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ABSTRACT

This study explored whether university students' perceptions of the social environment are influenced by professors' classroom teaching innovations. Data from 559 university students in 13 innovative disciplines within 11 schools at the University of Seville, Spain, were used. First, factor analytic procedures with varimax rotation were used to generate a seven-factor solution that accounted for 59% of the variance. Second, using hierarchical linear modeling, it was found that the average student's perception of interest is also influenced by prior knowledge. Implications for further research on university teaching and innovation assessment are discussed. Two appendixes contain sample questionnaires. (SLD)

University Classroom Teaching Innovations: A Meta-Analysis Study

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UNIVERSITY CLASSROOM TEACHING INNOVATIONS: A META-ANALYSIS STUDY

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ABSTRACT

This study explores whether University students' perceptions of the social environment are influenced by professors' classroom teaching innovations. Data from 559 University students in 13 innovative disciplines within eleven Schools at the University of Seville (Spain) were used. First, factor analytic procedures with varimax rotation were used to generate a seven-factor solution that accounted for 59% of the variance. Second, using Hierarchical Linear Modeling (HLM), we found that average students' perception of interest is also influenced by his prior knowledge (Level 2). Implications for further research on University teaching innovation assessment based on students' perceptions of the social environment are discussed.

1. INTRODUCTION

1.1. Justification of research

In this study we explain variations in students' perceptions of facets of social learning environment associated with their demographic characteristics. Besides, we explore the conditions and classroom size mediating processes that may underlie University students' perception of interest as a dimension of a learning environment. Thus, we document 13-classroom teaching innovations research synthesis during the academic year of 1998-1999 at the University of Seville (Spain). The summarization of University classroom teaching innovations in a new meta-analysis study highlights the results of separate but coordinate studies in new categories that identify interaction relationships or trends, in order to reset the links among students and their fragmented learning environment perceptions. We used Hierarchical Linear Modeling (HLM) (Bryck and Raudenbush, 1992) to summarize the effects of University classroom teaching innovation on students' perception of interest.

1.2. Research Questions

We have organized our study around three related research questions. We pose hypotheses about the effects we expect. Question 1 is based on the idea that University classrooms are composed of students with different demographic and academic features: Are students' perceptions of classroom innovation environments similar or distinct according to the Student Demographic Questionnaire (S.D.Q.)? We expect to find differences in classroom environment scales across student social-style and academic background groups. Question 2 concerns validity of the measurement questionnaire: Is the Evaluation of University Teaching Activities Questionnaire (E.U.T.A.Q.) a reliable and valid University classroom climate instrument? We hypothesize an internal consistency reliability and a valid factor structure of E.U.T.A.Q. Question 3 concerns student perception of interest and classroom teaching innovation size: Does classroom teaching innovation size have a direct effect on the students' perception of interest? We hypothesize that classroom teaching innovation size has a direct effect on student perception of interest. Students belong to a hierarchical logistic model: they are individuals (student-level), and, at the same time, they belong to a classroom teaching innovation (classroom-level). The second problem demonstrates some connection between a learning construct and a teaching practice.

In general, HLM used in our study of University context effects involved two levels. On the first level, variance in an outcome measure is divided into two components: innovation within the learning environment, and innovation between-learning environments. Only the proportion of variance in the outcome that lies systematically between classroom teaching innovations may be modeled as a function of teaching-learning environment characteristics. The second level estimates within-learning environment characteristics for each classroom teaching innovation. In this case, the outcome variable is estimated as a function of individual student's characteristics of each classroom teaching innovation.

2. BACKGROUND

2.1. Two Distinct Lines of Research

The research background for this study lies in two nonoverlapping bodies of literature: University classroom learning environment and University teaching innovation. A major focus of the study, University classroom learning environment, is supported by a body of research that almost entirely targets primary and high schools. Because we examine how University classroom teaching innovations affect students, another body of research is relevant, one that focuses on University classroom teaching innovation.

University Classroom Learning Environment

The classroom learning environment is an important ecological feature of any educational organization. There is a relevant stream of research that examines how students' perceptions of their learning climate influence students' outcomes (Fraser and Walberg, 1991). The learning climate also separates into two branches; studies focus on either the psychological or sociocultural environment. The former branch is the most relevant here. Many educators have relied on behaviorally based measures targeting on discrete variables (e.g. the use of positive feedback) to describe classroom-learning climate. Not surprisingly, a new cognitive apprenticeship approach is generating a significant appeal among educational researchers for assessing student perceptions of learning environments (e.g. the scaffolding technique). But while "guiding in student learning" is a University principle, few instruments exist to measure the active nature of learning from a Spanish University student's perspective (Villar, 2001a). The types of research on Spanish University classroom learning environment include: (a) evaluation of classroom teaching innovations (Villar, 2001b), and (b) the investigation of classroom differences perceived by students (Toledo, 2000).

University Teaching Innovation

University teaching innovation could be a practice or a technology material that is accepted as a novelty by a professor. It is the professors' perception of newness that is considered. Also University teaching innovation is used as the process by which new methods, practices or technology resources are developed or redesigned. We have assumed the individualistic perspective on innovation. Students were perceived to be rational individuals that made decisions in order to maximize the learning value. Therefore, we have identified student-level antecedents of innovation (e.g. age, sex, academic background). Moreover, we have hypothesized other relationships between a teaching innovation and University organizational variables (e.g. classroom size, discipline differentiation, field of study complexity), thus assuming a structural perspective.

A few numbers of universities have been surveyed to determine the effects of variables such as size or student measurement of classroom learning environment on the adoption or implementation of teaching innovations. Since there were no guidelines for doing integrative reviews, researchers began to follow meta-analysis to summarize studies efficiently.

3. METHOD

3.1. Sample and Data

Our sample was restricted to the 13 University voluntary classroom teaching innovations that enroll students through the entire span of the two University cycles. We obtained 559 valid responses. With regard to student demographic characteristics, they also responded the Student Demographic Questionnaire (S.D.Q.). Most students were women. The majority were 19 year-old (22.6 percent). They belonged to different College groups, the highest being the School of Geography and History (21.5 percent). The uneven distribution of students surveyed per School and innovation reflects the fact that this study was done on a voluntary participation basis. A wide range of students of Science Pre-University Course was represented (45.5 percent). The dominant average academic grade was a pass qualification (36.3 percent). Students did not have to retake subjects (70.3 percent). This experiment mainly took place with first year students (46 percent). Surveys (S.D.Q. and E.U.T.A.Q.) were administered to students by trained student assistants in the class. Students were told the purpose of the surveys was to find what students believed and thought about teaching innovations. (Our assessment method involved careful examination of 16 hypotheses on students' grouping characteristics of the S.D.Q. used for Question 1).

3.2. Data Collection

The core quantitative instruments in this study were (a) Evaluation of University Teaching Activities Questionnaire (E.U.T.A.Q.) that encompasses 25 items in accordance with principles of cognitive and social psychology, to include a subset of ten multi-item learning dimensions from the cognitive apprenticeship literature. It addresses students' co-construction of knowledge, and professors' scaffold orientation (see Appendix 1). The format for all items was a 5-point scale, ranging from 1 (*Totally agree*) to 5 (*Totally disagree*); and (b) Student Demographic Questionnaire (S.D.Q.), which is composed of 16 items. This instrument taps selected students' biographical factors (i.e., standard demographic and academic characteristics: age, sex, course level, University department, type of subject matter, etc.).

3.3. Analytical Approach

The main goal of factor analysis was to define the underlying factor structure in E.U.T.A.Q. For this reason we first tried to identify dimensions (factors) separated from the structure, and furthermore, to calculate the grade of justification of each item related to each factor. In order to develop it, we followed a process: (a) data suitability for the application of factor analysis; (b) factor deduction; (c) varimax rotation to transform factors; (d) assignment of factorial scorings to students aiming to construct variables that could be processed further on HLM (Hierarchical Linear Model), and (e) factor interpretation.

We tested HLMs that use occasions of measurement within individuals as the first level, and individuals within classroom teaching innovations as the second level. The outcome variable selected (student perception of interest) is constructed as a factorial scoring nested within students, and in turn, students are nested within classroom teaching innovations. Therefore there is a natural hierarchy staggered at two levels (individual student and classroom teaching innovation). HLM is also appropriate because it recognizes that student data within each classroom teaching innovation are not statistically independent observations (all students in the same classroom teaching innovation are taught by the same professor and they have opinions about the same classroom learning environment). Lastly, HLM generates parameter estimates for explanatory variables at both levels and analyses which variables are significant at each level.

4. RESULTS

4.1. Descriptive Analysis of Classroom Learning Environment Measures

Table I displays E.U.T.A.Q. dimensions and their agreement percentages, means and standard deviations for the 13 University classroom teaching innovations. Means indicate that, in general, students' perceptions agreed with items, although they tended to unknow their classroom environment. Most students selected *agreement* as their response in the classroom climate items. Firstly, the scale Clarification was particularly high (54.6%). Secondly, as a contrast, the dimension Student autonomy had a discrete percentage (30.7%). There is some indication in data that student' beliefs and perceptions concerning classroom teaching environment were not acutely memorable.

(Table I should be included about here)

4.2. Analysis of Variance to Investigate Between-Students Differences in the Dimensions of E.U.T.A.Q.

It was expected that there would be individual differences in student perceptions of their classroom learning environment. To examine whether student background characteristics affected classroom climate perceptions 16 one-way analyses of variance were carried, in which student demographic and academic features were independent variables with varying numbers of students per characteristic, and each of the ten dimensions of E.U.T.A.Q. was the outcome variable. We observed a number of significant differences in students' climate perceptions across group characteristics in Table II. Thus, for the most part, there were individual differences regarding student perceptions in nine climate dimensions due to the type of School. There was less variability (three dimensions) in students' perceptions of classroom climate explained by Course level, Gender, Age, Academic background, and Future expectations. Significant differences in only one climate dimension between students with different characteristics (types of Pre-University Course and High School Centre, Residence during the week, and repetition of subject matters of other courses) were detected. Most students were different in their perceptions of the degree to which University students establish their own knowledge connections and generate their own learning products.

(Table II should be included about here)

4.3. Statistical Validation of E.U.T.A.Q.

Analyses of data generated statistics that were used to determine the reliability and validity of E.U.T.A.Q. Internal consistency reliability was calculated using Cronbach's alpha coefficient for all items ($\alpha = .8635$). Reliability analyses also indicated that dropping item 7 resulted in a higher Cronbach's alpha for all items ($\alpha = .8659$). Thus, item 7 was dropped.

Data suitability. In order to apply factorial analysis it was desirable that there was a certain degree of multicolineality among E.U.T.A.Q. items. For this reason the matrix of correlated links among the 24 items had been calculated in order to identify their meaning. As there were 24 variables, 276 correlated links had been calculated, out of which 34 were not significant ($p<.01$). Then, there were 91% significant correlated links. To finish, we calculated the anti-image matrix correlated links. We got a matrix in which the extra diagonal terms are next to zero, while the main diagonal terms are quite high, being .727 the smaller, and most of them over .800. This ratifies the validity of the research. The 24 items provided information that we tried to summarize in a more handy number of variables (factors). At this respect, principal components factor analysis was selected. We chose seven factors, which explained almost 59% of the total variance. In order to determine their significance, we strictly evaluated them. For the size of our sample (larger than 350) with $p<.05$, and a power level of 80%, it is considered that a factorial load is significant when is similar or higher to .30.

Afterwards, the varimax rotation was used to generate a simpler factorial structure. Once the factor matrix was built, we saw that in the rotated factorial solution each factor had few high loads, and the rest of them were next to zero. Also, each item was loaded in a single factor. Lastly, we observed that there were not two factors with the same distribution. After identifying the biggest load of each item (all were significant as they were >.30), we defined the factors starting from the items that were integrated in each one of them. Table III presents the factorial loads on each factor of the new instrument structure (see the New Evaluation of University Teaching Activities Questionnaire (N.E.U.T.A.Q.) in Appendix 2).

(Table III should be included about here)

If we attend to the N.E.U.T.A.Q. dimensions, Factor 1 includes items 21, 22, 23, 24 and 25 that initially appeared in the E.U.T.A.Q. under the names of Motivation and Evaluation. It seems that the general idea of *Interest fostered by the innovation* (IFI) is coming off them, as much in students as in professors. This was the reason why we selected it as the outcome variable for the HLM hypothesis of the study. Therefore, we believed that Factor 1 had summarized all those questions related to the innovation interest perceived by the people, within the classroom group formed by students and professors. This factor was the one that explained a higher percentage of variance (11.81%).

At short distance, in terms of the explained variance (10.48%), was Factor 2. It contained items 15, 16, 19 and 20. The first two initially formed the dimension Interrogation / discussion, and the remaining ones formed the scale Collaboration and negotiation. It was deduced that all of them were referred to different manifestations of the feature that we nominated “participation developed by the innovation”. Considered jointly, factors 1 and 2, represented a variance of 22.37%, or more than 37% of the total variance explained by the seven dimensions that come off the factorial analysis. This variable was selected as a predictive one for the HLM hypothesis of the study.

Factor 3 seems to refer to the sphere of “innovation integration with student prior knowledge”. This seems to be deduced from items 10, 11 and 12 (contained initially under the scale Student prior knowledge) plus 13 and 14, that tried to investigate the degree of connection between the received training and other kind of student prior knowledge. Again, this variable was another predictor for the HLM hypothesis.

Factor 4 turned out to be, together with Factor 6, the one that contained a smaller number of items (3 and 4). However, this is not its only peculiarity. In the previously analyzed factors, the underlying structure of data implied the set of more general and wider groupings than those initially proposed in E.U.T.A.Q. Surprisingly, exactly the opposite happens in this case. Items 3, 4, 5 and 6 were included under the scale Student autonomy, while the factorial analysis seems to refute this proposal when disrupting the first two considering them as an entire factor. Both items mention the perspective and attitude change that the innovation could have caused in student’s beliefs.

Items 1, 2 and 8 form Factor 5. This seems to be a factor closely connected with the teaching aspects of the innovation. While items 1 and 2 refer to clarity with which the concepts have been transmitted, item 8 alludes to sufficiency of the received information in order to facilitate later achievements. Both aspects are clearly connected, since a bigger teaching clarity in the transmission of knowledge (items 1 and 2) should go associated to a bigger use on the part of the students and consequently, a bigger appropriation of knowledge on the part of them. In sum, Factor 5 had emphasized students' perception of the importance of teaching clarity for information reception, which would explain the high statistical correlation between both items.

Factor 6 is exactly adjusted to one of the dimensions that already were outlined in E.U.T.A.Q., under the scale Explorations based in new technologies. Items 17 and 18 investigated the degree of contribution of the innovation to encourage the acquisition of other different skills to those that could come off directly of the learned concepts. From a global conception of training, we know that the professor's teaching mission should go beyond the simple transmission of subject matter knowledge. Students need not only knowledge to successfully practice a future professional activity. They will also need to internalize certain skills and work routines. Also, students should develop some attitudes that allow them a complete use of the received training: verbal and written expression capacity, analytic and critical mental abilities, disposition for teamwork, etc.

Finally, Factor 7 referred to the existence of a certain student's empowerment. Items 5, 6 and 9 suggest continually developing whose ends would be a completely guided activity (in one side) and a totally self-taught training (in the opposite side). Between both limits an extensive range of options opens up, as the student's incidence in the design and implementation of the training plan progressively increases.

Differences of meaning between Factor 6 and Factor 1 exist. The last one contained those facets of the training process that suggested the presence of student participation, while developing an innovation. Instead, Factor 7 would try to measure the degree to which students had participated actively in the design of the innovation.

4.4. Hierarchical Lineal Regression Results

Conceptually, this University study is a series of within-classroom teaching innovation experiments conducted using the same procedures and outcome variable. The within-classroom teaching innovation model in our primary analysis treated IFI (outcome variable) as a function of learning environment characteristics. This specification was chosen because of the widely known relation between IFI and other students' metacognitive abilities and perceptions.

HLM analysis has been carried out at three stages. First, it was used to analyze how the high variability of the outcome variable is due to its change within and among classroom teaching innovations. Second, we added variables to the *Student-Level Model* (Level 1). Here we studied whether the variability of the outcome variable was partly due to the predictor variables introduced in this level. And third, we added explanatory variables to the *Classroom-Level Model* (Level 2) to analyze if the classroom-teaching innovations influence on the selected outcome variable.

The specific model (level 1) for the IFI score Y_{ij} of the ith student in the jth classroom teaching innovation was

$$Y_{ij} = \beta_{0j} + \beta_{1j}(TECLA)_{ij} + \beta_{2j}(STUPRIK)_{ij} + \beta_{3j}(PARDE)_{ij} + \beta_{4j}(DESCA)_{ij} + r_{ij}$$

where:

i varies from 1 to n_j (i represents the student i in the classroom j), j varies from 1 to J (it symbolizes each classroom teaching innovation); Y_{ij} is the value of the outcome variable IFI for a student i of the classroom j; β_{0j} symbolizes the average IFI adjusted for the classroom j; β_{1j} (TECLA) the covariate effect of the indicator variable for teaching clarification on the classroom j; β_{2j} (STUPRIK) is the covariate effect of the student prior knowledge on the classroom j; β_{3j} (PARDE) is the covariate effect of the degree in which participation is developed by the innovation on the classroom j; and β_{4j} (DESCA) is the covariate effect of developing students' capabilities on the classroom j.

Level 2. We gave random character to the coefficients of Level 1, and expressed the intercept based on the explanatory variable AVESTUPRIK of Level 2 (average student prior knowledge of each classroom):

STUPRIK

$\beta_{0j} = \gamma_{00} + \gamma_{01}(STUPRIK)_{.j} + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

where:

γ_{00} is the adjusted total average of the outcome variable; γ_{01} symbolizes the expected gross change in β_{oj} when the average prior knowledge is increased one unit in anyone classroom; γ_{10} is the regression coefficient Y_{ij} within each group associate to the variable TECLA; γ_{20} *idem* for for the variable STUPRIK; γ_{30} *idem* for for the variable PARDE, and γ_{40} *idem* for the variable DESCA. Variable u_{0j} represents the possible variation of the ordinate in the origin (intercept) associated to classroom *j*, while u_{1j}, u_{2j}, u_{3j} and u_{4j} represent the possible variations of slopes associated to classroom *j* (1)

5. DISCUSSION

We observed that all predictor variables made a significant contribution to the explanation of the outcome variable ($p<.05$). At the same time, the average prior knowledge of each classroom had a positive influence on the intercept ($p=.017$). The coefficient indicated that a variation of the average prior knowledge of one unit, when passing from a classroom to another, meant a positive variation on the intercept (.727). Therefore, the average fostered by the innovation adjusted for each classroom was explained partially by average prior knowledge of the same one. In this case, the percentage of variance explained was 33%. (See Table IV).

(Table IV should be included about here)

All explanatory variables made positive contributions to the outcome variable. Since the variables were measured with the same scale, we could compare estimated coefficients, and concluded that Student prior knowledge (STUPRIK) was the most influent variable on IFI, while Developing students' capabilities (DESCA) was the one that less influence had on it. Paying attention to the estimated slope of STUPRIK, we notice that the increase of one unit (in a scale 0 to 5) of Student prior knowledge supposes an increment of .29 units (in the same scale) on IFI. This is a significant coefficient ($p=.007$), and it is moderately reliable because its associated reliability index is .442, according to Kelley (1927), mentioned by Bryk & Raudenbush (1992). Also, this variation is significant according to the chi-square statistic ($p=.027$), as it is shown in Table V. Due to the not balanced nature of data (number of student changes across different classrooms), the traditional methods of variance estimation can produce non-efficient results. For this reason, alternative methods have been used (algorithm EM), in order to produce maximum plausible variance estimations of any other parameter. Table V presents the final estimation of components of variance.

(Table V should be included about here)

Coefficient .3503 indicates significant variability among classrooms attending to their average interest. The biggest variance component (.6093) was in the student level. It indicated that the model did not explain a part of IFI variability. Respecting to the units of the classroom level model, there was a significant variability in the slope of the STUPRIK variable (p=.027). It means that the unitary increment of Student prior knowledge produces different increments in IFI depending on each classroom. This aspect is not significant for the rest of the variability slopes. Therefore, the unitary increments of anyone of the other predictor variables produce the same IFI effects on the resting classrooms.

Matrix T of variance and covariance of the random effects is 5 x 5, since we considered 5 random effects in the classroom level of the model. We had built the matrix of correlated links corresponding to the 5 random effects. Table VI highlights the strong negative correlations between the random effects of STUPRIK and TECLA. It means that if Student prior knowledge influence on IFI tends to rise, Teaching clarity influence on IFI tends to fall.

(Table VI should be included about here)

Positive correlated links between the random effects of TECLA and DESCA show that if Teaching clarity influence on IFI grows, the effect of Developing students' capabilities on IFI also grows.

5.1. Conclusions

First, our analyses of student perceptions taught in various University Schools revealed statistically differences for nine climate dimensions. Effects of other student variables, such as Course level, Gender, Age, Academic background, and Future expectations, were found for three climate scales. Other student background variables – Type of Pre-University Course, Type of High School Centre, Residence during the week, and You repeat subject matters of other courses – pointed out a difference for only one climate domain.

Second, seven factors emerged from the climate items (eigenvalues of .816 and .464) that explained 59% of the variance in all 24 classroom environment items. This finding was consistent with our theoretical model (E.U.T.A.Q.), except for Professor Scaffolding scale where item 7 was omitted. This result provides evidence that classroom climate in University teaching may be assessed by a subset of constructs included in E.U.T.A.Q. as a reliable and valid climate measurement instrument.

Third, the outcome variable (IFI) was significant and positively influenced by TECLA, STUPRIK, PARDE and DESCA at the Student-Level Model (Level 1), being STUPRIK the most influential variable. Besides, average STUPRIK at the Classroom-Level Model (Level 2) also yielded a positive and significant effect on average class IFI, and therefore, indirectly on each student's Interest fostered by the innovation.

5.2. Policy implications

We provided evidence that University classroom climate assessment is affected by student demographic variables outside professors' classroom control. The effects of professors' classroom innovations have been difficult to demonstrate, partly because of the impact of student composition, course characteristics and class structure that could shape students' learning climate perceptions, and the mismatch between what is taught in a classroom teaching innovation and what is measured. Further research should be directed at determining how student ability and background may interact with the content and format of E.U.T.A.Q. dimensions. This study provides a preliminary evidence of the E.U.T.A.Q. construct reliability and validity in estimating students' perceptions of classroom teaching-learning practices.

College student-level cognitive factors are quite well known (Pressley, *et al.*, 1998). Prior knowledge is a metacognitive ability that effects study strategies, such as seeking information, notetaking, reviewing tests, notes, (e.g. relating information to prior knowledge to personalize understanding of it) (item 12 of E.U.T.A.Q.). Thus, other students' academic outcomes as reflections of personal efforts and abilities could be the topics to be included and tested in new Hierarchical Linear Models.

REFERENCES

Bryk, A. S., and Raudenbush, S. W. (1992). *Hierarchical Linear Models. Applications and data analysis.* Newbury Park, CA: Sage.
Fraser, B., and Walberg, H. (1991). *Educational Environments: Evaluation, antecedents and Consequences*. New York: Pergamon Press.
Toledo, P. (2000). *El ambiente universitario: Estudio descriptivo y comparativo del clima de aula de la Universidad de Jaén.* Sevilla, Edición Digital @ tres: S.L.L.
Villar, Luis M. (Ed.) (2001a). *La Universidad. Evaluación educativa e innovación curricular.* Sevilla: I.C.E.
Villar, Luis M. (2001b). Metaevaluación: un inquietante modelo. In Luis M. Villar (Ed.), Metaevaluación y metaetnografía de las innovaciones curriculares de la Universidad de Sevilla, *Revista de Enseñanza Universitaria* 17, Junio: 43-76.

APPENDIX 1

Evaluation of University Teaching Activities Questionnaire (E.U.T.A.Q.)

For each sentence select the value of the answer that better it is adjusted to your perception, surrounding with a circle the elected option, in the answer sheet that is attached.

Totally of agreement	Agreement	I don't know	In disagreement	Totally in disagreement
1	2	3	4	5

Dimension A. CLARIFICATION (degree to which University students are given explanations, examples and multiple forms of understanding a problem or difficult material).
1. Professor clarifies difficult aspects of this innovative activity.

2. Professor elaborates the most confused information of this innovative activity by means of outlines, diagrams or illustrations of the main ideas.

Dimension B. STUDENT AUTONOMY (student perception that University teaching is student-centred and that she has been offered the possibility to make decisions on her learning).

3. This innovative activity has changed my vision on the University student's role.

4. This innovative activity has changed my attitude towards the subject matter and the way of confronting University studies.

5. I assume responsibilities in this innovative activity.

6. I suggest possible educational problems and tasks with peers.

Dimension C. PROFESSOR SCAFFOLDING (degree to which professors demonstrate the steps or structure of a problem and provide keys and help to complete the innovative activity with success).

7. This innovative activity gives me keys to solve problems but it doesn't induce me to a certain answer.

8. This innovative activity offers me enough information to be successful.

9. Professor gives me feedback while I solve a problem in this innovative activity.

Dimension D. STUDENT PRIOR KNOWLEDGE (degree to which learning activities are personally excellent and related to University students' prior knowledge and practical skills).

10. This innovative activity relates new information to what I have learned previously.

11. I use ideas and information that I know to understand something new.

12. I have developed other cognitive capacities in this innovative activity (e.g. analysis, synthesis, critical thinking).

Dimension E. CONNECTIONS (degree to which University students establish their own knowledge connections and generate their own learning products).

13. This innovative activity helps me to investigate, build and relate ideas and facts.

14. I explore how information relates with other topics and subject matters.

Dimension F. INTERROGATION / DISCUSSION (degree to which conjecture, questioning, and discussion in this innovative activity is fostered).

15. This innovative activity cheers up University students to ask questions and discuss answers given in a book.

16. I discuss correct and incorrect problem solutions.

Dimension G. EXPLORATIONS BASED IN NEW TECHNOLOGIES (degree to which new technologies tools and other academic resources facilitate University students' idea generation and knowledge construction).

17. This innovative activity develops University students' other study capabilities (e.g. handling of tools, documental search, library use).

18. I find new information about the topics and subject matters using new technologies.

Dimension H. COLLABORATION AND NEGOTIATION (degree to which University students make social interactions with other students to give meanings and obtain agreements about teaching activities and viewpoints).

19. I share ideas, answers and visions with my professor and peers in this innovative activity.

20. I learn how to think about a problem from peers and to consider their points of view.

Dimension I. MOTIVATION (degree to which University students are involved in an innovative activity).

21. I am motivated to work in this innovative activity.

22. This innovative activity improves my opinion about the content of the subject matter (practical vision).

23. I get more involved in this innovative activity than if I studied it in a theoretical way (useful vision).
Dimension J. EVALUATION (degree to which University students evaluate an innovative activity).
24. I believe that this innovative activity develops professors' interest in teaching.
25. I believe that innovative activities like this would significantly improve the quality of University teaching.

APPENDIX 2

New Evaluation of University Teaching Activities Questionnaire (N.E.U.T.A.Q.)

Dimension I
1. I am motivated to work in this innovative activity.
2. This innovative activity improves my opinion about the content of the subject matter (practical vision).
3. I get more involved in this innovative activity than if I studied it in a theoretical way (useful vision).
4. I believe that this innovative activity develops professors' interest in teaching.
5. I believe that innovative activities like this would significantly improve the quality of University teaching.

Dimension II
6. This innovative activity cheers up University students to ask questions and discuss answers given in a book.
7. I discuss correct and incorrect problem solutions.
8. I share ideas, answers and visions with my professor and peers in this innovative activity.
9. I learn how to think about a problem from peers and to consider their points of view.

Dimension III
10. This innovative activity relates new information to what I have learned previously.
11. I use ideas and information that I know to understand something new.
12. I have developed other cognitive capacities in this innovative activity (e.g. analysis, synthesis, critical thinking).
13. This innovative activity helps me to investigate, build and relate ideas and facts.
14. I explore how information relates with other topics and subject matters.

Dimension IV
15. This innovative activity has changed my vision on the University student's role.
16. This innovative activity has changed my attitude towards the subject matter and the way of confronting University studies.

Dimension V
17. Professor clarifies difficult aspects of this innovative activity.
18. Professor elaborates the most confused information of this innovative activity by means of outlines, diagrams or illustrations of the main ideas.
19. This innovative activity offers me enough information to be successful.

Dimension VI
20. This innovative activity develops University students' other study capabilities (e.g. handling of tools, documental search, library use).
21. I find new information about the topics and subject matters using new technologies.

Dimension VII
22. I assume responsibilities in this innovative activity.

23. I suggest possible educational problems and tasks with peers.
24. Professor gives me feedback while I solve a problem in this innovative activity.

Table I

Agreement Percentages, Means and Standard Deviations Results for E.U.T.A.Q. Dimensions

Dimensions	Agreement Percentage	Mean	*S.D.*
Clarification	35.3	2.1	.7654
Student autonomy	13.5	2.8	.7522
Professor scaffolding	20	2.6	.6743
Student prior knowledge	22.7	2.1	.7609
Connections	37.6	2.1	.7789
Interrogation / discussion	23.8	2.6	.9859
Explorations based in new technologies	26.9	2.4	.9378
Collaboration and negotiation	29.6	2.3	1.0321
Motivation	21.8	2.1	.8319
Evaluation	23	1.8	.8393

Table II

Analysis of Variance in E.U.T.A.Q. Dimensions for Student Variables in University Class Innovations

Hypothesis	Dimensions	*F*-ratio	*p*
1. Course level	Clarification	16.373	.000
	Student autonomy	11.839	.000
	Professor scaffolding	7.687	.000
	Student prior knowledge	6.15	.000
	Connections	6.870	.000
	Interrogation / discussion	9.371	.000
	Explorations based in new technologies	6.480	.000
	Collaboration and negotiation	24.993	.000
	Motivation	8.400	.000
	Evaluation	5.494	.000
2. University School	Clarification	6.691	.000
	Student autonomy	7.581	.000
	Professor scaffolding	3.399	.000
	Student prior knowledge	4.626	.000
	Connections	5.192	.000
	Interrogation / discussion	3.186	.000
	Explorations based in new technologies	6.595	.000
	Collaboration and negotiation	20.914	.000
	Motivation	4.255	.000
	Evaluation	5.928	.000
3. Gender	Motivation	2.941	.032
4. Age	Professor scaffolding	3.338	.019
	Interrogation / discussion	7.702	.000
	Collaboration and negotiation	10.115	.000
	Motivation	3.066	.027
5. Type of Pre-University Course	Clarification	5.252	.000
	Professor scaffolding	2.666	.031
	Connections	3.014	.017
	Interrogation / discussion	9.621	.000
	Collaboration and negotiation	10.028	.000
6. Academic background	Clarification	4.155	.002
	Professor scaffolding	5.591	.000
	Connections	3.478	.008
	Interrogation / discussion	5.136	.000
	Explorations based in new technologies	3.154	.014
	Student autonomy	7.303	.001

7. Complementary activities while studying	Student autonomy	7.303	.001
	Professor scaffolding	5.591	.000
	Student prior knowledge	4.978	.008
	Connections	4.749	.010
	Evaluation	3.886	.022
8. Complementary jobs while studying: You teach children	Student prior knowledge	2.766	.019
9. Complementary jobs while studying: You work in an office	Collaboration and negotiation	2.620	.022
10. Complementary jobs while studying: You help doing tasks at home	Clarification	1.927	.020
	Student prior knowledge	2.691	.001
	Collaboration and negotiation	1.943	.019
	Motivation	2.095	.010
11. Future expectations	Clarification	3.735	.024
12. The field studies at this University were chosen …	Evaluation	3.098	.046
13. You repeat this subject	Student autonomy	6.509	.002
	Motivation	3.278	.038
14. You repeat subjects of other courses	Clarification	10.895	.000
	Professor scaffolding	4.137	.016
	Interrogation / discussion	11.971	.000
	Motivation	4.744	.009

Table III

Factor Analysis Results

E.U.T.A.Q. Scales and items	N.E.U.T.A.Q. Factors						
	I	II	III	IV	V	VI	VII
CLARIFICATION							
1					.766		
2					.728		
STUDENT AUTONOMY							
3				.729			
4				.788			
5							.469
6							.607
PROFESSOR SCAFFOLDING							
7							
8					.464		
9							.592
STUDENT PRIOR KNOWLEDGE							
			.603				
10			.723				
11			.525				
12							
CONNECTIONS							
13			.519				
14			.595				
INTERROGATION / DISCUSSION							
15		.696					
16		.773					
EXPLORATIONS BASED IN NEW TECHNOLOGIES							
17						.768	
18						.816	
COLLABORATION AND NEGOTIATION		.685					
19		.666					
20							

MOTIVATION 21 22 23	 .719 .739 .699						
EVALUATION 24 25	 .644 .628						

Table IV

Final Estimation of Fixed Effects

Fixed effects	Coefficient	*SE*	*T* ratio	*p*
Intercept β_0				
Intercept 2, γ_{00}	1.1979	.5238	2.287	.048
STUPRIK, γ_{01}	.7272	.2452	2.965	.017
Slope of TECLA β_1				
Intercept 2, γ_{10}	.1961	.0422	4.641	.001
Slope of STUPRIKβ_2				
Intercept 2, γ_{20}	.2877	.0810	3.551	.007
Slope of PARDE β_3				
Intercept 2, γ_{30}	.2052	.0408	5.029	.000
Slope of DESCA β_4				
Intercept 2, γ_{40}	.112831	.043526	2.592	.029

Table V

Final Estimation of Components of Variance

Random effect	*SD*	Variance component	*df*	*Chi-square*	*p*
Intercept 1 u_0	.3503	.1227	9	18.7504	.008
Slope of TECLA u_1	.0647	.0042	10	13.6754	.188
Slope of STUPRIK u_2	.1871	.0350	10	2.2568	.027
Slope of PARDE u_3	.03548	.00126	10	15.5168	.114
Slope of DESCA u_4	.09637	.00929	10	14.3387	.158
Level 1 r	.6093	.3713			

Table VI

Correlations Among Random Effects of Variables

	Intercept 1	TECLA	STUPRIK	PARDE	DESCA
Intercept 1	1	.023	-.470	-.328	-.618
TECLA	.023	1	-.878	.590	.626
STUPRIK	-.470	-.878	1	-.393	-.305
PARDE	-.328	.590	-.393	1	.396
DESCA	-.618	.626	-.305	.396	1

---

(1) Conventional statistical techniques (ANOVA or regression analysis) informed us that demographic and academic variables of S.D.Q. (age, sex, course level, University department, type of subject matter, etc.) did not make significant influences on interest. For this reason they were put aside.

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