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Attitude and Learning Approaches in the Study of General Didactics. A Multivariate Analysis☆

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ABSTRACT

The influence of different approaches and attitude towards learning in the General Didactics is studied in few investigations. The main objective of this work is to describe in a multivariate way the relationships between attitude towards General Didactics and learning approaches of students majoring in Social Learning of the University of Salamanca. The Measurement of Attitude towards General Didactics and the Revised Study Process Questionnaire two factor (R-SPQ-2F) questionnaires were used to gather the information. The analysis of the relationship between attitude and learning approaches is performed using the HJ-Biplot. This multivariate statistical technique allows the simultaneous representation of students, attitudes and learning approaches. This methodology, combined with hierarchical clustering method, reveals the existence of four types of students: C1, those characterised by high marks on interest, professional usefulness and deep study of the subject; C2, those that display high anxiety and high marks in superficial study; C3, students that show average interest, low anxiety, superficial study and believe in the professional usefulness of Didactics; and C4, students with high levels of anxiety that study the subject in depth. These results point the existence of a relationship between attitudes and learning approaches and can be used to improve the performance and offerings of educational teams, achieving more efficient strategies that lead to a better educated student community.

Actitud y enfoques de aprendizaje en el estudio de la Didáctica General. Una visión multivariante

Palabras clave:
Didáctica General
Actitud
Enfoques de aprendizaje
HJ-Biplot

RESUMEN

Pocos estudios investigan la influencia de la actitud y enfoques de aprendizaje en la Didáctica General. El objetivo principal de este trabajo consiste en describir, en un sentido multivariante, las relaciones entre la actitud hacia la Didáctica General y los enfoques de aprendizaje de estudiantes del grado de Educación Social de la Universidad de Salamanca. El cuestionario de *Medición de la Actitud hacia la Didáctica General* y el cuestionario de *Proceso de Estudio Revisado de Dos Factores* (R-SPQ-2F) son los instrumentos de recogida de información. El análisis de la relación actitud-aprendizaje se realiza mediante HJ-Biplot, técnica estadística multivariante de representación simultánea de estudiantes, actitudes y enfoques de aprendizaje. Esta metodología, combinada con el análisis de clúster jerárquico, pone de manifiesto la existencia de cuatro grupos de estudiantes: C1, caracterizado por alto interés, utilidad profesional y enfoque profundo; C2, diferenciado por su ansiedad y altas puntuaciones en enfoque superficial; C3, con interés

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medio, baja ansiedad, enfoque superficial y creencia en la utilidad de la Didáctica a nivel profesional; y C4, estudiantes con altos niveles de ansiedad que estudian de manera profunda. Los resultados apuntan a la existencia de una congruencia directa entre actitudes y enfoques de aprendizaje y pueden emplearse para mejorar las prestaciones de los equipos docentes, para lograr estrategias más eficaces que mejoren la calidad de la enseñanza.

Introduction

Student attitudes represent a fundamental pillar for teaching in any field. The teacher's role entails adapting teaching to students, incorporating variables related with students' attitudes, learning approaches and the context in terms of implementation of the teaching-learning process (Demirbas & Demirkan, 2007). Didactic methodologies should be adapted in light of information on learning approaches and their relationship with motivational factors (Hernández-Pina, García, & Maquilón, 2005; Hernández-Pina, García, Martínez, Hervás, & Maquilón, 2002; López & Falchetti, 2009).

Learning approaches

The Student Approaches to Learning (SAL) model proposed by Marton and Säljö (1976) introduces the concepts of *surface* and *deep learning* approaches. This is extended by Biggs, Kember, and Leung (2001) and Kember, Biggs, and Leung (2004) in the 3P model (presage-process-product), which supports a notion of learning in which the student is the focal point. The *deep approach* is related with high intrinsic motivation and meaningful understanding of the task (López & López, 2013); it involves the implementation of strategies that allow relationships to be established between different areas of content (García, Duarte, Rivera, Villalba, & Capacho, in press). The *surface approach* is linked to low motivation and the use of memorisation strategies, resulting in rote learning (Biggs, 1988); there is minimal establishing of relationships between different areas of content and maximal concern for the time invested in the task (Witriw, Molina, & Ferrari, 2014). A preference for one approach over the other may be explained by the motivation underpinning the learning and whether or not there is a focus on understanding meanings. As motivation determines the choice of approach, it is not possible for both approaches to co-exist simultaneously.

The model proposed by Biggs (1991) combines motivational, strategic and contextual variables. Tiwari et al. (2006) suggest that teaching methodology can have an impact on the approach adopted, although Akdemir and Koszalka (2008) do not find evidence of this. Meanwhile, Groves (2005) affirms that employing a teaching methodology that encourages a *deep approach* can increase use of the *surface approach* due to workload and evaluation style.

In general, researchers emphasise the importance of reinforcing a *deep approach* to improve quality of learning (Monroy & Hernández-Pina, 2014), with the adoption of this type of learning being perceived as an indicator of good teaching (Prosser & Trigwell, 2014).

This perception is in turn related with the teacher's knowledge of the subject, the methodology deployed and their personality, all of which can influence the choice of learning approach (Rosário et al., 2014). This means that learning approaches are not necessarily static (García et al., in press; Ullah, 2016); rather, they can change depending on context, emphasising the significance of contextual variables (Dolmans, Loyens, Marcq, & Gijbels, 2016; Esquivel, Rodríguez, & Padilla, 2009; Hernández-Pina, Rodríguez, Ruiz, & Esquivel, 2010).

Attitudes

Attitudes are defined as predispositions or value judgments capable of influencing an individual's behaviour vis-à-vis an object, subject or situation (Schwarz, 2001). According to Ajzen and Fishbein (1977), if an understanding of the attitudinal construct permits prediction of subject behaviour, then knowledge of students' attitudes towards the field of study can also contribute to improving the teaching-learning process. For Baron and Byrne (2002), this influence is complex and moderated by individual and contextual variables and attitude in itself.

Rosenberg and Hovland (1960) suggest that the attitudinal construct is multidimensional. Along these lines, Triandis (1971) and Muñoz and Mato (2008) report the existence of three components: (1) *cognitive*: ideas, thoughts and notions regarding the attitudinal object; (2) *affective*: feelings and emotions of acceptance or rejection vis-à-vis the attitudinal object; and, (3) *behavioural*: actions, intentions, behaviour or tendencies with regard to an attitudinal object.

General Didactics in the Social Learning degree

Teaching on this subject involves a didactic methodology in which the teacher acts as a mediator rather than merely transmitting content. The range of available options allows for attendance in person and remotely, and require different organisational models such as theory classes, seminars, workshops, practical classes, tutorials, individual study/work and group study/work. These models are implemented using different methodologies, including lectures, case studies, profession-related exercises and cooperative project-based and project-focused learning. All of this is intended to encourage autonomous learning, prioritising a professional outlook and a *deep approach* to content in terms of learning. The described methodology is positioned from the perspective defined by Biggs and Tang (2011) as "constructive alignment", aimed at improving teaching quality.

Many students identify problems with their performance in this subject, which they perceive to be a burden. This is one reason for selecting the subject for the purposes of this research. This work represents an initial approach to the study of the structural relationship between attitudinal factors and learning in General Didactics. It is known that the relationship between attitudes, perceptions and actions (approaches) can give rise to a range of context-dependent relationships, but the literature does not contain published research that contributes to this analysis.

The aims of this study are: (a) to examine the possible influence of personal and/or contextual factors (age, sex and university entrance grade) on the attitude and learning approach of General Didactics students; (b) to analyse the scores for attitude to General Didactics at the start and end of the course; (c) to develop a detailed understanding of the relationship between the various attitudes of university students based on learning approach; and (d) to provide a graphic representation of the profile of students' learning approaches and attitudes towards the subject.

Method

In order to explore the learning approach adopted by students and to conduct a detailed study of its relationship with attitudes, a multivariate analysis was conducted using the HJ-Biplot technique (Galindo, 1986) so as to obtain a graphic representation of both students' learning approaches and their attitudes before and after the course was taught. The students were subsequently classified in various profiles via cluster analysis.

Participants

The sample consisted of 146 Social Learning degree students at the University of Salamanca enrolled in General Didactics, a mandatory term-long subject taught during the second year of the degree course. The study group was made up of students beginning their degree in 2011–2012 (28.1%), 2012–2013 (32.2%) and 2013–2014 (39.7%), and predominantly comprised women (87.7%). The average age was 21 ± 2.65 years. The age range of the sample was as follows: 35.6% between 18 and 19 years, 30.1% between 20 and 21 years, 21.9% between 22 and 23 years, and 12.3% over 23 years. The average university entrance grade was 6.87 ± 1.06 points.

Instruments

Revised two-factor Study Process Questionnaire: R-SPQ-2F. The R-SPQ-2F instrument (Biggs et al., 2001) was used for this study in its Spanish-adapted version produced by Hernández-Pina et al. (2005) and made up of 20 Likert-scale items (1 = never or rarely, 2 = sometimes, 3 = half of the time, 4 = frequently, 5 = almost always or always). The theoretical factorial model reflects two latent factors associated with the *deep approach* and the *surface approach*. These factors were identified in the Spanish university environment by Geraldo, del Rincón, and del Rincón (2011), Justicia, Pichardo, Cano, Berbén, and De la Fuente (2008), De la Fuente et al. (2017) and De la Fuente, Sander, and Putwain (2013).

Reliability was assessed using the Cronbach's alpha coefficient and the ω index; with high internal consistency found for both subscales (*deep* $\alpha = .72$, $\omega = .74$; *surface* $\alpha = .71$, $\omega = .71$). In this study, a confirmatory factor analysis (CFA) showed adequate fit with the model: chi-square/*df* = 1.31, RMSEA = .05 (.03, .06), CFI = .91, and SRMR = .07. The results for composite reliability (CR) and average variance extracted (AVE) show high CR indices (*deep* CR = .88; *surface* CR = .86), and lower values in the case of AVE (*deep* AVE = .27; *surface* AVE = .19).

Measurement of Attitude towards General Didactics Questionnaire (MAGDQ). This was adapted from the Measurement of Attitude towards Statistics questionnaire (Mondéjar, Vargas, & Bayot, 2008), which analyses the existence of a latent factorial structure in the affective and assessment domains in terms of attitude towards statistics. The scope of application of the questionnaire was extended to the subject of General Didactics for this study, using the same items established by the authors but modifying the questionnaire to reflect the new subject being assessed. This instrument is composed of 27 Likert-scale items (1 = totally disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = totally agree). The theoretical factorial structure consists of four dimensions proposed by Mondéjar et al. (2008): two subscales of an affective component, namely *interest* and *anxiety*, and two subscales of an assessment component, *professional usefulness* and *present usefulness*. The internal consistency of the four dimensions shows strong reliability indices at the start of the subject (*interest* $\alpha = .81$, $\omega = .82$; *anxiety* $\alpha = .84$, $\omega = .84$; *present usefulness* $\alpha = .57$, $\omega = .63$; *professional usefulness* $\alpha = .78$, $\omega = .79$) and after teaching (*interest* $\alpha = .85$, $\omega = .85$; *anxiety* $\alpha = .84$, $\omega = .84$; *present usefulness* $\alpha = .66$, $\omega = .66$; *professional usefulness* $\alpha = .83$, $\omega = .84$). Weaker reliability indices are found for *present usefulness* as it is only made up of four items. The fit of the global measure models was acceptable both pre- and post-teaching: chi-square/*df* = 1.52, RMSEA = .06 (.05, .07), CFI = .88, SRMR = .07 and chi-square/*df* = 1.71, RMSEA = .07 (.06, .08), CFI = .88, SRMR = .08, respectively. AVE by dimension presented higher average values post-teaching, and CR indices showed a high level of validity pre-teaching (*interest* CR = .96, AVE = .40; *anxiety* CR = .90, AVE = .41; *present usefulness* CR = .93, AVE = .40; *professional usefulness* CR = .90, AVE = .26) and post-teaching (*interest* CR = .97, AVE = .54; *anxiety* CR = .94, AVE = .45; *present usefulness* CR = .92, AVE = .32; *professional usefulness* CR = .97, AVE = .39).

Procedure

Subsequently to the obtaining of consent and verification of ethical aspects, data were collected using the R-SPQ-2F questionnaire at the start of the subject, as well as two applications of the MAGDQ instrument pre- and post-teaching, in order to evaluate changes in the attitudinal construct.

Data analysis

A confirmatory factor analysis (CFA) was performed using maximum likelihood estimation to confirm the theoretical factorial structure of both questionnaires. The fit of the models is supported via chi-square/*df* (with optimal fit of the model for values lower than 3), CFI (comparative fit index) (models with values of approximately 1 considered acceptable), RMSEA (root mean square error of approximation) and its confidence interval of 90% (where the goodness-of-fit of the model is considered adequate with a value lower than .08) and SRMS (standardised root mean square residual) (with an acceptable goodness-of-fit located at .08).

A descriptive analysis was subsequently performed for the items of both questionnaires in order to identify attitudes towards General Didactics and the learning approach of Social Learning undergraduate students. Differences in the pre- and post-teaching responses to the attitude-measurement questionnaire, where all the students in the sample had experienced both circumstances, were analysed via the parametric paired sample *t*-test. An analysis of possible sex-based differences analysis for the attitude and learning dimensions, or of the differences between students with *deep* as opposed to *surface learning*, was conducted using the non-parametric Mann–Whitney *U* test as it concerned independent groups with a small sample size. The Kruskal–Wallis test was used to study differences between age groups (which involved more than two independent groups), due to the small sample size of the groups.

The predominant learning approach was calculated based on the scores for the latent dimensions. Scores for the *deep* and *surface learning* constructs were constructed by adding together the scores for the items that make up said factors, as proposed by Hernández-Pina et al. (2010).

A multivariate analysis was then conducted using HJ-Biplot (Galindo, 1986). HJ-Biplot is used across multiple fields, such as economics (Amor-Esteban, García-Sánchez, & Galindo-Villardón, 2017; Ortas, Álvarez, Jaussaud, & Garayar, 2015), genetics (Frutos, Galindo, & Leiva, 2014) and geochemistry (Nieto-Librero, Sierra, Vicente-Galindo, Ruíz-Barzola, & Galindo-Villardón, 2017). It enables students and questionnaire items to be represented on a single graph, meaning their relationships can be visually interpreted.

The main aim of this work is to describe student profiles (represented with dots on the Biplot graph) based on the questionnaire items (represented with vectors). To interpret the results on a Biplot representation, it is necessary to take into account that: (a) the direction of the vectors indicates the gradient of increase

in values of the variable; (b) the student-item relationship is interpreted via the plotting of the dot that represents a student on the vector that represents the item; (c) the relationship between students is based on the distance between the dots that represent them (dots close together correspond to students with similar profiles in relation to their attitude-learning); and (d) the relationship between items is analysed via the cosine of the angle that their vectors form (along the increasing directions of both vectors), which coincides with their linear correlation. In this regard, two items are independent if their angle is perpendicular; directly correlated if the angle is acute, and inversely correlated if it is obtuse.

Finally, hierarchical cluster analysis was performed using Ward's method for the Biplot coordinates obtained to define a structure of students' groups with similar behaviour and to identify the characterisation of said groups in terms of attitude-learning on the HJ-Biplot representation.

The data were analysed using version 23.0 of the IBM SPSS Statistical Package programme. The CFA was conducted using version 23.0 of the AMOS module of IBM SPSS (Arbuckle, 2014) and the HJ-Biplot analysis and the cluster analysis were performed using the biplotbootGUI library developed by Nieto, Galindo, Leiva, and Vicente-Galindo (2014) from free R software (R-team, 2017).

Results

Tables 1 and 2 contain a descriptive analysis of the questionnaires' items. Notably low scores were obtained for the *present usefulness* subscale, in contrast to the higher scores found for *professional usefulness*. An analysis of differences between pre- and post-teaching in the MAGDQ shows statistically significant differences in item 15 for *interest* ($p = .005$, $d = 0.24$) and in item 5 for *professional usefulness* ($p = .041$, $d = 0.17$). As seen in Table 1, these results reflect a significant post-teaching loss of *interest* in the subject and an increase in *anxiety* after studying it. Post-teaching, students report stronger belief in the *professional usefulness* of the subject.

A majority of students adopt a *deep approach* ($n = 127$, 87%), followed by those with a *surface* ($n = 14$, 9.6%) or *mixed* ($n = 5$, 3.4%) approach. The Mann–Whitney *U* test showed a significant difference with a medium effect size ($p = .003$, $r = .27$) in the university entrance grade among students with a *deep* or *surface approach* and in *interest* and *anxiety* pre-teaching ($p = .000$, $r = .3$ and $p = .016$, $r = .2$, respectively). The average grade for students with a *deep approach* was 6.97 points, in comparison with 6.18 points for students with *surface learning*. *Interest* was higher among students exhibiting *deep learning* and *anxiety* was higher among students with a *surface approach*. No significant differences were found for learning approaches or attitude depending on the age variable. However, there was a significant difference based on sex ($p = .014$, $r = .2$) in pre-teaching *anxiety* levels, which were higher among women.

The HJ-Biplot subsequently identified different groups of students based on their learning approach and attitude towards the subject. When the range of items from both questionnaires are represented in a two-dimensional space (vectors on the graph), there is a visual description of student (dots on the graph) in relation to their attitude/learning. A proper implementation of the HJ-Biplot entails considering measures such as: (a) explained variance for each of the factorial axes; (b) the relative contribution of the factor to the element, which represents the variability of each item explained by the factor, thereby identifying the variables responsible for the plotting of the students on the vectors (Table 3); and (c) cosines of the angles between the vectors of two variables, which are interpreted in terms of intercorrelation (Figure 1).

The first two axes of the HJ-Biplot absorb 26% and 26.1% of the variability pre-teaching (Figure 2, left) and post-teaching (Figure 2, right), respectively. Plane 1–2 is used to represent the information, providing a description of the relationship between the items of both scales as stated below.

Interpretation of the variables is based on the cosines of the angles between the vectors. Small angles (positive cosine) refer to directly correlated items (with similar behaviour), right angles (cosine close to 0) show independent items and obtuse angles (negative cosine) refer to inversely correlated items (see Figures 1 and 2). There is a notably direct and strong relationship between items from the same theoretical dimension (*interest* (I), *anxiety* (A), *professional usefulness* (ProU), *present usefulness* (PreU), *deep approach* (D) and *surface approach* (S) items). The *professional usefulness* items are directly related with the *interest* of students and with the *deep approach*. *Anxiety* is directly related with *present usefulness*. The *surface* and *deep learning* items present a high inverse correlation, and this is also the case between the items of *anxiety* and *interest*, and *present usefulness* and *professional usefulness*. A direct relationship is also observed between a *deep approach*, *interest* and *professional usefulness* and between a *surface approach*, *anxiety* and *present usefulness*. Post-teaching, there are stronger relationships between the items comprising attitude and *professional usefulness*, and those comprising *anxiety* and *present usefulness*.

Table 3 shows that the items of the four subscales in the attitude questionnaire substantially contribute to factorial axis 1, but make a low contribution to axis 2, both pre-teaching and post-teaching. Certain learning items, particularly the *surface approach* items, also contribute pre-teaching to axis 1. The horizontal latent axis of the HJ-Biplot (Figure 2, left) is explained by variables that measure attitude and *surface approach*, while the vertical axis is explained by variables from both learning approaches, particularly *surface*. In post-teaching (Figure 2, right) there is a higher contribution of attitude variables to the formation of the first factorial axis, while the *deep* and *surface learning* items are those that explain the vertical latent dimension. These results in the students positioned in the first and second quadrants being those who present a predominantly *surface approach* post-teaching, while the students located in the lower part of the graph present a *deep approach*.

Taking into account that the students located in similar positions on the graph present similar behaviour and that the plotting of a student with regard to an item reflects a student's response on said variable, the cluster analysis distinguished four groups of students at the pre-teaching stage: C1, with high scores for *interest*, *professional usefulness* and *deep approach* vis-à-vis the subject; C2, distinguished by *anxiety* and high scores for *surface approach*; C3, made up of students showing medium *interest*, low *anxiety* and *surface approach* and belief in the *professional usefulness* of General Didactics; and finally, C4, comprising students with high levels of *anxiety* and using the *deep approach* to study. The cluster analysis showed a change in these groups at the post-teaching stage. A small reduction was observed in the number of students adopting a *deep approach*, owing to the relationship with their attitude.

The Biplot analysis shown in Figure 3 regarding the questionnaire dimensions permits a detailed examination of the post-teaching change in attitude towards General Didactics. Of note when analysing the angles between vectors are the direct relationship between *anxiety* post-teaching and the *deep approach* dimension, as opposed to independence at the pre-teaching stage, and the almost total post-teaching independence between *present usefulness* and *surface approach*, as opposed to its direct initial relationship. *Interest* is unchanged post-teaching and is independent of *anxiety* at the end of the study.

Table 1
Descriptive analysis of the items of the Measurement of Attitude towards General Didactics questionnaire by dimension, pre- and post-teaching

	Pre				Post			
	Average	Standard deviation	Asymmetry	Kurtosis	Average	Standard deviation	Asymmetry	Kurtosis
Interest								
I13	3.11	.82	−.21	.49	3.04	.85	.06	.61
I14	2.59	.83	−.21	−.08	2.65	1.04	.18	−.43
I15	2.51	.82	−.28	−.12	2.23	.96	.27	−.49
I17	2.78	.85	−.24	.10	2.69	.94	.11	−.02
I18	3.24	.72	−.28	1.14	3.38	.76	−.10	.07
I24	2.87	.73	−.23	1.08	2.83	.93	−.18	−.29
Anxiety								
A1	2.63	.85	−.04	.05	2.77	.95	.34	.09
A7	3.12	.85	−.04	.39	3.24	.87	−.30	.49
A9	2.37	1.16	.54	−.48	2.59	1.09	.11	−.76
A12	2.69	.77	−.25	1.30	2.72	.95	.35	−.16
A21	2.51	1.05	.23	−.49	2.54	1.18	.32	−.75
A22	2.83	1.19	.07	−.75	2.99	1.30	−.03	−1.12
A23	3.32	.87	−.42	.38	3.19	1.07	−.39	−.29
Present usefulness								
PreU3	1.92	.97	1.15	1.31	2.01	1.01	.87	.21
PreU10	1.99	.98	.87	.57	1.99	.95	.80	.44
PreU16	2.10	.96	.57	−.15	1.99	1.06	1.02	.69
PreU25	2.79	.83	−.26	.26	2.64	.96	.01	−.40
Professional usefulness								
ProU2	3.88	.88	−.71	.62	3.88	.87	−.84	1.19
ProU4	3.66	.84	−.40	.34	3.56	.92	−.37	.27
ProU5	3.86	.85	−.48	.06	4.05	.85	−.94	.99
ProU6	4.11	.76	−.95	1.75	4.22	.72	−.92	1.96
ProU11	3.57	.80	−.39	.56	3.73	.86	−.45	.33
ProU19	2.47	.86	.01	.03	2.40	.97	.50	.18
ProU20	3.90	.90	−.51	−.18	4.07	.83	−.72	.51
ProU26	3.79	.78	−.25	−.28	3.86	.70	−.17	−.17
ProU27	3.62	.80	−.18	.48	3.77	.91	−.49	.05
Att8	3.23	.93	.26	−.35	3.29	1.02	.19	−.61

Table 2
Descriptive analysis of the items of the R-SPQ-2F questionnaire by dimension

	Average	Standard deviation	Asymmetry	Kurtosis
Deep approach				
D1	3.54	1.15	−.49	−.78
D2	3.65	1.04	−.58	−.58
D5	3.51	1.00	−.44	−.51
D6	2.42	1.06	.52	−.50
D9	2.71	.99	.56	−.42
D10	3.29	1.13	−.24	−.85
D13	3.23	.87	.05	−.56
D14	2.03	.97	.82	.01
D17	2.35	1.05	.69	−.31
D18	2.53	.93	.25	−.20
Surface approach				
S3	1.73	.93	1.45	2.14
S4	3.08	1.19	−.02	−1.11
S7	1.40	.67	1.99	5.36
S8	1.92	1.05	1.42	1.59
S11	1.86	1.06	1.32	1.21
S12	2.29	.90	.61	.22
S15	1.55	.82	1.84	3.94
S16	2.34	1.22	.62	−.56
S19	1.96	.97	1.06	.88
S20	2.10	1.16	.81	−.35

Discussion

The results of this research provide information to teachers on the General Didactics course regarding the relationship between attitudes, conceptions and actions (approaches). The high levels of *anxiety* and low valuation of the subject among students may be counteracted, strengthening a perception among students that the subject has a role to play as an optimal tool for their academic and professional lives.

Hernández-Pina et al. (2010) report on the predominance of the *deep approach* in the university context; we confirm this assertion, given that the majority of students in our sample report a *deep approach* (87%). Although 32.4% of the sample was aged over 21 years, no significant attitudinal factor or learning approach differences were found based on age group. Along the same lines as Mondéjar-Jiménez and Vargas-Vargas (2010), women reported higher levels of *anxiety* than men in this study.

Table 3
Relative contribution of factor to element

	Pre		Post	
	Axis 1	Axis 2	Axis 1	Axis 2
Interest				
I13	836.95	163.05	994.38	5.62
I14	996.64	3.36	999.53	.47
I15	999.2	.8	977.54	22.46
I17	934.97	65.03	988.81	11.19
I18	999.77	.23	996.65	3.35
I24	996.6	3.4	999.03	.97
Anxiety				
A1	900.2	99.8	994.71	5.29
A7	874.31	125.69	986.65	13.35
A9	509.2	490.8	918.16	81.84
A12	807.57	192.43	998.47	1.53
A21	723.71	276.29	983.28	16.72
A22	932.22	67.78	997.95	2.05
A23	748.4	251.6	993.34	6.66
Present usefulness				
PreU3	878.92	121.08	840.16	159.84
PreU10	950	50	816.32	183.68
PreU16	725.82	274.18	924.57	75.43
PreU25	269.22	730.78	761.57	238.43
Professional usefulness				
ProU2	918.7	81.3	922.21	77.79
ProU4	208.24	791.76	664.16	335.84
ProU5	619.03	380.97	548.05	451.95
ProU6	689.49	310.51	781.52	218.48
ProU11	824.59	175.41	954.9	45.1
ProU19	812.9	187.1	890.49	109.51
ProU20	512.32	487.68	916.72	83.28
ProU26	793.46	206.54	846.21	153.79
ProU27	832.09	167.91	887.74	112.26
Att8	917.27	82.73	927.79	72.21
Deep approach				
D1	992.44	7.56	446.7	553.3
D2	499.83	500.17	403.28	596.72
D5	296.08	703.92	149.31	850.69
D6	278.13	721.87	236.93	763.07
D9	745.88	254.12	248.31	751.69
D10	404	596	6.15	993.85
D13	483.65	516.35	63.86	936.14
D14	521.5	478.5	74.22	925.78
D17	92.64	907.36	117.56	882.44
D18	399.64	600.36	12.98	987.02
Surface approach				
S3	705.37	294.63	56.61	943.39
S4	672.32	327.68	89.94	910.06
S7	847.31	152.69	394.96	605.04
S8	543.64	456.36	159.4	840.6
S11	442.26	557.74	142.16	857.84
S12	606.25	393.75	184.47	815.53
S15	991.82	8.18	176.05	823.95
S16	318.22	681.78	243.22	756.78
S19	520.51	479.49	90.51	909.49
S20	897.46	102.54	8.62	991.38

The results of multivariate analysis point to the existence of a relationship between attitude and learning approach, in contrast to the findings of Elias and Sánchez-Gelabert (2014). This relationship is organised through four groups of students with different academic profiles. C1 and C4 have a *deep approach* to the study of General Didactics, and C2 and C3 have a *surface approach*. C1 students show high *interest* in the subject, considering it useful for their professional futures. The same is true for C3 students, although despite showing *interest* and believing in the usefulness of the subject for their future work, they report low *anxiety*. This is not the case for the C2 and C4 groups, who show different levels of *anxiety* in comparison with the other groups in terms of attitude.

The reduced number of students adopting a *deep approach* post-teaching is in line with Groves (2005), who reports that the use of methodology favouring a *deep approach* may increase the *surface approach* due to workload and evaluation style. An increase in students with high levels of *anxiety* who study the subject using a *deep approach* and show less *interest* in it is also observed; the final evaluation test being close. Along the same lines as Beyaztaş and Senemoğlu (2015), it was observed that the type of evaluation can affect the choice of approach. In accordance with the findings of Tiwari et al. (2006), our results suggest that teaching methodology can influence the learning approach adopted. This is in contrast to Akdemir and Koszalka (2008) and Stromso, Grottum, and Lycke

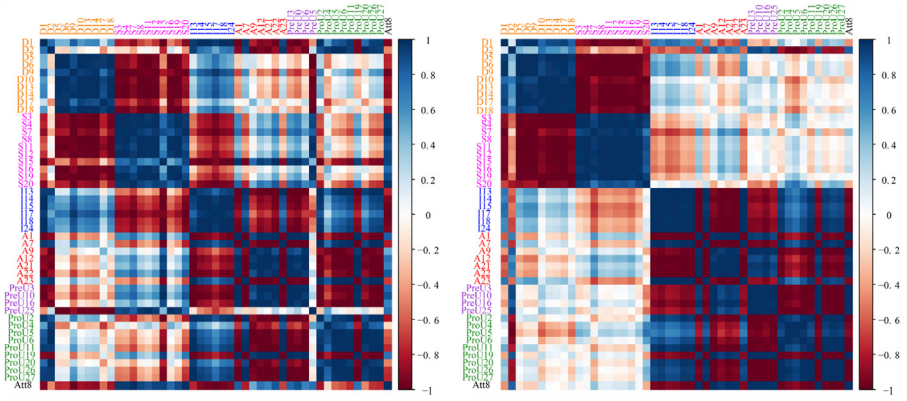

Figure 1. Correlations between items estimated based on the cosines of angles obtained between variables in the HJ-Biplot analysis.

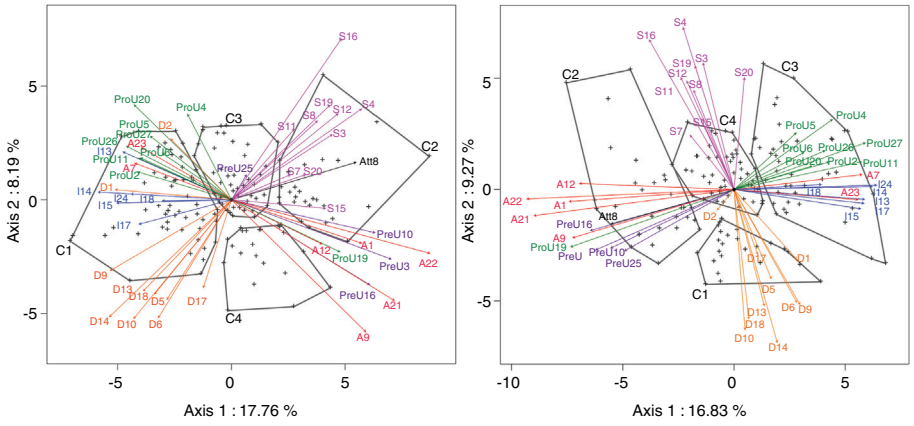

Figure 2. 2D graphs of the 1–2 factorial plane. Each acronym refers to the six factors studied: *surface approach* (S) and *deep approach* (D), *professional usefulness* (ProU), *present usefulness* (PreU), *anxiety* (A) and *interest* (I). (Left: HJ-Biplot for the Pre-Teaching Attitude and Learning items; Right: HJ-Biplot for the Post-Teaching Attitude items).

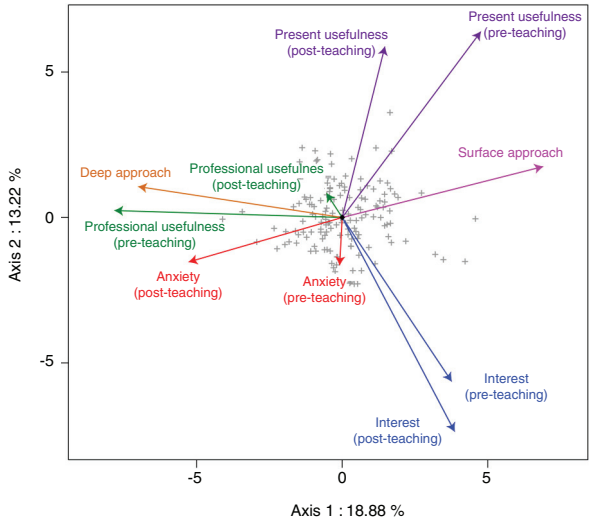

Figure 3. 2D graph of HJ-Biplot factorial axis 1–2 by questionnaires' factors. Each colour refers to the ten factors studied: *surface approach* and *deep approach* from the R-SPQ-2F questionnaire, pre- and post-teaching *professional usefulness*, pre- and post-teaching *present usefulness*, pre- and post-teaching *anxiety* and pre- and post-teaching *interest* of the MAGDQ.

(2004), who did not find evidence of a relationship in this respect. Students' learning approaches and attitudes are not static and are context-dependent, as other authors such as García et al. (in press), Ullah (2016) and Vanthournout (2011) have previously argued.

An inverse relationship is found both pre- and post-teaching between the items comprising the *surface* and *deep approach*, along the lines of the results found by Geraldo et al. (2011) who argue that these approaches are more opposing than complementary. There is a direct relationship between *deep approach*, *interest* and *professional usefulness*, highlighting that the evaluation process impacts on choice of approach and moderately influences the attitude towards the subject. As affirmed by Machado, Brites, Magalhaes, and Sá (2011), these students show an attitudinal component that places value on the instrumental or professionalising character of didactics. The adoption of a *deep approach* is also found to be aligned with employment objectives, in contrast to the findings of Ruiz, Hernández, Ureña, and Argudo (2011). This relationship could be taken into account when planning course content, with priority given to competencies linked to professional practice.

The direct relationship observed between *surface approach*, *anxiety* and *present usefulness* is also proposed by Biggs (1988), and the relationship between *anxiety* and *surface approach* is confirmed, in line with Sansgiry, Bhosle, and Sail (2006), who report that lack of preparation and revision of exam content are characteristic of students with greater *anxiety* vis-à-vis exams.

Finally, the Biplot representation of scores on each questionnaire subscale shows that students' *interest* in a subject does not change post-teaching and is independent of the *anxiety* suffered at the end of the study, which may logically be subject to the influence of contextual variables such as evaluation. As regards practical implications, the study provides teachers with information and could be used in proposing strategies to create a student community that is better trained in didactic aspects relating to the design and planning of socio-educational intervention processes.

Limitations

This work is innovative in providing a joint visual representation of the relationship between attitude and learning approaches in General Didactics, but certain limitations should be taken into account. First, the small sample size could have consequences in terms of the identification of differences in participant behaviour. Recent studies show differences between sexes (Mondéjar-Jiménez & Vargas-Vargas, 2010) in attitudinal factors, but in our case we only detected differences in *anxiety*. This may be explained by the low percentage of men in the sample. Second, although this study included different teachers and academic years, the generalisation of the results may be affected by the type of student, teaching methodology and learning context. Further research is hence needed in other universities to establish whether the learning approaches and attitudes shown by Social Learning undergraduate students are the same in different contexts. It is also important to take into account the low AVE for the R-SPQ-2F questionnaire dimensions in the CFA. Future research should consider a review of the possible dimensions presented in said instrument, or a specific analysis of the items that comprise it.

Further research is also necessary with regard to whether the teaching methodology proposed by the European Higher Education Area (EHEA), intended to encourage *deep learning*, may result in an increase in the *surface approach* due to workload and evaluation style, or whether it has no impact on the choice of learning approach.

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Conflict of interest

The authors declare no conflicts of interest.

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