How Difficulties, Didactic Supports and Teaching Quality in Disciplines Can Be Perceived Through the Structural Approach

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This paper is aimed at investigating the teaching quality of some subjects taught in the first year of a Bachelor's degree. The early purpose of the work was to check the assumption that, for each discipline, the workload (WL) necessary to prepare an exam (which is evaluated according to one's own studying commitment, the width of the programme and the difficulty of the subjects themselves) could be perceived on the basis of the didactic material actually used (which is evaluated according to clarity, exhaustiveness, availability and adequacy).

The data, which have been collected from the surveys carried out by the NUCLEO DI VALUTAZIONE inside the University of Milan-Bicocca in the academic years 2000-2001 and 2001-2002 concern three subjects taught in the first teaching year of the Faculty of Economics: Mathematics (MT, 807 questionnaires), Business Economics (BE, 1042 questionnaires), Statistics (ST, 717 questionnaires). The 6 items selected to check the above-mentioned assumption have all been pointed out on a four-degree ordinal scale (1=yes, very much, 2=yes, so and so, 3=no, little, 4=no, nothing at all). According to the validity analysis (face and content) the three items relating to WL contribute to explain the latent dimension that is defined Didactic Load Tenability (DLT), while the three items relating to DM define the Didactic Material Adequacy (DMA) dimension.

The confirmatory factorial analyses (CFA) have supplied values of goodness-of-fit ratios (RMSEA value is respectively equal to 0,013 for MT, to 0,00 for BE, to 0,045 for ST) (Muthen, 1989). Thus, our causality assumption proposed by resorting to the construction of a system of structural equations has been actually verifiable. Though confirming the existence of a relation between the DLT and DMA, the structural analysis, however, has not enabled us to identify the causality direction. This phenomenon is usually known as *equivalent models,* that is models where no structural connections between the two latent dimensions can be identified. From a formal point of view, two or more models are equivalent when they give identical values of data fix index so that choosing the best model is impossible. Equivalent models can cause misinterpretations and entail the use of specifying strategies, which can differ with regard to a planned structural change. In case there are no planned actions, common sense should prevail and the closest model to reality should be chosen leaving aside the one based on less reliable hypothesis. A structural approach has been devised allowing to reformulate the structural model. Two options are possible: either the early observed variables are changed or a new latent variable between the two generating the equivalent model is included (Mac Callum, 1993). In our case we must consider that the Faculty is structured into different courses and, with reference to the academic years and the three disciplines which have been analysed, six parallel courses, each one having its own teacher, were available. It is therefore possible to assume that the assessment of the courses for the same discipline may be influenced by a

"teacher effect". In fact, the questionnaire used had three items aimed at assessing the teacher's ability to expose the subjects, to arouse the students' interest and to clarify critical points. The CFA, carried out on the three disciplines considering the three latent variables, have resulted in values which are still very high (RMSEA equal to 0,01, 0,067, and 0,075 respectively for BE, MT and ST).

Before starting to build a new structural model, a preliminary descriptive analysis has been done to compare the average scores related to the three latent dimensions both in every discipline and in the single evaluated courses. As these items are surveyed on an ordinal scale, it is not possible to calculate a total score and, traditionally, either the scale is dichotomised by considering the percentage of positive assessments for each dimension, or the median is calculated. Though the first solution entails a rather relevant loss of information, the synthesis through the median is even less informative because adopting a limited 4-degree scale means reducing the possibility of discrimination both in the subjects and especially in the courses. A new index, starting from a previously exposed one (Civardi, 2002), has been calculated. It is based on the observed distribution of the different kind of answers and gives a numerical score synthesising the aspect under examination. The index is the algebraic sum of two indexes: an index expressing the score obtained on the half-plane of the positive assessments and another corresponding to the half-plane of the negative ones. In brief, with reference to positive assessments, let us consider, for a generic teaching *i*, the whole distribution of the scores assigned to *k* items measuring a latent dimension. If x_i indicates the percentage of positive assessments and y_i the % of very positive assessments on the overall positive assessments, the couple (x_i, y_i) identifies, in the Cartesian plane, a point P_i which lies in a 100 square surface (the positive assessment area). By dividing the interval into ten parts both on the axis of abscissas and on the axis of ordinates, 100 squares may be obtained which can be ordered by the positive assessment decreasing intensity. The order is obtained by assigning a range r=1 to a square placed at the upper left vertex of the area till a range r=10 is assigned, proceeding vertically, to the tenth square of the outer column (the column of the disciplines which have obtained positive assessments ranging from 90 to 100 %). A range r=11 will be later assigned to the upper square of the following column (the column of the disciplines which have got positive assessments ranging from 80% to 90%) and so on. It is thus possible to assign a score $V_+ = 100 - r + 1$, $0 \leq V_+ \leq 100$ to point P_i. A here-adopted better alternative considers even the distance of point Pi from the upper left vertex of the square where it is placed (point of maximum relative positivity). The new score will therefore be calculated as $V_+^* = V_+ - \sqrt{2}$ (d being the distance between the Pi and the point of maximum relative positivity. The calculation of V index (negative assessment) is totally similar and the algebraic sum results in the index V [-100,100]. The results confirm the opportunity to adopt a new model by considering the structural relation among DLT, DMA and the third dimension: the students' opinion on didactics (SOD). Including this variable in the first model could allow to identify the nature of the existing relation: DLT and SOD are the exogenous variables and they both have a positive effect on the endogenous variable DMA (RMSEA equal to 0,00, 0,05, and 0,054 respectively for BE, MT and ST).

REFERENCES

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RÉSUMÉ

Le travaille propose un modèl structurel appliqué aux données sur l'èvaluation des course universitaires de la première annèe.