revista de EDUCACIÓN
Nº 370 OCTUBRE-DICIEMBRE 2015

Métodos centrados en el aprendizaje, estrategias y enfoques de aprendizaje en estudiantes universitarios

Learning-centered methods, learning strategies and learning approaches in university students

Bernardo Gargallo López
Pedro Ramón Garfella Esteban
Piedad M. Sahuquillo Mateo
Irene Verde Peleato
Miguel A. Jiménez Rodríguez

GOBIERNO DE ESPAÑA
MINISTERIO DE EDUCACIÓN, CULTURA Y DEPORTE
Calidad de Revistas Científicas Españolas FECYT 2013

Learning-centered methods, learning strategies and learning approaches in university students[1]

Métodos centrados en el aprendizaje, estrategias y enfoques de aprendizaje en estudiantes universitarios

DOI: 10.4438/1988-592X-RE-2015-370-304

Bernardo Gargallo López
Pedro Ramón Garfella Esteban
Piedad M. Sahuquillo Mateo
Irene Verde Peleato
Universidad de Valencia
Miguel Ángel Jiménez Rodríguez
Universidad Católica de Valencia

Abstract

Learner-centered methods seem more appropriate for promoting student learning and self-regulation skills. We wanted to assess the impact of learning-centered methodology on learning strategies and learning approaches of three student groups. They were first year students studying the degrees of Pedagogy and Social Education at the University of Valencia, who studied the subject of Educational Theory. The sample consisted of 133 students. A pre-experimental design was used with pretest and post-test measures with the CEVEAPEU and CPE questionnaires. Besides, students assessed the methods used by their teachers with a quantitative questionnaire. Qualitative data were also collected from students to provide a more integrated perspective: a focus group was

(1) The results that we enclose are based on a three years research. It is «Learning-centered methodologies at the university. Design, implementation and assessment", approved by the Spanish Economy and Competitiveness' Ministry into the National Basic Research Program, 2001 (2013-2015) (Financing Plan E, PGE), directed by Professor Ph.D. Bernardo Gargallo (code EDU2012-32725).

Received: 23-04-2015 Accepted: 08-07-2015

organized with some students to analyze the methods, and some students from all three groups also assessed them with an opened questionnaire. The teachers of the three groups agreed the learner-centered methodology. Teaching methods included an expository methodology, questions, classroom discussion, classroom practices, cooperative work, conducting research work and classroom presentation, and an evaluation system which used training procedures that returned feedback to students (two portfolios, assessment of oral presentations, rubrics, co-evaluation, self-assessment and written tests). Significant improvements in learning strategies and in deep approach scores were obtained in the post-test. Students positively assessed the methods used compared with more traditional ones. This work is relevant for the positive results obtained from a more integrative methodological approach than in other analyzed studies.

Keywords: learner-centered teaching, self-regulated learning, learning strategies, learning approaches, freshmen.

Resumen

Los métodos centrados en el aprendizaje parecen más adecuados para favorecer el aprendizaje del estudiante y sus capacidades de autorregulación. En este trabajo se pretendía valorar la incidencia de métodos centrados en el aprendizaje sobre las estrategias de aprendizaje y los enfoques de aprendizaje de tres grupos de alumnos de 1º de los grados de Pedagogía y Educación Social de la Universidad de Valencia en la asignatura Teoría de la Educación, de 1º curso. La muestra estaba constituida por 133 alumnos. Se utilizó un diseño preexperimental, con medidas de pretest y postest, tomadas mediante los cuestionarios CEVEAPEU y CPE; además los alumnos valoraron los métodos utilizados por sus profesores con un cuestionario cuantitativo. También se recogieron datos cualitativos de los estudiantes para disponer de una perspectiva más integradora: se realizó un grupo de discusión para analizar los métodos y también alumnos de los tres grupos los valoraron por medio de un cuestionario cualitativo abierto. Los profesores de los tres grupos acordaron la metodología, centrada en el aprendizaje y en el alumno. Los métodos docentes utilizados integraban metodología expositiva, preguntas, discusión en clase, prácticas de aula, trabajo cooperativo, elaboración de un trabajo de investigación y exposición ante la clase, y un sistema de evaluación que hacía uso de procedimientos formativos que devolvían feedback a los estudiantes (dos entregas de portafolios, evaluación de las exposiciones orales en clase, rúbricas, coevaluación, autoevaluación y pruebas escritas). Se encontraron mejoras significativas en las estrategias de aprendizaje en el postest y en las puntuaciones de enfoque profundo. Los alumnos valoraron positivamente los métodos utilizados en comparación con otros más tradicionales. Este trabajo es relevante por los resultados positivos debidos de un planteamiento más integrador a nivel metodológico que en otros estudios analizados.

Received: 23-04-2015 Accepted: 08-07-2015

Palabras clave: enseñanza centrada en el aprendizaje, aprendizaje autorregulado, estrategias de aprendizaje, enfoques de aprendizaje, estudiantes de primer curso.

Introduction

The learning-centered model used in students has become more important in the literature and in research on higher education.

Based on several works that have used interpretative approaches to study teachers' ways of teaching and their conceptions of teaching and learning (Biggs, 2005; García Valcárcel, 1993; Kember, 2009; Kember & Gow, 1994; Kember & Kwan, 2000; Samuelowicz & Bain, 2001), two models have been specified: the traditional model, *transmitting knowledge, teacher-centered and teaching-centered,* and the *learning-centered, student-centered model* in both teaching and evaluation.

The learning-centered model emphasizes student learning. Knowledge is understood as building. Teachers are responsible for curricular design, but students must cooperate in curricular development. Students are encouraged to design their learning routes and to be committed to the process (Machemer & Crawford, 2007). Student conceptions are employed as a basis to prevent errors and to promote a conceptual change. The student-teacher interaction is bidirectional to negotiate meanings. Cooperative work among students is encouraged for joint knowledge building and developing the skills, attitudes and values needed in their student and professional life. Using what students have learned is expected for life and for interpreting the reality in which they live. Interest and motivation fall especially on students themselves.

Innovative teaching is used –with different methods that favor active learning: cooperative work, problem-based learning, developing projects, and other methods, that are compatible with a quality expository methodology (Zabalza, 2012)-; a significant evaluation, considered to be a learning opportunity, with different information collection sources, that provides students with feedback (Hernández, 2012), allows them the chance to participate in the process and encourages learning from students' self-assessment process. The competences and results of

Received: 23-04-2015 Accepted: 08-07-2015

learning to be acquired by students are clarified and explained in order to facilitate self-assessment (Hannafin, 2012), and a flexible curriculum is prepared to offer students the possibility of selecting alternative learning routes (EI-ESU, 2010). The fundamental role played by teachers in this context is as mediators and coordinators of good environments and learning experiences (Monereo & Pozo, 2003).

Several publications exist on recommendations to implement the model (Bista, 2011; Campbell, 2012; Mostrom & Blumberg, 2012; Nitza, 2013;), and also on specific development initiatives of some parameters (Armbruster, Patel, Johnson & Weiss, 2009; Christopher & Rust, 2006; Heise & Himes, 2010; Pucha & Utschig, 2012; Tessier, 2007; Tien, Roth & Kampmeier, 2002).

In the present work, we intend to provide a relevant contribution in this direction by presenting the results of a research work that aimed to analyze the impact of innovative learning-centered methods on university students' learning based on the conviction of having empirical data available to help improve quality in university teaching-learning.

Although promoting a student-centered approach throughout university would be ideal, being modest at the beginning and taking small steps are worthwhile. When students obtain positive results, the area of influence can be extended. This work analyzes the impact of innovative learning-centered methods implemented by three teachers who teach the same subject (Educational Theory) with year-one students in two Education degrees (Pedagogy and Social Education) at the University of Valencia. To evaluate this, students' learning strategies were assessed. These strategies include affective-motivational and support elements, metacognitive and cognitive elements: "will", "self-regulation" and "skill" (Weinstein, Husman & Dierking, 2000), which permitted the assessment of their self-regulation capacity (Pintrich, 2000 & 2004; Yip, 2012; Zimmerman, 2002; Zimmerman & Schunk, 2011). We also assessed learning approaches, consistencies that refer to the way an academic test is dealt with, which stem from both student perceptions of the task and the individual's characteristics (Biggs, 1993; Entwistle, 2011; Entwistle & Peterson, 2004; McCune & Entwistle, 2011. The typology that we support is that which postulates the existence of two approaches, surface and deep (Biggs, 1993; Entwistle, 1995). Data were also collected from the assessments that students made of the process followed in teaching and assessment.

Received: 23-04-2015 Accepted: 08-07-2015

Thus the objectives pursued in this work were to evaluate the incidence of student-centered methods in student-learning strategies and approaches, and to analyze the assessments made by students of the methods used in the subject.

Method

Hypothesis

Applying learning-centered methods to the aforementioned subject will reveal statistically significant differences among students between the pretest and the post-test in *learning strategies,* which will improve, and in *learning approaches,* by improving the deep approach scores and lowering the surface approach ones. Student assessments will be positive.

Design

A pre-experimental pretest-post-test design was applied to the groups of students who were taught the subject. We opted for this design[2] as student selection was not aleatory and we did not have a similar sample of students undergoing traditional teaching-learning treatments. Two lots of qualitative data were included when the subject ended, which derived from a focus group and open questionnaires, and indicated students' perception of the process.

Sample

The sample included 133 year-one students at the University of Valencia who studied Education Theory in the degrees Pedagogy (two groups, one with 50 students and 62 in the other) and Social Education (one group with 21 students). Of these, 114 were female (85.7%) and 19 were male (14.3%).

(2) We are aware that a quasiexperimental design with a non equivalent control group, and with students who also studied the same subject in the same degree or in another one, but with a traditional methodology, would have been better. It was not possible to take such an initiative given the difficulties it implied, specifically the need to count on research with traditional teachers, who we know exist, but do not accept this type of research.

Received: 23-04-2015 Accepted: 08-07-2015

Instruments

To evaluate university students' learning strategies, we used the *CEVEAPEU* (Questionnaire to Evaluate University Students' Learning Strategies) questionnaire (Gargallo, Suárez-Rodríguez & Pérez-Pérez, 2009), which was designed based on the assumptions of the self-regulated learning theory (Boekaerts, 2006; Pintrich, 1995, 2000 and 2004; Zimmerman, 2002) and includes the three components mentioned in the Introduction.

It comprises 88 items on a 5-grade Likert-type response scale, and is arranges in two scales, six subscales and 25 strategies. Details of its structure are included in Table I, along with its reliability data. The reliability of the whole questionnaire was *á*=.897.

To evaluate the *learning approaches,* we used *CPE* (Study Processes Questionnaire), which is a Spanish translation of the R-SPQ-2F by Biggs, Kember and Leung (2001). It includes 20 items divided into two scales, one with a surface approach and the other with a deep approach. Each scale is formed by 10 items subdivided into two factors that evaluate motives and strategies (surface ones on one scale and deep ones on the other). We used the translation by Hernández Pina, who adapted it to the Spanish population (Abalde et al., 2001). Table II presents its structure and the internal consistency data.

Received: 23-04-2015 Accepted: 08-07-2015

TABLE I. The CEVEAPEU structure and the internal reliability-consistency data

Scales	Subscales	Strategies
Affective strategies, of support and control/ self-management (α = .819)	Motivational strategies (α = .692)	Intrinsic motivation (α = .500)
		Extrinsic motivation (α = .540)
		Task value (α = .692)
		Internal attributions (α = .537)
		External attributions (α = .539)
		Self-efficacy and expectations (α = .743)
		Conception of intelligence being modifiable (α = 595)
	Affective components (α = .707)	Physical state and mood (α = .735)
		Anxiety (α = .714)
	Metacognitive strategies (α = .738)	Knowledge of the evaluation objectives and criteria (α = 606)
		Planning (α = .738)
		Self-assessment (α = .521)
		Control. Self-regulation (α = .660)
	Context-based control strategies, social interaction and resources management strategies (α = .703)	Controlling the context (α = .751)
		Social interaction skills and learning with classmates (α = .712)
Information processing-related strategies (α = .864)	Information seeking and selection strategies (α = .705)	Knowledge of information sources and searches (α = .685)
		Selecting information (α = .630)
	Information processing and use strategies (α = .821)	Acquiring information (α = .677)
		Elaboration (α = .739)
		Organization (α = .810)
		Personalization and creativity. Critical thinking (α = .771)
		Storage. Memorizing. Use of technical mnenomics resources (α = .765)
		Storage. Simple repetition (α = .691)
		Transfer. Using information (α = .656)
		Managing resources to use the acquired information (α = .598)

Source: The Authors

Received: 23-04-2015 Accepted: 08-07-2015

TABLE II. Structure of the CPE and the internal reliability-consistency data.

Scales	Factors
Scale 1, Deep Approach (α = .812) (10 items)	Deep approach (α = .631)
	Deep strategy (α = .688)
Scale 2, Surface approach (α = .795) (10 items)	Surface motive (α = .652)
	Surface strategy (α = .706)

Source: The Authors

To evaluate the methods, all the students answered a *quantitative questionnaire prepared by the research team* when teaching ended according to its usefulness for learning and for personal satisfaction. The assessment scale had five grades (Not at all-A lot).

A *discussion group (focus group)* was also organized in which the participating students who belonged to three groups described the teaching methodology and evaluation used by the teacher, assessed it and made suggestions for improvements.

Fifteen students, five from each group, answered an *open questionnaire, prepared by the research team*, and also described the methodology by assessing it for its usefulness for learning and comparing it with other experimented methods. Finally, they made suggestions for improvements.

Data collection procedure

Students answered the CEVEAPEU and CPE questionnaires when teaching the subject began (the pretest) and contextualized their responses in the way they usually learned, and answered them again at the end (the post-test) by contextualizing their responses about teachers and the subject they had learnt on the website: https://poliformat.upv.es/portal. When teaching ended, students also answered the closed quantitative questionnaire to assess the methodology, a discussion group was

organized and the selected students completed the open assessment questionnaire.

Dynamics and methodology followed in the subject

The three teachers used the same innovative learning-centered methods: for each theme, they presented in class the expected competences, objectives and learning results, along with contents, tasks and materials. Well in advance, teachers uploaded questions/answers of different complexities from each theme to the virtual classroom, which the students answered based on the autonomous work they did with the materials. Later in class, a preliminary assignment was carried out, which included discussion and seeking the group's consensus about the questions that each student had worked on individually. This was followed by an idea-shared session as a large group, led by the teacher, which involved students participating, debating, and providing the necessary explanations and accounts. Classroom practicals were done on each theme to help students acquire skills and practically apply contents, which included study cases, simulations, videos, using pedagogic techniques, etc. These practicals provided group work and idea-shared sessions, in which the teachers mediated. During the 4-month period, students conducted some research as a group with fieldwork about the life-long learning situation in a town, or in a district if they were in a large city. Follow-up sessions were organized in class to council students and to compare the achievements they made. At this point, students had to present their work, which involved the teacher and the other students in their group asking questions, and voicing doubts, considerations, etc., when the final document that witnessed their work was handed to the teacher. This presentation was evaluated by both the teacher and the students who did not participate in the presentation group by means of a public rubrics and evaluation criteria. During the same 4-month period, students had to hand in two portfolios that provided evidence for student learning: questions debated in class, reports of practicals, a metacognitive reflection on the process followed, and self-assessment, with rubrics. The teachers returned the corrected portfolios to the students with their assessments and proposals for improvement, and students could improve the product they had prepared. At the end of the 4-month period, students also sat a written exam on the contents they had worked on.

Received: 23-04-2015 Accepted: 08-07-2015

Thus the following methods were employed for teaching:

- Participative master class
- Question time
- Discussion in a small group about the questions prepared, idea-shared session in a large group, and general discussion with the teacher as a mediator
- Classroom practicals
- Preparing research work by cooperative work
- Preparing a portfolio

After the evaluation, several tools were used:

- portfolio (handed in twice and corrected by the teachers to be returned to students to provide them feedback) (60% of the end mark, which represents 20% to the questions prepared by students, 20% to the practicals reports and 20% to the group research work), with evaluation rubrics
- final written open-answer exam about the contents worked on (40% of the end mark)
- co-evaluation of the research work presented by students, using a public rubrics
- student self-assessment

Statistical analysis

The sample's normality was analyzed using the Kolmogorov-Smirnov (K-S) test to determine with what items the parametric tests could be done. The results of the items with normal distribution were submitted to an analysis of variance (ANOVA) (a repeated-measures General Linear Model) which included effect size estimations (*partial* η^2) using SPSS 19.0, and comparing the scores obtained in the pretest with the post-test score. In those cases in which distribution was not normal, the Wilcoxon Z test was used. In such cases, the effect size was estimated by φ (Fritz & Morris, 2012).

Received: 23-04-2015 Accepted: 08-07-2015

Results

In learning strategies

The results are described after first including those with the global questionnaire score, then those obtained with the two scales, the six subscales and the 25 strategies (Table III). Given the large quantity of data, we only included the results of the variables with significant differences. For each variable, the ANOVA F-test was included with the significance of the difference and the partial η^2 value. When the F-test values were below 1, in those cases in which distribution was not normal, non parametric tests were also carried out (the Wilcoxon Z test and estimating its effect sizes by φ). When it was necessary to include the multivariate analysis results to analyze two variables or more, this was done with the results not included in the table because it only includes the results of univariate tests and not of the non parametric tests.

In order to present a simpler discourse, what is indicated below refers to the value of the significance in the F-test, and also to partial η^2 in the overall score, in the strategies and subscales, and all with normal distribution. The same was done with the scores of the strategies. A reference and comment were collected only in those cases in which the non parametric tests provided relevant information: be it because of a higher degree of significance of the differences obtained by the Wilcoxon Z test, or a higher φ value in the effect size estimation.

We found differences in the statistically significant means in the mean overall questionnaire score from the pretest to the post-test, $p < .01$, partial $\eta^2 = .073$, with a medium effect size[3], and improvement in the post-test.

As we went down a specification level, the 2-scale one, which had two variables, a multivariate analysis was done. The results of the change in the joint profile of both scales were also statistically significant (λWilks $1.132 = 5.026$; $p = .027$; partial $\eta^2 = .037$), and the effect size was small.

With the univariate analysis, we obtained statistically significant differences on both scales for the affective strategies of support and

(3) Typically, the proposal of Cohen (1988) has been used to specify the effect size of partial η^2, small size=.01-.06, medium size =>.06-.14 and large size = >.14. In a very recent study on effect size, Fritz & Morris (2012) also interpreted for partial η^2 a small effect size from.01, a medium effect size from.059 and a large effect size from.14. The same authors provided the following evaluation scale for φ: a small effect size from.01, medium from.24 and large from.37.

Received: 23-04-2015 Accepted: 08-07-2015

control, p <.05, partial η^2 =.044, and for the Information processing strategies, p <.01, partial η^2 =.055. The effect size was small.

With the multivariate analysis, we found that the results obtained in the evolution of the joint profile of the six subscales were statistically significant (λWilks $_{6.68}$=3.081; p=.008); partial η^2 =.127. The effect size was medium.

We found statistically significant differences in the univariate analysis. We noted improvement in the post-test on three of the six subscales: Metacognitive strategies, p <.01, partial η^2 =.061, Seeking and Selecting, p <.001, partial η^2 =.110 and Processing and Using, p <.01, partial η^2=.055. The effect size was small in the third case and medium in the other two. This did not occur on the other three subscales, and the score was higher in the post-test.

In the multivariate analysis, the joint profile of the 25 learning strategies and their evolution from the pretest to the post-test showed statistically significant differences (λWilks $_{25.104}$=1.768; p<.05; partial η^2 =.298). The effect size was large.

When we move down to the last dimension (strategies), we observed statistically significant differences in eight of the 25 strategies, and improvement in the post-test:

In the two Motivational strategies we found: Intrinsic motivation, p <.05, partial η^2 =.039 and Self-efficacy and expectations, p <.01, partial η^2 =.058. The effect size was small.

Statistically significant differences were noted in one of the Metacognitive strategies with growth in the post-test: Knowledge of objectives and criteria, p <. 05, partial η^2 =.080, with a medium effect size. In the other three, the differences were not significant, and those found in Self-assessment came close to the.05 significant value, p =.094. Improvement was also seen in the post-test.

Significant differences were noted in the Seeking and selecting strategies: Knowledge of sources, p <. 001, partial η^2 =.099, and a medium effect size; Selecting information, p <. 05, partial η^2 =.049, with a small effect size.

Significant differences were observed in the three Processing and using strategies: Elaboration, p <.01, partial η^2 =.058, Personalization and creativity, p <.05, partial η^2 =.033 -in this case, the significance value in the Wilcoxon Z test was higher and φ= 0.2415-; Storage and memorizing, p <.075, partial η^2 =.033. The effect sizes were small and medium.

Received: 23-04-2015 Accepted: 08-07-2015

Therefore, we can state that students' learning strategies improved and this improvement was greater in the Motivational, Metacognitive, seeking and selection, and Processing and using strategies, which are strategies in which the implemented teaching and evaluation dynamics can have a positive and stronger influence. Not all the strategies significantly improved: in some cases, strategies referred to conceptions, which are not easy to change (as with Strategy 7, which referred to Conceiving intelligence), while in others, elements were not controlled in the subject (as in Strategy 8, Physical state and mood, or as in strategy 9, Controlling anxiety, areas which, at the end of the 4-month period, when there are exams and all the stress that comes with them, can affect students' perception). In any case, nearly all the strategies improved in the post-test, but they did not all show significant differences.

Received: 23-04-2015 Accepted: 08-07-2015

TABLE III. The ANOVA F-test and the significance of the differences in the learning strategies (pretest-post-test).

Strategies		Mean	SD	F	partial η^2	Z	φ
Overall score	Pretest	3.7140	.38650	10.151*	.073		
	Post-test	3.7978	.36746				
Scale 1 Affective strategies of support and control	Pretest	3.7970	.38224	5.924*	.044		
	Post-test	3.8617	.34457				
Scale 2 Processing and using information strategies	Pretest	3.7050	.49117	7.484*	.055		
	Post-test	3.8084	.47394				
Subscale 3 Metacognitive strategies	Pretest	3.6891	.50991	8.303**	.061		
	Post-test	3.8102	.44777				
Subscale 5 Seeking and selecting information strategies	Pretest	3.1725	.50780	15.784***	.110		
	Post-test	3.3356	.52204				
Subscale 6 Processing and using information strategies	Pretest	3.7050	.49117	7.484**	.055		
	Post-test	3.8084	.47394				
Strategy 1 Intrinsic motivation	Pretest	4.1189	.60352	5.130*	.039		
	Post-test	4.2455	.58113				
Strategy 6 Self-efficacy and expectations	Pretest	3.8805	.70410	7.909**	.058		
	Post-test	4.0362	.57799				
Strategy 10 Knowledge of objectives and eval. criteria	Pretest	3.7364	.82698	11.186**	.080		
	Post-test	4.0000	.71807				
Strategy 16 Knowledge of sources and seeking information	Pretest	3.0833	.67700	14.002***	.099		
	Post-test	3.3030	.69713				
Strategy 17 Selecting information	Pretest	3.2616	.51526	6.605*	.049		
	Post-test	3.3682	.52247				
Strategy 19 Elaboration	Pretest	3.3140	.87590	7.872**	.058		
	Post-test	3.5013	.72184				
Strategy 21 Personalization and creativity, Critical thinking	Pretest	3.5647	.86165	4.385*	.033	-3.344**	0.2415
	Post-test	3.7097	.65461				
Strategy 22 Storage, Memorizing	Pretest	3.4922	.89118	10.342**	.075	-2.735**	0.1452
	Post-test	3.7028	.89121				

N= 133; gl= 1 and 132; *p <.05 **p <.01 ***p <.001
Source: The Authors

In learning approaches

As in the previous case, we only included the results of the variables that showed significant differences in the table. As all the variables in this case showed normal distribution, the results of the non parametric tests were not included.

Received: 23-04-2015 Accepted: 08-07-2015

In the multivariate analysis, the results that referred to the change in the joint profile of the two approaches/scales were also statistically significant (λWilks $_{1.132}$=9.469; p=.000; partial η^2 =.126). The effect size was medium.

In the univariate test, statistically significant differences were found in the overall score of the deep approach, which increased in the post-test, partial η^2 =.126, with a medium effect size. No such differences were found, however, in the overall score of the surface approach, and scores lowered in the post-test.

Moreover the results obtained about how the joint profile evolved of the four subscales/factors reflected statistically significant changes from the pretest to the post-test (λWilks $_{4.129}$=4.759; p=.001); partial η^2 =.129, with a medium effect size.

The univariate analysis obtained statistically significant differences in the partial scores of the deep approach, and higher scores in the post-test: for the Deep Motive, p<.001, partial η^2 =.094, and for the Deep Strategy, partial η^2 =.109, with a medium effect size. No differences were observed in the partial scores of the Surface Approach or for Motive (p=.080). The same occurred in the scores of the Strategy (p=.355), which lowered in the post-test.

Therefore, the Deep Approach scores considerably improved with a large effect size, while the Surface Approach scores lowered, but no significant differences were observed.

TABLE IV. The ANOVA F-test and the significance of the differences in the learning approaches between the pretest and post-test.

Approaches		Mean	Standard deviation	F	partial η^2
Deep approach	Pretest	3.1891	.68238	18.974***	.126
	Post-test	3.4148	.59928		
Deep strategy	Pretest	3.0744	.71918	16.163***	.109
	Post-test	3.3048	.62233		
Deep motive	Pretest	3.3038	.74706	13.630***	.094
	Post-test	3.5263	.65668		

N= 133; gl= 1 and 132; *p <.05 **p <.01 ***p <.001
Source: The Authors

Received: 23-04-2015 Accepted: 08-07-2015

Student Assessments

Students assessed the methodology employed in two ways: quantitatively with a closed questionnaire, and qualitatively with a group discussion and an open questionnaire.

Quantitative Results

When teaching ended, students completed a questionnaire prepared by the research group to assess the teaching and evaluation methods used by teachers. For each one, its utility for learning and student's personal satisfaction were assessed on a 5-grade scale (Not at all-A lot) (Table V).

All the teaching methods were positively assessed and obtained high scores for their usefulness for learning, except for students' presentations with a mean of 3.92, and class discussion with a mean of 3.94 (even so, the percentage of acceptance, obtained by summing responses Quite a Lot and A Lot, came to 69.4% for the former and 76.1% for the latter). All the other methods exceeded the mean of 4 (the percentages of acceptance, obtained by summing responses Quite a Lot and A Lot, came to 75% in most cases and 80% in quite a few).

The methods that students best assessed were personal work corrected by the teacher, seminars, portfolios, cooperative work and classroom practicals.

The assessments made on students' personal satisfaction were also positive, but slightly lower for the master class, and for question time and students' presentations, with results that came close to a mean of 4. For the two first methods, students considered their usefulness with a high grade, and with a slightly lower one for personal satisfaction: the master class obtained 80.3% of acceptance of its usefulness, and 68% for satisfaction; question time obtained 85.6% acceptance of its usefulness and 76.1% for satisfaction; presentations rated 69.4% for its usefulness, with 80% for satisfaction. All the other methods obtained high scores, with a mean of 4 for planned tutorials, and the others obtained mean scores of over 4 (the percentages of acceptance, obtained by summing responses Quite a Lot and A Lot, came to 75% in most cases and 80% in quite a few).

Received: 23-04-2015 Accepted: 08-07-2015

The best assessed methods were personal work corrected by the teacher, seminars, portfolios, classroom practicals and cooperative work.

All the evaluation methods were positively valued for their usefulness, with high scores above the mean score of 4, except for the first three (self-assessment, co-evaluation and written tests), which exceeded the mean of 3.5 (in this case, the percentages of acceptance, obtained by summing responses Quite a Lot and A Lot, came to 60.5% for self-assessment, 57% for co-evaluation and 61.9% for written tests). This is a more than acceptable grade of positive evaluation. The highest score went to portfolios (a mean of 4.27 and an acceptance percentage of 90.7%), when we grouped the responses Quite a Lot and A Lot, where assessments that used the A Lot option were the highest, with 54.3% of acceptance.

The assessments made of personal satisfaction with the evaluation methods followed a similar pattern, and the three methods that obtained a mean score that reflected a less positive evaluation were the first three, although the mean was always above 3.5 (the percentages of acceptance, obtained by summing responses Quite a Lot and A Lot, came to 54.7% in the first case, 53.3% in the second case and 57.7% in the third). Moreover, the highest positive evaluation went to portfolios (a mean of 4.21 and an acceptance percentage of 78.7%). Although this percentage, which included the Quite a Lot and the A Lot responses, was slightly lower than in other evaluation methods, it obtained more A Lot responses, and an acceptance percentage of 50.8%.

The most evaluated methods in both cases were portfolios, group works, individual works and oral presentations.

Received: 23-04-2015 Accepted: 08-07-2015

TABLE V. Grade of utility of the methods for obtaining knowledge and skills (means and percentages)

TEACHING METHODS	UTILITY							SATISFACTION						
	Mean	SD	PERCENTAGES					Mean	SD.	PERCENTAGES				
			Not at all	A little	Quite	Quite a Lot	A Lot			Not at all	A little	Quite	Quite a Lot	A Lot
Master class (expository methodology)	4.01	.945	1.5	8.3	9.8	48.5	31.8	3.74	1.031	1.5	8.3	9.8	48.5	31.8
Questions on the subject to comment on in class	4.17	.777	0.8	2.3	11.4	50.0	35.6	3.88	.785	0.0	3.1	18.8	53.1	25.0
Expositions and student presentations	3.92	.829	0.0	3.8	26.7	42.7	26.7	3.87	.798	0.8	2.5	26.7	49.2	20.8
Cooperative work	4.30	.730	0.0	2.3	9.1	44.7	43.9	4.14	.846	0.8	3.3	14.8	43.4	37.7
Personal work corrected by the teacher	4.46	.749	0.8	0.8	8.5	31.5	58.5	4.37	.754	0.0	2.5	9.1	37.2	51.2
Classroom practicals	4.26	.837	1.5	1.5	12.2	39.7	45.0	4.27	.775	0.8	0.8	12.5	42.5	43.3
Planned tutorials (not in class)	4.06	.998	0.0	6.5	25.8	22.8	45.2	4.00	.926	0.0	6.9	20.7	37.9	34.5
Class discussions	3.94	.908	2.8	2.8	18.3	49.3	26.8	4.04	.754	1.3	2.5	11.3	61.3	23.8
Case studies	4.00	.926	1.2	3.5	24.7	35.3	35.3	4.01	.893	1.3	1.3	26.7	36.0	34.7
Seminars	4.39	.767	0.0	2.6	9.2	34.2	53.9	4.29	.858	0.0	4.1	13.7	31.5	50.7
Research work	4.16	.858	0.8	3.1	16.0	39.7	40.5	4.12	.788	0.0	2.5	18.0	44.3	35.2
Portfolios	4.35	.822	1.5	0.8	10.7	35.1	51.9	4.27	.840	1.6	1.6	10.6	40.7	45.5
EVALUATION METHODS	UTILITY							SATISFACTION						
Self-assessment	3.68	.935	1.6	8.5	29.5	41.1	19.4	3.53	.906	2.6	8.5	34.2	42.7	12.0
Co-evaluation	3.59	.885	3.8	2.5	36.7	44.3	12.7	3.55	.793	1.3	5.3	40.0	44.0	9.3
Short-answer written tests	3.71	1.126	4.8	9.5	23.8	33.3	28.6	3.65	1.001	2.8	8.5	31.0	36.6	21.1
Oral presentations showing theme s-works …	4.05	.799	0.0	3.1	20.2	45.7	31.0	3.90	.947	2.5	5.0	20.0	45.0	27.5
Individual works	4.18	.884	1.6	3.2	12.1	41.9	41.1	4.02	.891	2.5	1.6	18.9	45.9	31.1
Group works	4.30	.731	0.0	2.3	9.2	45.0	43.5	4.11	.907	1.6	4.1	13.9	42.6	37.7
Portfolios	4.42	.757	0.8	1.6	7.0	36.4	54.3	4.21	.989	2.5	3.3	15.6	27.9	50.8

Source: The Authors

Qualitative Results (discussion group and qualitative questionnaire)

A discussion group was organized with seven students, two from each Pedagogy degree group and three from the Social Education group (5 females and 2 males).

One group of 15 students, five from each group (11 females and 4 males), completed the open qualitative questionnaires.

Students were selected according to the following criteria: they had to be males and females according to the percentage adapted to the gender distribution in each group; from each class, at least one student with good performance/high implication/participation, and another with average performance/implication/participation should be selected.

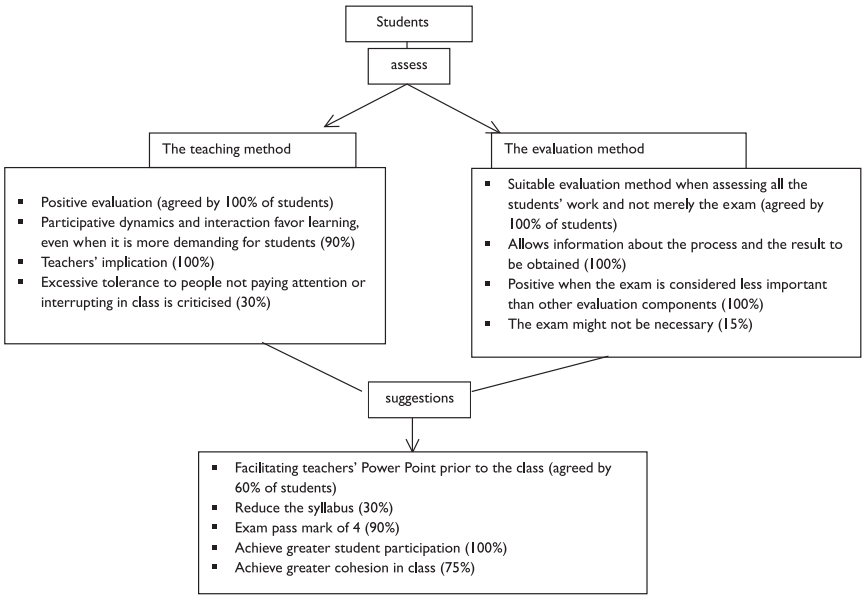
In both the discussion group and questionnaires, among other matters, students were asked to briefly describe the teaching and evaluation method employed by the teacher, and to assess it for its usefulness for learning by comparing it with other experimented methods. They were also asked to make suggestions to improve it.

This group was led by an expert, and interventions were recorded and transcribed. The results of both procedures underwent a content analysis by two expert judges to delimit analysis categories, frequencies of responses and their interpretation, using an inductive-deductive system that specified categories by using previously determined categories and then including new categories whenever necessary.

The conceptual map below includes the most relevant contributions made. We selected only those that referred to the assessments made of the methods and to the suggestions made to improve them.

Received: 23-04-2015 Accepted: 08-07-2015

FIGURE I. Conceptual Map. Qualitative Results



Discussion and Conclusions

The objective of this work was to analyze the incidence of the student-centered methodology in students' learning strategies and approaches, and to evaluate the teaching process.

The results have allowed us to confirm most of the hypotheses put forward, and the scores of the strategies and approaches improved in the post-test.

Significant differences were obtained in students' learning strategies in the overall score, on the two scales and in three of the six subscales: Metacognitive, Seeking and Selecting; Processing and Using. The differences observed in eight strategies were statistically significant: Intrinsic motivation, Self-efficacy and expectations, Knowledge of objectives, Knowledge of sources, Selection, Elaboration, Personalization and creativity and Storage/memorizing.

Received: 23-04-2015 Accepted: 08-07-2015

Although the differences in the other strategies were not statistically significant, they improved in the post-test.

The learning approach scores also improved, the Deep approach scores increased, and statistically significant scores were obtained for the overall approach score, and also in the partial scores in motive and strategy.

Students' assessments of the methods and techniques employed for teaching and evaluations were positive, with high evaluations made for both their usefulness for learning, and personal satisfaction in using them for most of the methods employed.

These results are relevant as using learning-centered methods improves both students' learning strategies and approaches. This is stressed particularly in Motivational strategies, which confirms the opinion of teachers, who understand that using such methods improves student motivation. They are also relevant in the Metacognitive strategies, which is coherent with the work expected of students, who demand such skills; in strategies Seeking and Selecting, and also in Processing and Using, which are expected for the tasks undertaken with students.

The subject teaching consideration also expects to find the Deep approach among students, who work with tasks that demand critical thinking, preparation, providing their own proposals, etc. Thus students' deep learning approach increased significantly.

These results coincide with those reported in previous research, which verified that teachers' teaching and evaluation methods influenced the way their students learned (Gargallo, 2008; Gargallo, Garfella, Pérez & Fernández, 2010).

Other works have employed similar considerations, mainly with small groups, as we did. One example of such is Armbruster et al. (2009), who worked with students in introductory Biology classes in a North American university. This work indicated improvements in the form of students showing more interest, self-managed learning, etc. These authors moved from a master class methodology to one that was more learning-centered, which was developed by the teachers themselves after redesigning the course and using problem-solving approaches in groups, and formative and self-assessment evaluation elements.

Tien et al. (2002) experimented with group work led by Organic Chemistry students in a North American university. Researchers redesigned the course by also training leaders for each group. They

Received: 23-04-2015 Accepted: 08-07-2015

organized group problem-solving workshops where students had to reflect on the process followed. The leaders of each group emphasized these metacognitive-type reflexive processes. This work improved students' performance, memorizing and attitudes.

Tessier (2007) used peer tutorials as a complementary working method of the expository methodology in such a way that, after previously becoming experts on part of the syllabus, the General Biology students who took part in a primary education teacher training program taught each other in small groups. They obtained better learning results and better qualifications than with conventional methods.

In this context, our work is relevant for the results it presents and the process it followed because it employed a more integrating methodological approach that went beyond those used in the analyzed studies, which introduced highly specific practices. The combination of methods employed for teaching, and the formative evaluation and the self-assessment practice, improved the learning strategies and increased the deep learning approach.

We realize it would be ideal to implement learning-centered methods in learning degrees throughout centers and, if at all possible, througout the university. This is the case of Kember's initiative in 2009, who managed to make relevant and significant changes during 2 years in students' perception of the learning environment and teachers' action (increased active learning, teaching for understanding, etc.), and also in students developing their skills (critical thinking, self-managed learning, etc.), after the teachers involved introduced innovative methods. We are also aware of some obstacles to be overcome: need for organizational changes (De La Sablonière et al., 2009); quality teacher training (Gibbs & Coffey, 2004), etc. In the meantime, works like that presented herein can act as an incentive for other teachers to engage in such dynamics.

Before finishing this work, we wish to point out some study limitations: our sample is not representative of either the university or the degrees. In order to be more rigorous, a quasiexperimental design should have been used; Footnote 2 provides the reasons why we used a preexperimental design. Quite often in educational research, what is desirable is not always feasible.

Received: 23-04-2015 Accepted: 08-07-2015

Bibliographical References

Abalde, E., Muñoz, M., Buendía, L., Olmedo, E. Mª., Berrocal, E., Cajide, J., Soriano, E. Hernández Pina, F., García, M.P. & Maquillón, J. (2001). Los enfoques de aprendizaje en estudiantes universitarios españoles. *Revista de Investigación Educativa. 19* (2), 465-489.

Armbruster, P., Patel, M., Johnson, E. & Weiss, M. (2009). Active learning and student-centered pedagogy improve student attitudes and performance in introductory biology. *Education, 8*, 203-213.

Boekaerts, M. (2006). Self-regulation and effort investment. En E. Sigel & K.A. Renninger (Vol. Eds.), *Handbook of Child Psychology, Vol. 4, Child Psychology in Practice* (pp. 345-377). Nueva York: John Wiley & Sons.

Biggs, J. (1993). What do inventories of students' learning processes really measure? A theoretical review and clarification, *British Journal of Educational Psychology, 63,* 3-19.

Biggs, J. (2005). *Calidad del aprendizaje universitario*. Madrid: Narcea.

Biggs, J., Kember, D. & Leung, D.Y.P. (2001). The revised two-factor Study Process Questionnaire: R-SPQ-2. *British Journal of Educational Psychology, 71*, 133-149.

Bista, K. (2011). How to Create a Learning-Centered ESL Program. *English for Specific Purposes World, 10* (31), 1-13.

Campbell, C. (2012). Learning-Centered Grading Practices. *Leadership, 41* (5), 30-33.

Christopher, C.M. & Rust, F O'C. (2006). Learning-Centered Assessment in Teacher Education. *Studies in Educational Evaluation*, 32 (1), 73-82

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

De La Sablonnière, R., Taylor, D.M. & Sadykova, N. (2009). Challenges of applying a student-centred approach to learning in the context of Education in Kyrgystan. *International Journal of Educational Development, 29*, 628-634.

EI, ESU (2010). *Student-Centred Learning. An Insight into Theory and Practice*. Brussels: Education International, European Students' Union.

Entwistle, N. (1995). Frameworks for understanding as experienced in essay writing and in preparing for examinations. *Educational Psychologist, 30*, 47-54.

Received: 23-04-2015 Accepted: 08-07-2015

Entwistle, N. & Peterson, E. (2004). Learning styles and approaches to studying. En Ch. Spielberger (Ed.). *Encyclopedia of Applied Psycology,* Vol. 2 (pp. 537-542). Amsterdam: Elsevier.

Fritz, C. O. & Morris, P. E. (2012) Effect Size Estimates: Current Use, Calculation, and Interpretation. *Journal of Experimental Psychology*: General. 141:1, pp. 2-18.

García Valcárcel, A. (1993). Análisis de los modelos de enseñanza empleados en el ámbito universitario, *Revista Española de Pedagogía, 194,* 27-53.

Gargallo, B. (2008). Estilos de docencia y evaluación de los profesores universitarios y su influencia sobre los modos de aprender de sus estudiantes. *Revista Española de Pedagogía, 241,* 425-445.

Gargallo, B., Fernández, A., Garfella, P.R & Pérez, C. (2010*). Modelos de enseñanza y aprendizaje en la universidad*. Madrid, Universidad Complutense. Recuperado de: http://pendientedemigracion.ucm.es/info/site/docu/29site/ponencia3.pdf

Gargallo, B., Suárez-Rodríguez, J. & Pérez-Pérez, C. (2009). El cuestionario CEVEAPEU. Un instrumento para la evaluación de las estrategias de aprendizaje de los estudiantes universitarios. *RELIEVE, 15.* Recuperado de: http://www.uv.es/relieve/v15n2/RELIEVEv15n2_5.htm

Gibbs, G. & Coffey, M. (2004). The impact of training of university teachers on their teaching skills, their approach to teaching and the approach to learning of their studentes. *Active Learning in Higher Education, 5* (1), 87-100.

Hannafin, M. (2012). Student-Centered Learning. in N.M. Seel (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 3211-3214). New York: Springer.

Heise, B.A. **& Himes, D. (2010). Educational Innovation: The Course Council-An example of student-centered learning. *Journal of Nursing Education*, 49(6), 343-345. doi:10.3928/01484834-20100115-04.**

Hernández, R. (2012). Does continuous assessment in higher education support student learning? *Higher Education*, 64, 489-502. DOI 10.1007/s10734-012-9506-7

Kember, D. (2009). Promoting student-centred forms of learning across an entire university. *Higher Education, 58*, 1-13.

Received: 23-04-2015 Accepted: 08-07-2015

Kember, D. & Gow, L. (1994). Orientations to teaching and their effects on the quality of student learning, *Journal of Higher Education, 65* (1), 59-74.

Kember, D. & Kwan, K. (2000). Lecturers' approaches to teaching and their relationship to conceptions of good teaching. Instructional Science, *28*, 469-490.

Machemer, P.L. & Crawford, P. (2007). Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education, 8* (1), 9-30.

McCune, V. & Entwistle, N. (2011). Cultivating the disposition to understand in 21st century university education. *Learning and Individual Differences, 21* (3), 303-310.

Monereo, C. & Pozo, J.I. (2003). *La universidad ante la nueva cultura educativa. Enseñar y aprender para la autonomía.* Madrid: Síntesis.

Mostrom, A. & Blumberg, P. (2012). Does Learning-Centered Teaching Promotes Grade Improvement? *Innovative Higher Educacion, 37* (5), 397-405.

Nitza, D. (2013). Learning-centered teaching and backward course design-From transferring knowledge to teaching skills. *Journal of International Research,* 9 (4), 329-338.

Pintrich, P. R. (1995). Understanding self-regulated learning. *New Directions for Teaching and Learning, 63*, 3-12.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. En M. Boekaerts, P. Pintrich y M. Zeidner (Eds.), *Handbook of Self-Regulation* (pp. 451-502). California. Academic Press.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16* (4), 385-407.

Pucha, R. & Utschig, T. (2012). Learning-Centered Instruction of Engineering Graphics for Freshman Engineering Students. *Journal of STEM Education: Innovations and Research, 13* (4), 24-33.

Samuelowicz, K. & Bain, J.D. (2001). Revisiting academics' beliefs about teaching and learning, *Higher Education, 41,* 299-325.Tessier, J. (2007). Small-group peer teaching in an introductory biology classroom. *Journal of College Science Teaching 36* (4), 64-69.

Received: 23-04-2015 Accepted: 08-07-2015

Tien, L.T., Roth, V. & Kampmeier, J.A. (2002). Implementation of a peer-led team learning instructional approach in an undergraduate organic chemistry course. *Journal of Research in Science Teaching 39* (7), 606-632.

Weinstein, C.E., Husman, J. & Dierking, D. (2002). Self-Regulation Interventions with a focus on learning strategies. En M. Boekaerts, P.R. Pintrich y M. Zeinder, *Handbook of Self-regulation* (pp. 727-747). San Diego: Academic Press.

Yip, M.C.W. (2012). Learning strategies and self-efficacy as predictors of academic performance: a preliminary study. *Quality in Higher Education, 18* (1), 23-34.

Zabalza, M.A. (2012). Metodología docente. *REDU (Revista de Docencia Universitaria, 9* (3), 75-98.

Zimmerman, B.J. (2002). Becoming a self-regulated learner: an overview. *Theory into Practice, 41*, 64-70.

Zimmerman, B.J & Schunk, D.H. (2011). *Handbook of self-regulation or learning and performance.* New York: Routledge.

Contact address: Bernardo Gargallo. Universidad de Valencia, Facultad de Filosofía y Ciencias de la Educación, Departamento de Teoría de la Educación. Avda. Blasco Ibáñez, 30; 46010-Valencia. E-mail: Bernardo.gargallo@uv.es

Received: 23-04-2015 Accepted: 08-07-2015

La *Revista de Educación* es una publicación científica del Ministerio de Educación, Cultura y Deporte español. Fundada en 1940, y manteniendo el título de *Revista de Educación* desde 1952, es un testigo privilegiado de la evolución de la educación en las últimas décadas, así como un reconocido medio de difusión de los avances en la investigación y la innovación en este campo, tanto desde una perspectiva nacional como internacional. La revista es editada por la Subdirección General de Documentación y Publicaciones, y actualmente está adscrita al Instituto Nacional de Evaluación Educativa de la Dirección General de Evaluación y Cooperación Territorial.

GOBIERNO DE ESPAÑA
MINISTERIO DE EDUCACIÓN, CULTURA Y DEPORTE

NIPO línea: 030-15-016-X
NIPO ibd: 030-15-017-5
ISSN línea: 1988-592X 0034-8082
ISSN papel: 0034-8082

www.mecd.gob.es/revista-de-educacion