APPLICATION OF ITEM RESPONSE THEORY IN THE ATTITUDES EVALUATION

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The aim of this study was to analyze the validity evidences based on intern structure of the Attitudes toward Statistics scale by Item Response Theory. The Rasch polytomous models are shown as favorite, for their characteristics, for the application in the field of personality, attitudes and interests measurement. We analyze the responses of 693 undergraduate that had already studied the Statistical course in the higher education. The principal results of this study indicated validity evidences in the intern structure of the scale. It is believed that the study of the attitudes in relation to the Statistics can contribute for the improvement of the teaching and of the learning of this course and of another that need statistical concepts.

INTRODUCTION

During the school life, the student is submitted to several teaching situations and a lot of modifications can happen in their thoughts, feelings and actions. However, the working of a person's mind and the internal processes that happen cannot be visualized and analyzed, but some aspects of their intellect or of their competence can be inferred from the observation of their behaviors, actions or accomplishments (Vendramini, 2000).

In this perspective, the comprehension of how the attitudes, the competences, the self-concept and the students' actions are related can aid in the planning and evaluation of the teaching-learning of a course. Gal and Ginsburg (1994) pointed out the concern that teachers and researchers in statistical education should care, not only for cognitive subjects such as abilities and knowledge, but also for noncognitive subjects, such as feelings, attitudes, opinions, interests, expectations and students' motivations.

The adoption and the maintenance of beliefs, attitudes and values are made in reference to the group, so that there is a correspondence of the conformity or divergence positions in the inter-personal or group relationships system. Thus, the conformism elapses of the primary social contacts, face-to-face, when one judges, has faith or acts in conformity with that the others wait of them (Martins, 1988).

The authors Vendramini and Brito (2001) pointed out that the positive attitude is an important element to facilitate the learning of concepts, and the academic performance can be related to the learning of previous experiences. They commented that several authors have dealt with the evolution of the “attitude” term and it is interesting to notice as the employment of the term has been altered, developing from a more somatic conception to a conception more closely related to the cognitive and affective aspects.

Considering the students' emotional state, it is important that the educators be more attentive to the attitudes and self-concept presented by the students, and they have to be careful to create validity and reliability evaluation instruments that allow a good initial diagnosis of these students. The educators have to be prepared to monitor the students during the whole period in which they are studying Statistics course, for instance.

One of the steps used in the construction and validation of psychological instruments involves the analysis of the items that compose them by Classical Test Theory (CTT) or the Item Response Theory (IRT). The CTT has been useful for decades for the development of psychological tests although it faces of several limitations like, for instance, being dependent of the group of items composing the measure instrument, limiting its applicability (Andrade, Tavares & Valle, 2000). IRT doesn't enter in contradiction with the basic principals of the CTT, and brings a new statistical proposal of analysis centered on the items, besides presenting new technological resources for the psychological and education evaluation.

The validity evidences based on the internal structure can be verified by CTT or IRT. According to Tejada and Meléndez (2001), the Rasch polytomous models, are shown as favorite, for their characteristics, for the application in the field of personality, attitudes and interests measurement. The Rasch model assumes that only a single item parameter is required to represent

the item response process, this item parameter is termed “difficult”. Considering the importance of the students’ attitudes in the educational evaluation and the instruments validity and reliability to evaluate these attitudes, this research aimed to analyze the psychometric properties of a Attitudes towards Statistics scale by IRT.

METHOD

Participants

The sample of 693 undergraduate students of Administration, Engineering, Pedagogy and Psychology courses participated in this research. These students were from 16 to 65 years old, and started to study in the university from 1991 to 2006, they are most feminine (67.5%), and 60.3% of them study in the night period. All the participants had already studied the Statistical course in the higher education, and 87.5% of them didn't fail the course. All the participants that left more than three items without response or that assigned the same response in all items were excluded from the sample.

Instruments

The students answered two instruments, one questionnaire regarding the identification and socioeconomic characterization of the participants, and a scale of Attitudes toward Statistics, named EAE. The questionnaire contained questions such as gender, age, course, series and academic performance in Statistics, expressed by the average of the grades obtained by the students in tests or specific evaluations of the statistics course. This scale is an adaptation of the scale of Aiken and Dreger (1961) that was translated, tested and validated by Brito (1996). The authors Cazorla, Silva, Vendramini and Brito (1999) altered that last scale changing the Mathematics word for Statistics and to validate the new scale of Attitudes towards Statistics scale, named EAE, applied it to 1,154 undergraduate students of the state of Sao Paulo, Brazil, from two private universities and from different courses, 711 of the capital and 423 of the interior of the state. The results showed that the scale EAE has a satisfactory reliability and validity. The coefficient alpha of Cronbach is .95 indicating the intern consistence of the instrument.

The scale EAE contains 21 likert-type items containing propositions that express the feelings that the individuals possess in relation to Statistics. All the propositions refer to the Statistics "in itself" and not to teaching-learning situations or other factors. These propositions are divided in 10 positive and 10 negative items and one proposition about the performance self-perception in Statistics and it was analyzed separately. The maximum of points that can be obtained in the scale of attitudes is 80 and the minimum 20, indicating, respectively, more positive attitudes and more negative attitudes. In that instrument none of the propositions is considered right or wrong, because they just reflect the participants' feeling on each of the propositions.

Procedure

The participants were informed about the objectives of the research and requested to read and sign the Free and Aware Consent Term agreeing to participate in the research. The researcher instructed the students about the correct way to complete the identification questionnaire and the scale. The research instruments were applied in group for those that accepted to participate in the research.

RESULTS AND DISCUSSION

In order to investigate the adjustment of the data to the model, the items of the Attitudes towards Statistics scale were analyzed by the Polytomous Partial Credit Model. The principal results indicate a high intern consistence of the attitudes scale, the coefficient alpha of Cronbach is equal .95, the same result found by Cazorla, Silva, Vendramini and Brito (1999). Before performing the Rasch analysis the instrument dimensionality was tested by main components factorial analysis. This analysis indicated the factorial loading of the first factor is five times superior for the second factor and the first factor explains 55.7% of the total variance. This result indicates the scale is predominantly unidimensional, then the items analysis was performed by

item response theory using the program WINSTEPS. The Rasch dimension explains 75.9% of the variance in the data, it is a good result. The first contrast in the residuals explains 6.0 % of the variance.

The items of the scale present appropriate statistical values for the adjustment to the Rasch model. Besides, the correlations item-total obtained were all positive ones, indicating a same tendency of answers for the item and the general scale, and they varied from .54 to .82. The item 17 treats of negative proposition and demand smaller adhesion, indicating answers that tend necessarily to attitudes more negatives (Figure 1). The item 18 treats of a positive proposition and indicating that the analysis of items demands larger adhesion from the participants to the construct of attitudes, in other words, it demands answers that tend to attitudes more positive (Figure 2). The infit values were from .72 to 1.53, and the outfit values were from .69 to 1.51, indicating productive of measurement.

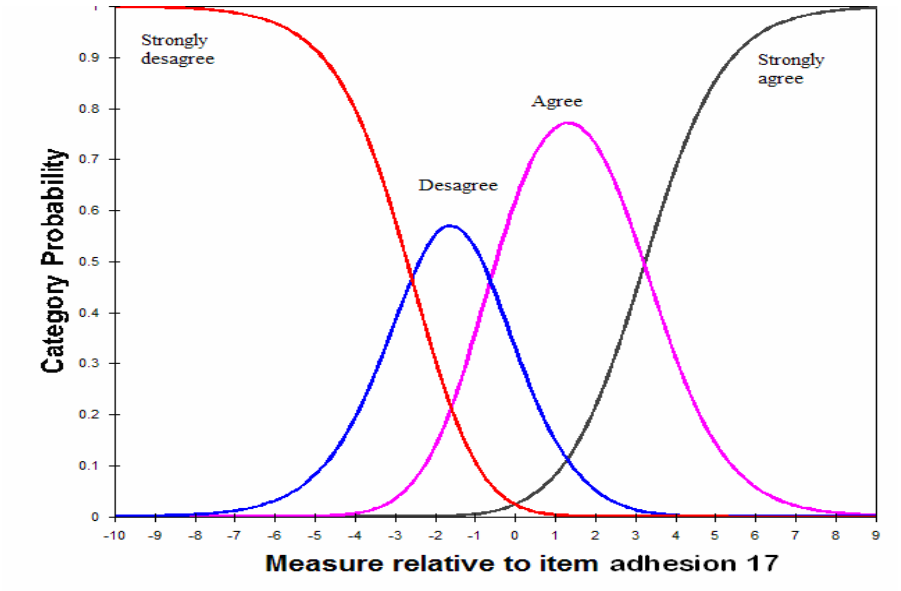

Figure 1 – Category probability curves to item 17

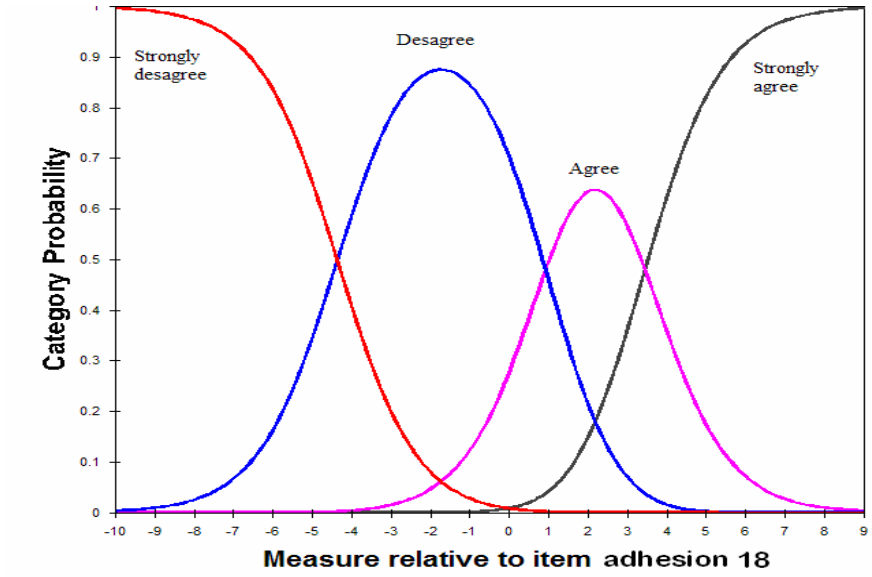

Figure 2 – Category probability curves to item 18

The principal results of this study indicated validity evidences of the intern scale structure. It is believed that the study of the attitudes in relation to the Statistics can contribute for the improvement of the teaching and of the learning of this course and of another that need statistical concepts.

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