficients between the two factors.

Table 5: The values of correlation coefficients between the two factors and the overall scale

Factor	**Content of the test**	**Procedures for applying the test**	**The overall scale**
Content of the test	-	** 0.58	0.68**
Procedures for applying the test		-	0.74**
The overall scale			-

** Significant at ($\alpha \leq 0.01$)

It is noted from Table (5) that all values of correlation coefficients were high and statistically significant at ($\alpha \leq 0.01$).

The values of the Cronbach – Alpha reliability coefficients were calculated for the dimensions of the scale and the overall scale. The value of Cronbach – Alpha coefficient for the first factor was (0.88), for the second factor (0.83) and for the overall scale (0.89). These values indicate a high reliability of the study tool.

The scale of attitudes achieved the indications of discriminatory validity, as it was possible to distinguish between the categories of faculty members who are expected to have distinct attitudes toward electronic tests. The scale distinguished between faculty members who attended training courses in the field of electronic tests and members who did not attend such courses.

The reliability of the prepared scale was estimated by using the half – split method, as the scale was treated as a component of two

equal halves in their coverage of the gradient caller. The division was made on the basis of the gradual values of the scale items, so that each item in the first half (10 items) corresponds another item in the second half (10 item) equal to it in the gradual value approximately. The value of the half – correlation coefficient was (0.77). The calculated reliability factor value is seen as the parity reliability for each of the two halves.

Given that the value of the reliability factor is (0.77) acceptable, either of the two halves can be used to measure attitudes toward electronic tests, especially since applying a thumbnail image of the scale saves time and effort for researchers. The value of the total reliability factor of the scale using the Spearman Brown equation is (0.88). The availability of good valid and reliable indications for the scale of attitudes towards electronic tests, is attributed to the good selection of the scale items, as well as the valuable comments and notes of arbitrators when the scale items are judged.

Therefore, the current scale in light of the assumption that the members of the study sample are serious in responding to it, provides accurate information about their attitudes toward electronic tests that encourage its use for this purpose and for future research purposes.

4. CONCLUSION

The results of the current study were consistent with the results of many previous studies that the apparently equal groups method to

developing attitudes measures provides good psychometric properties in addition to its ease of use and application. In light of the results of the study, the researcher recommends applying the scale of attitudes towards electronic tests to faculty members at the university in order to know their attitudes toward electronic tests and study the factors affecting them in order to encourage them all to use them.

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