Attitude towards Educational Research Scale (ATERS): Development and Psychometric Properties

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Abstract: *This study developed an instrument called "Attitudes towards Educational Research Scale" (ATERS), exploredits multidimensional factor structure and examined its psychometric properties. The participants of the pilot testing of the ATERS were 86 undergraduate students taking up Bachelor in Elementary Education (BEED). Cronbach's alpha was used to determine the coefficient of reliability and Principal Components Analysis (PCA) with varimax rotation was used to determine the construct validity of the instrument. The instrument was a 6- point Likert-type attitudinal scale, initially made up of 44 items and reduced to a 22-item attitudinal scale in its final form. The final form has 6 subscales or components which were determined using principal components analysis with varimax rotation. The scale showed indications of factorability as evidenced by the KMO measure of sampling adequacy of 0.737 and p<0.01 for Bartlett's Test of Sphericity. Some items were revised; some were discarded based on the index of discriminating power and multiple factor loadings. The final re-run of PCA yielded the final form of 6 components and 22 items. The final Cronbach's alpha of the whole scale was found to be stable with alpha = 0.912. Consequently, reliability coefficients were also calculated for the 6 subscales to ascertain their individual reliability, that is, 0.811, 0.886, 0.731, 0.800, 0.718, and 0.752, respectively. Also, the six subscales were labeled – Function/Purpose of Research, Value of Research, Confidence to Articulate, Analytical Proficiency, Satisfaction on Output, and Applicability of Research, respectively. These same six subscales could be extended to a more encompassing measurement tool on one's view about academic research in general across different fields.*

Keywords: test and measurement, educational research, researchinstrumentdevelopment, scale psychometric properties

1. Introduction

Humanistic learning theories point out the significant role that attitudes and perceptions about a subject matter or a course play in the learning process of an individual. A central assumption of humanism, according to Huitt (2001), is that people act with intentionality and values. Humanists strongly contend that the holistic study of the human person is essential and indispensable especially as an individual grows and develops over the lifespan. A significant area of interest involves the study of the self, motivation, attitudes and goals. With this premise, it is the purpose of this paper to develop an instrument that will probe into the attitude of students towards a subject or course. The course of interest is in the area of educational research. Studies by Richardson and Onwuegbuzie (2002) on American graduate students revealed that many of them have negative attitudes towards research. Moreover, it was found that African- American graduate students showed higher levels of research self-efficacy which implied possible relationship of attitude toward research and racial orientation. Also, the study of Perl and Khan (1981) ascertained that exposure to research training is linked to attitude towards research. They found out that, overall, research interest increased with training and experience. However, a positive correlation was also found between increased research interest and obtaining statistically significant results in one's research.

The literature regarding research competence and research literacy is relatively scarce, thus, endeavors geared towards this area would be beneficial to the field of research in bridging the information gap. Thus, this paper puts into context the development of an Attitude towards Educational Research Scale which aims to provide quantification of the attitude of teacher education students (or pre-service teachers) towards educational research. A related instrument had been developed by Papanastasiou (2005). This instrument was done in the context of the educational system and standards of Cyprus. It is the purpose of this paper to make a similar instrument in the local context.

Students at the undergraduate university level, typically tend to view research-related courses with negative attitudes and feelings. Certain studies have documented negative attitudes in relation to courses in research, statistics and mathematics. One of the main troubles of these negative attitudes is that they become obstacles to learning (Adams & Holcomb, 1986; Elmore & Vasu, 1980; Wise, 1985; Waters, Martelli, Zakrajsek, & Popovich, 1988). Other studies found out that negative attitudes are linked with poor performance (Elmore& Lewis, 1991; Woelke, 1991; Zeidner, 1991). Likewise, causal models suggest that attitudes are actually intermediaries between past performance and future achievement (Meece, Wigfield& Eccles, 1990; Ma, 1995). Prior research studieshave found that negative attitudes toward a course (e.g., mathematics) have been found to explain a significant portion of the differences in student learning. In turn, these attitudes influence the amount of effort one is willing to spend on learning a subject, which also influences the selection of more advanced courses in similar areas (e.g., research and statistics courses) beyond those of minimum requirements. Therefore, it is necessary to assess attitudes of students toward a research method course to enable instructors/ professors to develop appropriate pedagogies leading to more positive attitudes toward the subject (Waters, et al., 1988).

The identification of the factors that form the structure of the students' attitudes toward a research method course bears important theoretical and practical implications. By identifying these subscales of attitudes, research method instructors may facilitate the learning of research for their students by enabling them to create more positive attitudes toward such courses. This could help undergraduate students better appreciate research in the light of the factors concerning students' attitudes towards educational research. Therefore, the central aims of this study were to develop an instrument called the "Attitudes Toward Educational Research Scale" (ATERS), toexplore its multidimensional factor structure and to examine its psychometric properties.

2. Method

Cronbach's alpha was used to determine the reliability coefficient as posited by Gliem&Gliem (2003) that it is imperative to calculate and report Cronbach's alpha coefficient for internal consistency reliability when using Likert-type scales for any scales or subscales. Item Analysis and principal factor analysis were employed to ascertain the other psychometric properties of the instrument as described by Hair, et al. (2006).

The instrument that was developed was a 6-point Likert-type attitudinal scale. The scale was initially made up of 44 items. Each item is scored from 1 – "strongly disagree" to 6 – "strongly agree". Both positively and negatively worded items were used with the scoring reversed for negatively worded items. An even numbered scale is also essential to rule out the respondents' propensity to choose the average response or the middlemost part of the scale at times of indecision. The rationale of the Likert scale instrument as the type of choice was based on the assertion that Likert scaling presumes the existence of an underlying (or latent) continuous variable whose value characterizes the respondents' attitudes and opinions, thus, providing an encapsulated quantification of the respondent's attitude. If it were possible to measure the latent variable directly, the measurement scale would be, at best, an interval scale. This quantification allows for parsimonious description.

The participants for the pilot testing of the developed Attitude Towards Educational Research Scale (ATERS) were undergraduate students of a state university taking up Bachelor in Elementary Education (BEED). The instrument was administered on March 9, 2010 at various class periods during the day. The instrument was administered to the 2nd, 3rd, and 4th year students only. A summary of the distribution of participants according to year level is presented in Table 1 below.

Table 1: Profile of Participants according to Year Level and Sex

Year Level	Sex		Total
	Female	Male	
Second	29	7	36
Third	22	8	30
Fourth	18	2	20
Total	69	17	86

This was based on the number of enrolled students during the administration of the pilot test. Most of the participants (2nd and 3rd year students comprising 76.8% of the sample) do not have theoretical foundations or background in educational research as it is a subject offered during the first term of the fourth year curriculum. Thus, only the fourth year students have background on the methods of educational research comprising 23.3% of the sample. The developed instrument was sent through electronic mail to the designated representative to facilitate the reproduction and administration of the instrument. Permission was sought from the Campus Administrator of the institution where the pilot testing was administered. The approved letter of permission was presented to the professors having classes with the 2nd and 3rd year BEED students and to the Student Teaching Supervisor for the 4th year students on the day of pilot testing. After which information was given to the students/participants as to the nature of the pilot testing to be made and the instrument itself. Each student was given a set of the instruments to be pilot tested and left to be collected later after their class. The instruments were immediately retrieved after they were answered. The papers were then sent through a commercial courier company to the instrument developer. The results were coded and analyzed using a statistical analysis software.

3. Results

At a preliminary examination, the 44 items of the ATERS underwent an initial reliability analysis to determine the internal consistency of the items. Cronbach's alpha was found at 0.94, a relatively high consistency. The index of discrimination was computed in the definition and procedure suggested by Garson(2008):

"Index of discriminative power (DP) is sometimes used as a statistical criterion for selecting more discriminating Likert (or other) items over less discriminating ones. Items with a high DP coefficient are ones where the mean score of the top 25% of respondents' scores on the item is very different from the mean score of the bottom 25% of respondents' scores on the item. That is, for a set of judges a set of Likert items, all meant to measure the same variable is administered. For each judge, the mean score is computed for all items in the set (recoding where necessary, of course, so a "5", for instance, is always "high" on the variable). Judges are then ranked by mean score on the set of items, For the top 25% of judges and for the bottom 25% of judges, a mean value of judges is computed and the difference of the two mean values is the DP coefficient. In composing a scale of the variable, the items with the highest DP value are selected for inclusion in the final survey."

Summary of the index of discrimination power of the scale is presented in Table 2.

Table 2: Index of Discrimination Power Summary

Mean DP	1.289
Median DP	1.370
Standard Deviation	0.781
Skewness	-0.750
Minimum	-0.826
Maximum	2.565

The mean DP is found to be at 1.289. Considering the maximum DP to be at 2.565 and an SD of 0.781, it could be said that the discriminative power of most of the items is relatively high. The mean was greatly pulled down by the presence of a few negative DPs. One thing which could also be implied from the negative skew of the distribution is that the mass of the distribution is concentrated on the right of the mean; that is, it has relatively few low values which are ideal for the scale to have items with high discriminating power.

A principal factor analysis with varimax rotation was then used to determine the possibility of having certain subscales in the instrument. The scale showed indications of factorability as evidenced by the KMO measure of sampling adequacy of 0.737 and p<0.01 for Bartlett's Test of Sphericity. Initial results revealed 10 factors (subscales) using the Kaiser criterion, accounting for 71.07% of the variance. Inspection of the rotated matrix revealed cross loadings in the lower factors. The items were then discarded either due to insignificant factor loading or factor cross loading combined with a very low DP. Thus, from a pool of 44 items the scale was reduced to 22 items. A re-run of principal factor analysis showed 6 subscales with one item (Item 21) cross loading on two subscales. Eventually the item was discarded leaving a 21-item scale for the final version. Table 4 shows the items retained in the final version and their corresponding factor loadings and discriminating powers.

After the original scale was reduced to its final form, Cronbach's alpha was recalculated, for the overall scale was found to be consistent with alpha = 0.912. Consequently, reliability coefficients were also calculated for the 6 subscales to ascertain their individual reliability. The coefficients for the subscales are within high to acceptable values. Details are presented in the Table 3 below.

Table 3: Recalculated Reliability Statistics

Component	Cronbach's Alpha	Standardized Cronbach's Alpha	No. of Items
Subscale 1	0.809	0.811	6
Subscale 2	0.881	0.886	3
Subscale 3	0.729	0.731	3
Subscale 4	0.796	0.800	4
Subscale 5	0.704	0.718	3
Subscale 6	0.740	0.752	3
Overall	0.910	0.912	22

Table 4 below shows the discriminating power and factor loadings of the final 22 statements in the developed instrument.

Table 4: Items of the Final Version of the Scale: Their Discriminating Power (DP) and Factor Loadings

Item No.	DP *	Subscale 1	2	3	4	5	6
33	2.17	.785					
40	1.96	.609					
10	2	.564					
16	2.17	.554					
24	2.13	.506					
44	2.09	.429					
3	1		.763				
1	1.35		.761				
2	1.04		.673				
8	1.09			.632			
27	1.13			.623			
34	0.96			.513			
6	1.83				.717		
5	1.96				.623		
4	1.09				.596		
41	1.91				.516		
37	1.61					.710	
36	1.39					.622	
39	2.57					.502	
11	1.13						.705
35	0.83						.624
18	0.61						.474

Having ascertained the reliability of the final form of the scale, validity becomes the next concern. The determination of the various subscales and the corresponding factor loadings and item correlations has identified the dimensionality of the scale. This much was established by the principal factor analysis. The correlations among related items point out to the correspondence of the items to a certain subscale.

4. Discussion

The reduction process eventually yielded an instrument with 22 items distributed across 6 factors or subscales. These six (6) factors would now be used to describe the construct of attitude towards educational research. These same six subscales could be extended to a more encompassing measurement tool on the one's view about academic research in general across different fields.

The six (6) subscales were designated names or titles as shown in Table 5.

Table 5: The 6 Subscales of the ATER Scale

Component	Title	No. of Items
Subscale 1	Function/Purpose of Research	6
Subscale 2	Value of Research	3
Subscale 3	Confidence to Articulate	3
Subscale 4	Analytical Proficiency	4
Subscale 5	Satisfaction on Output	3
Subscale 6	Applicability of Research	3
Overall		22

The first subscale named Function/Purpose of Research describes how the individual sees the importance of research in the field of teaching and learning. It centers on one's understanding of the rationale behind the usage of research. This addresses the "why of research". The second subscale, Value of Research, focuses on the consumers or users of research and the immediate benefit that one gets from the results of research. This looks intoone's view about the practical uses of research. This answers the question "how important" is research. The next subscale is on the confidence to articulate. It looks intoone's ability to express and communicate the results of a research and one's appreciation of its methods and purpose. A related factor is the analytical proficiency, which examines the ability of the researcher on how to conduct the research process and draw the appropriate interpretations from processed data. This

subscale tends to answer the question "how to research". The fifth subscale, satisfaction on output, considers the appreciation and contentment that one gets during and after a research is completed. It gives attention to the affective influence that research would have on the researcher and their interest of doing research on their own and not for mere compliance to a course requirement. The final component of the instrument is on the applicability of research. This addresses the future directions that a researcher should take when conducting a research study.

One of the primary issues that could affect the outcome of this endeavor is the initial conceptualization of the various items for the scale. There could have been more theoretical and conceptual foundation in the formulation of the items for the scale.

It was also found that the sample size of the respondents is a limitation to the study. Though they may be above the minimum requirements for factor analysis to be performed, more meaningful results and further testing would have been possible to provide stronger evidence of validity of the scale. The relatively small sample size prohibits the sample from being split into two groups of substantial size to allow comparison split factorial analysis and thus establishing a stronger evidence for convergent validity of the scale.

It is recommended to conduct a parallel study using a larger sample (n = 200 or greater).This would lend the instrument to further analyses thus establishing further evidence of its validity to a larger scope. Further analyses on larger samples using other factor analytic procedures (i.e. Confirmatory Factor Analysis), as well as, multivariate analyses, and Structural Equations Modelling (SEM) are also recommended whenever possible. The initial steps to the formulation of the ATER Scale have been established, and it would just be a matter of time and earnest effort to enhance it and make it more applicable to a more general context. Studies on epistemological beliefs could also be explored to better understand the "attitude towards educational research" construct. Moreover, the use of the techniques in instrument development to other quantitative research endeavors is highly recommended to assure validity of findings.

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