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## Autonomous work and skill learning strategies applying problem-based learning: Experience of innovation in subjects related to disability

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### ABSTRACT

The present article seeks to discover the autonomous work strategies used by students studying different degrees: Social Education, Early Childhood Education and Pedagogy, applying the methodology of problem-based learning and determining student profiles according to their learning strategies. We also sought to explore the relationship between the strategies used and the level of achievement in the skills evaluated through self-assessment and teacher assessment. The Autonomous Work Strategies Questionnaire was applied to 239 students of the Faculty of Education Sciences of UGR. The results showed unequal use of learning strategies, with levels of use varying according to the degree studied. We also verified the existence of a profile of students who had made greater use of the autonomous learning strategies, which was associated with better results. The results are discussed and it is suggested that it would be advisable to continue with this methodology in other courses and degrees.

### KEYWORDS

Autonomous learning;  
problem-based learning;  
disability; teaching  
innovation; competence

## Introduction

The implementation of the European Higher Education Area (EHEA) in recent years has led to major changes in the Spanish university system: both at an organisational level and in teaching practice. This process of transformation has brought about an educational model that promotes reflexive, critical and meaningful learning for the student (Asikainen, Parpala, Lindblom-Ylänne, Gert Vanthournout, & Coertjens, 2014). As a result of this learning, students are expected to acquire the necessary skills for their professional work (Correa & Paredes, 2009); understood as the knowledge necessary to carry out their particular professional or technical work well (De Miguel, 2006). In this context, teachers must seek to promote and develop the cognitive strategies that most help their students to achieve quality learning (Carbonero, Román, Martín-Antón, & Reoyo, 2009).

For this reason, the methodology used by teaching staff is fundamental, not only to achieving the objectives of learning, but also because it will influence the student's own working

methods. It has been observed that the climate created in the classroom and the support offered by the teacher are important, since they affect the learning strategies used by students (Baas, Castelijns, Vermeulen, Martens, & Segers, 2015; Rieser, Fauth, Decristan, Klieme, & Büttner, 2013). Various definitions of learning strategies have been proposed (López-Aguado, 2010; Yip, 2012), most of them illustrating the multidimensional character of this construct, as well as its importance in the process of learning to learn. As these learning strategies enable the student to achieve a learning objective in interactive contexts, it is understandable that they are currently arousing considerable interest in the study of skills learning. Likewise, several studies have found that the choice of certain teaching and evaluation procedures, as well as the nature of the task to be performed, determines students' use of certain strategies (Dinsmore & Alexander, 2016; Gargallo & Suárez, 2014). Equally, factors such as previous education, gender, and the extent of the student's experience or interest seem decisive in the level and use of learning strategies (Alexander, 2004; Vermunt & Donche, 2017). It has been possible to prove that university students use a small number of strategies (De la Fuente & Justicia, 2003), while those students who use more and better strategies have the best academic performance (Gargallo & Suárez, 2014; Martín, García, Torbay, & Rodríguez, 2008), even enabling them to achieve the profile of an excellent student (Gargallo & Suárez, 2014; Yip, 2012).

In short, the findings suggest that the development of strategies probably depends on the learning context (Dinsmore, 2017). In that case, it should be feasible to design and implement programmes that would enable more effective learning strategies to be planned, in order to improve students' academic performance (Aghaie & Zhang, 2012; Cantrell et al., 2014; Park & Kim, 2014). Therefore, the work of teachers should consist of planning and designing learning activities that promote the development of students' strategies and competencies. The use of active methodologies in the classroom responds to these objectives, while also improving the quality of student learning. Such methods encourage student participation, and involve students in the construction of their own knowledge, as in problem-based learning (PBL) (Dolmans, Loyens, Marcq, & Gijbels, 2016; Marklin & Hancock, 2010). Through this technique, students are faced with situations in which they must use information search strategies; apply new knowledge to solve realistic problems; make decisions; and work autonomously, reflexively and critically (Drăghicescu, Petrescu, Cristea, Gorghiu, & Gorghiu, 2014; Hmelo-Silver & Barrows, 2006; Yeung, Au-Yeung, Chiu, Mok, & Lai, 2003). In particular, in the case of training in disability care, this methodology is highly recommended since it favours the development of basic professional and social skills essential to students' integral formation (Vardi & Ciccarelli, 2008). In particular, recognition of and respect towards disability is a basic skill for professionals who work with people with functional diversity (López-Torrijo, 2009; Martínez, 2011). It has been shown that the training of this skill specifically generates favourable attitudes towards the inclusion of the group (Liesa, Arranz, & Vázquez, 2013; Polo, Fernández, & Batanero, 2011). The term disability includes both deficiencies and activity and participation limitations (World Health Organization, 2011). The number of people with disabilities is growing all over the world, and therefore it is necessary to offer training that can attend to and satisfy needs related to functional diversity. In this sense, it is essential to determine a measure for evaluating skills in working with people with functional diversity (Lussier & Allaire, 2004). This measure must evaluate the basic skills that the future professional must develop. It should also be carried out in situations close to reality; thus enabling students to use the strategies, skills and knowledge they have learned as a professional within a real context.

For this evaluative task, it is imperative to apply procedures such as self-assessment, a method whereby students make an assessment of their own learning – this procedure being a learning objective in itself (Villardón, 2006).

All this pedagogical reform has led us to develop a teaching innovation project, which aims at improving students' theoretical and practical abilities to deal with disability through the use of PBL. This is intended to discover which autonomous working strategies students of different university degrees use when applying this methodology, and we sought to verify the existence of student profiles according to the learning strategies they employ. In addition, we explored the relationship between the strategies used and the level of achievement in the skills assessed (both through self-evaluation and teacher evaluation).

## Method

### Participants

The project was aimed at students in their second year of undergraduate studies in three subjects that relate to disability across different degree programmes taught in the Faculty of Education Sciences in the University of Granada. The sample was of an incidental type, without missing data. A total of 239 students (18 men and 221 women) with a mean age of 21.5 years ( $SD = 3.74$ ) participated. The degrees and subjects involved, as well as the number of participating students are shown in Table 1.

### Instruments

The Autonomous Work Strategies Questionnaire (CETA) for university students (López-Aguado, 2010) was used. This instrument sets out 6 forms of learning strategies, the first of which is the broadening of the content studied and the activities undertaken. Using this instrument enables us to examine how the student in question relates specifically to the tasks of autonomous learning. It is based on the concept that such strategies are in fact decision-taking processes, which are activated in each specific learning situation as determined by the context. The questionnaire consists of 45 items in a Likert-type format, with five response options numbered from 1 to 5. These are: 1- Never; 2-Seldom, 3-Sometimes; 4-Often; 5-Always. The scale has good psychometric properties, with an average alpha coefficient reliability of .898. Factorial analysis of the questionnaire revealed six strategic factors: expansion (the search for and creation of materials to amplify, and complete, those materials contributed by the teacher), collaboration (the involvement of students in group tasks and their relationships with other partners), conceptualisation (intellectual work related with

**Table 1.** Distribution of students by degrees and subjects.

	Social education	Infant education	Pedagogy	Total
	Subject: <i>Various skills and Social Education</i>	Subject: <i>Development disorders</i>	Subject: <i>Processes and techniques of psycho-educational Interventions</i>	
Men	10	5	3	18
Women	56	100	65	221
Number	66	105	68	239
%	27.6	43.9	28.5	100

Skills and descriptors	1 None	2 Little	3 Some	4 A lot
<b>Organization and planning</b>				
I involve myself in the accomplishment of the group tasks. I meet work deadlines. I attend class sessions I plan and organize the work sessions in advance.				
<b>Teamwork</b>				
I participate actively, sharing information, experiences and knowledge. I take the points of view of others into account. I accept and follow the group rules. I ask for ideas and opinions to make decisions.				
<b>Problem resolution</b>				
I am able to identify and define a problem as well as the factors or elements involved in it. I investigate and seek information necessary to solve the problem, analysing this information. I present different alternative solutions to the same problem, evaluating their possible risks and advantages.				
<b>Interpersonal skills</b>				
I have the ability to put myself in the other's place. I listen actively, looking at the face of the person with whom I am interacting and with an appropriate posture. I speak in an appropriate tone of voice.				
<b>Oral and written communication</b>				
I transmit ideas in a clear and organized way. My oral expression is correct. My written expression is correct.				

Figure 1. Rubric of skills and descriptors.

the drawing up of schemes, conceptual maps, etc.), planning (time and task planning: relating both to study and to designing work), examination preparation (selection of important content and revision activities) and participation (the level of the student's participation in tasks and activities, such as their attendance at tutorials, their participation in class, etc.).

It also used rubrics for self-assessment and hetero-evaluation of students. Following the recommendations of Mertler (2001), a rubric was designed to assess performance levels with different descriptors (Figure 1). These tools provide information on the degree of a student's achievement and enable learning objectives to be clarified. The descriptors served as a guide for the design of the problems that all the students had to solve in group and for the evaluation of learning outcomes.

## Procedure

This is a quantitative, non-experimental, cross-sectional design study. After the selection of the participating groups, the teachers responsible for the subjects in question selected the skills to be promoted through the PBA methodology. The skills included in the whitepapers for the degrees in Social Education, Pedagogy (ANECA, 2005) and Teacher Training (ANECA, 2004) were taken as references; specifically those considered by graduates and associations to be most relevant to the profile of attention to diversity (ANECA, 2004, 2005).

We selected a minimum, base level of skills that would be relevant to the future education professional: the ability to organise and plan, oral and written communication, teamwork,

interpersonal skills, problem solving, and recognition of and respect for disability. At the end of the course, the students completed the CETA questionnaire and the rubrics for self-assessment and hetero-evaluation, clarifying the teachers' doubts about the instruments used.

### Data analysis

Data analysis was performed using the SPSS statistical package (V.23.0). First, we performed an ANOVA of the scores in the different scales of the CETA according to the degree being studied, in order to analyse the different strategies used by the different groups of students. Then, in order to determine student profiles according to their learning strategies, a cluster analysis of two-stage clusters was performed with scores on the CETA subscales. The number of clusters was determined using the Schwartz Bayesian criterion.

### Results

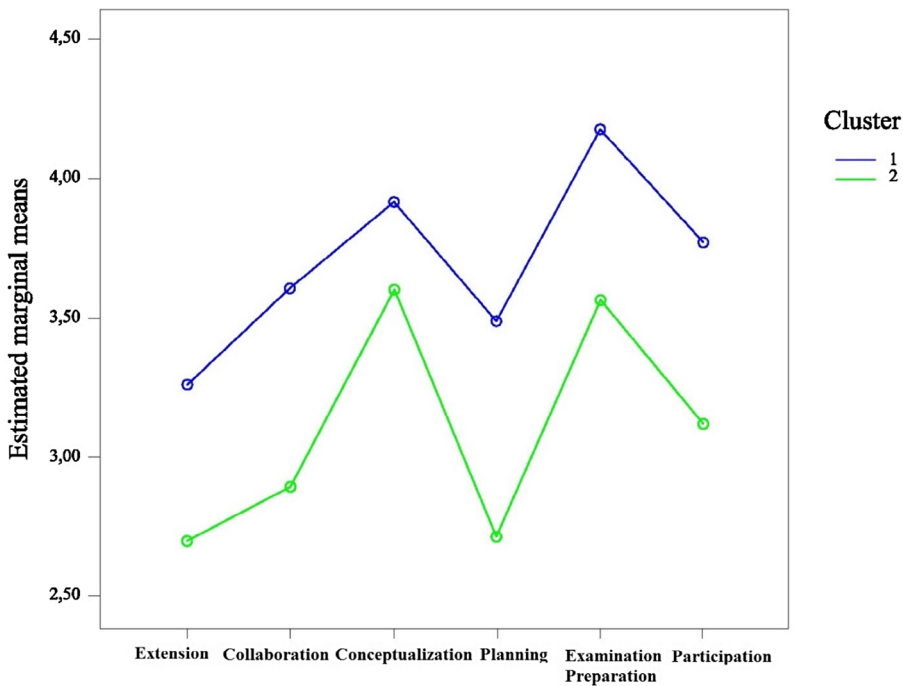
Table 2 sets out the descriptive statistics of the different CETA scales for each degree, as well as the ANOVA results, including estimation of effect size and the results of the multiple comparisons. In the sample surveyed, the strategies that were most used by the students were strategies relating to exam preparation, followed by those related to conceptualisation. Strategies relating to expansion and planning obtained a lower score.

According to the degree studied, significant differences were observed in collaboration strategies ( $F = 3.10, p = .047$ ), planning, ( $F = 6.10, p = .003$ ), examination preparation ( $F = 3.18, p = .043$ ) and participation ( $F = 9.46, p = .000$ ) (see Table 2). No differences were found in the use of strategies between genders ( $p > .050$ ). We found significant differences in the following pairs of groups ( $p < .05$ ): in the collaboration scale between Pedagogy ( $M = 3.39, DT = .47$ ) and Social Education ( $M = 3.15, ST = .59$ ); in the planning scale between Early Childhood Education ( $M = 3.04, SD = .71$ ) and Pedagogy ( $M = 3.37, SD = .65$ ), and also between Social Education ( $M = 2.69, SD = .85$ ) and Pedagogy ( $M = 3.37, SD = .65$ ); in examination preparation between Early Childhood Education ( $M = 3.80, SD = .48$ ) and

**Table 2.** Descriptive Statistics and ANOVA by titration of the different CETA scales.

		<i>N</i>	<i>M</i>	<i>ST</i>	<i>F</i>	<i>P</i>	$\eta^2$	Post-hoc
Extension	Early childhood education	105	3.04	.59	1.493	.227	.012	–
	Pedagogy	68	2.89	.47				
	Social Education	66	3.02	.60				
Collaboration	Early childhood education	105	3.26	.57	3.108	.047	.026	P-ES
	Pedagogy	68	3.39	.47				
	Social Education	66	3.15	.59				
Conceptualisation	Early childhood education	105	3.68	.63	1.945	.145	.016	–
	Pedagogy	68	3.80	.66				
	Social Education	66	3.88	.68				
Planning	Early childhood education	105	3.04	.71	6.107	.003	.049	EI-P ES-P
	Pedagogy	68	3.37	.65				
	Social Education	66	2.96	.85				
Preparation for examinations	Early childhood education	105	3.80	.48	3.182	.043	.026	EI-P
	Pedagogy	68	3.98	.46				
	Social Education	66	3.91	.45				
Participation	Early childhood education	105	3.55	.53	9.465	.000	.074	ES-EI ES-P
	Pedagogy	68	3.56	.53				
	Social Education	66	3.20	.61				

Notes: *P* (Pedagogy); *EI* (Infants' Education); *ES* (Social Education).



**Figure 2.** Estimated mean of each cluster in the different CETA scales.

Pedagogy ( $M = 3.98$ ,  $SD = .46$ ); in the participation scale between Social Education ( $M = 3.20$ ,  $SD = .61$ ) and Early Childhood Education ( $M = 3.55$ ,  $SD = .53$ ), as well as between Early Childhood Education ( $M = 3.55$ ,  $SD = .53$ ) and Pedagogy ( $M = 3.56$ ,  $SD = .53$ ).

Cluster analysis extracted two groups of students, the first group composed of 127 students (52.9%) and the second group of 113 students (47.1%) (see Figure 2).

Both groups differed significantly in the use of all strategies, with students in group 1 making greater use of more learning strategies than those in group 2 (see Table 3). As for students' results, the score of students in group 1 were noticeably higher ( $t = 1.99$ ,  $p = .043$ ,  $d = .23$ ).

We also analysed whether the clusters extracted previously, which show two groups of students (some with higher scores in the use of learning strategies and another group with lower scores), reproduced these differences in the development of the different skills both from the point from the view of students' self-evaluation and from the, more traditional, evaluation of the teacher. In order to assess this, the descriptive statistics and difference of means between the two clusters in the different skills evaluated are analysed in Table 4.

It can be seen that, from the point of view of self-evaluation, there are differences in organisational skills ( $t = 2.25$ ,  $p = .026$ ) and communication ( $t = 1.98$ ,  $p = .049$ ); while from the point of view of traditional assessment, the clusters show significant differences in interpersonal skills ( $t = 2.35$ ,  $p = .019$ ) and recognition ( $t = 2.68$ ,  $p = .008$ ). This implies that those students with more autonomous work strategies consider themselves to have developed their skills of organisation and communication. In the case of the teachers' assessments, students with more learning strategies are considered to have developed greater interpersonal and recognition skills.

**Table 3.** Group statistics.

	Cluster	<i>M</i>	<i>SD</i>	<i>T</i>	<i>P</i>	<i>D</i>
Extension	1	3.25	.51	8.704	.000	1.41
	2	2.69	.47			
Collaboration	1	3.60	.39	12.422	.000	1.60
	2	2.89	.49			
Conceptualisation	1	3.91	.63	3.830	.000	.49
	2	3.59	.65			
Planning	1	3.48	.64	9.199	.000	1.20
	2	2.70	.65			
Examination preparation	1	4.17	.35	12.997	.000	1.61
	2	3.56	.38			
Participation	1	3.76	.50	10.552	.000	1.53
	2	3.11	.45			
Numerical Note	1	7.43	1.38	1.990	.043	.23
	2	7.09	1.55			

**Table 4.** Descriptive statistics and difference of means.

	Clusters	<i>M</i>	<i>ST</i>	<i>T</i>	<i>P</i>	<i>d</i>
Self-evaluation organisation	1	3.46	.36	2.250	.026	.30
	2	3.35	.35			
Self-evaluation work	1	3.36	.38	.850	.397	.12
	2	3.31	.42			
Self-evaluation problem solving	1	2.97	.37	1.631	.104	.23
	2	2.88	.40			
Self-evaluation interpersonal skills	1	3.27	.46	.711	.478	.09
	2	3.23	.42			
Self-evaluation communication	1	2.99	.40	1.985	.049	.26
	2	2.87	.51			
Self-evaluation recognition of disability	1	3.58	.38	1.084	.280	.14
	2	3.52	.44			
Teacher evaluation organisation	1	3.55	.96	.747	.456	.10
	2	3.45	1.03			
Teacher evaluation of teamwork	1	3.66	.57	1.726	.086	.23
	2	3.51	.70			
Teacher evaluation of problem solving	1	3.55	.57	1.004	.316	.13
	2	3.47	.64			
Teacher evaluation of Interpersonal Skills	1	3.39	.63	2.359	.019	.33
	2	3.16	.74			
Teacher evaluation of Communication	1	3.16	.87	1.859	.065	.26
	2	2.93	.85			
Teacher evaluation of Recognition of Disability	1	3.98	.11	2.681	.008	.36
	2	3.90	.29			

## Discussion

The work presented here is part of a teaching innovation project of the University of Granada. The main objective of this study was to discover which strategies of autonomous work students participating in the innovation experiment used when applying PBL as a teaching methodology in subjects that deal with disability. Moreover, we tried to determine whether the students could be grouped or classified in different profiles according to the use of these strategies. In addition, we wanted to examine the relationship of these strategies to the achievement of skills, as evaluated through both self- and teacher-evaluation.

The results of the analyses show an unequal use of learning strategies in the materials dealing with disability, differing according to the degree course being studied. Strategies



dealing with collaboration, planning and participation are used to a lesser extent by the students of Social Education compared to Early Childhood Education and Pedagogy. These results could be due, in part, to factors such as previous experience and prior training in the use of such strategies or different, related, teaching skills. Additionally, although the theoretical and practical content and the methodology of teaching activities were similar in all the groups evaluated, this was not the case with the teaching staff, who were different for each degree specialism. As Baas et al. (2015) indicated, it may be that the support given by the teacher, and the teacher's way of interacting with the group, influenced the students' attitudes and motivation in the learning process.

Furthermore, the results confirm the existence of a profile of students who make greater use of the strategies of autonomous learning, and that this is associated with better grades. As indicated by previous research, the findings of this study also prove the existence of a profile of students who demonstrate excellence in learning strategies (Gargallo & Suárez, 2014; Yip, 2012). In this way, it would be possible to group together – or classify – students according to the strategies they use, and subsequently to design suitable tasks and activities in order to improve academic performance. Although the present study only analysed the strategies of autonomous work, it seems significant that those students who had more strategies – and put those strategies into use – achieved better results in matters relating to disability care.

Based on these findings, we consider it desirable to design activities for use in a university context that would enable students to acquire and manage learning strategies, and, in particular, the strategies of autonomous work that are so important within a model that focuses on student learning. This can be carried out either by the development of specific programmes (Aghaie & Zhang, 2012; Cantrell et al., 2014; Park & Kim, 2014) or by redesigning existing study materials, as detailed in the present study: although probably the best results are achieved by combining both actions.

In relation to the development of skills, those students who use more autonomous work strategies perceived themselves as being more competent at organisation. The results of the self-assessment evaluations are logical, since most of the strategies evaluated would be closely related to the organisation and planning of students' work.

With respect to the evaluation carried out by the teaching staff, those students who employed the most strategies were those who achieved a higher level of success in interpersonal skills and recognition of disability; thus implying that the methodology used fostered the learning of these skills and appeared to engender more positive attitudes towards disability. Just as various authors have already pointed out (Liesa et al., 2013; Polo et al., 2011), education and training in the skills of recognition of and respect for disability would generate favourable attitudes towards the social inclusion of the people who form part of this group. This is a fundamental skill for students to develop, since contemporary society exhibits many different forms of discrimination towards people with disabilities, due to the persistence of prejudices and negative stereotypes.

## Conclusion

The study carried out argues there is a need for pedagogical innovation within higher education. Currently, what is required is an integrated training based on skills, which would entail transforming the way in which learning content and tasks are tackled and evaluated

in the university classroom. This experiment shows how a theoretical and practical education that makes use of an active methodology such as PBL stimulates the students' use of learning strategies: so improving their performance. This indicates that a student who employs more, and better, learning strategies will be more able to develop skills and attitudes that promote sensitivity and respect for people with disabilities.

The results obtained in the study suggest that it would be desirable to continue with this methodology, and to focus on improving other learning strategies and skills in which favourable changes have not yet been obtained. For this, it would be necessary to take into account certain limitations of the present study. First, the evaluation of learning strategies has been carried out with a single tool to facilitate the process of information collection. In this sense, we would recommend applying other quantitative or qualitative tools to the study of this question, to confirm and complete the data obtained here. Moreover, within this we have not considered variables such as self-concept or motivation, which may be equally relevant in the learning process.

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### Notes on contributors

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