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# Measuring learning: discrepancies between conceptions of and approaches to learning

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**ABSTRACT**

This study is framed under the student approaches to learning tradition. The aim was to identify convergence in quantitative and qualitative responses of individuals when measuring their conceptions of and approaches to learning with a mixed methods design. A sample of 1110 Spanish Master's level teacher education students completed a scale on approaches to learning (R-SPQ-2F), and a randomly selected subsample of 111 answered an open-ended question on how they learned. Overall, the qualitative and quantitative data did not support each other, as inventory responses showed a clear predominance of a deep, non-surface approach to learning, whereas qualitative answers reflected a tendency towards lower-order conceptions of learning. Inconsistencies in the results suggest future research ought to use a combination of techniques when exploring constructs such as learning should they wish to draw valid conclusions.

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## Introduction

This paper presents a study on teacher education students' conceptions of and approaches to learning. Research into learning under the Student Approaches to Learning (SAL) tradition originated about four decades ago (e.g. Marton 1976; Biggs 1979; Entwistle, Hanley, and Hounsell 1979) and focuses on the interplay between the learner's perception of the learning environment, personal factors and experiences, contents and task demands and the context in which learning occurs. Students' views on learning may be described as: (1) reproductive, with an emphasis on memorising contents; and (2) constructive, with the purpose of understanding the author's intention (see Richardson 2011 for a review). SAL has been the focus of numerous studies for the past four decades, particularly in Europe and Australasia.

This study draws on earlier research which analysed learning from different perspectives (conceptions) and complements a previous study by the authors (Monroy and González-Geraldo 2017) which identified pre-service teachers' teaching conceptions and approaches measured quantitatively and qualitatively. What is novel in this study is the analysis and comparison of findings on teacher education students' views on learning using two complementary methodologies simultaneously to show whether qualitative and quantitative

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data support each other. In the following section, the theoretical background and aims of this study are described. Subsequent sections report the method, results, conclusions, as well as implications and suggestions for further research.

## *Conceptions of learning and approaches to learning*

Conceptions are defined as "cognitive representation[s] of something" and "specific meanings attached to experiences or phenomena which then mediate the individual's response to given situations that involve that phenomenon", (Pratt 1992, 305). Studies on how western students conceive of learning find their precursor in one of the most widely referred to classification of learning conceptions, namely Säljö's (1979) interview-based five-descriptor categorisation: (A) learning as the quantitative increase of knowledge; (B) learning as memorising; (C) learning as acquisition of facts, procedures, etc., which can be retained and/or utilised in practice; (D) learning as the abstraction of meaning; and (E) learning as an interpretative process aimed at the understanding of reality. Subsequently, Van Rossum, Deijkers and Hamer (1984) identified a sixth conception (Self-realisation), which was later confirmed by Marton, Dall'Alba, and Beaty (1993), who referred to it as (F) changing as a person and which was typically found in older students and/or at postgraduate studies. The first three conceptions are associated with superficial, reproductive learning tasks, while the remaining three represent a reconstructive, meaning-focused view of learning (Säljö 1979; Marton, Dall'Alba, and Beaty 1993; Van Rossum and Hamer 2010). Since then numerous studies following a phenomenographic approach (e.g. Van Rossum and Schenk 1984; Prosser, Trigwell, and Taylor 1994; Sharma 1997; Eklund-Myrskog 1998; Devlin 2002; Tsai 2004; Lord and Robertson 2006; Virtanen and Lindblom-Ylänne 2010) have sought to describe students' conceptions of learning and identified the same or very similar categories.

The identified categories were assumed to be a developmental sequence (Richardson 2010) or hierarchically related to one another in terms of complexity, in which higher-order conceptions subsume lower-order ones (Säljö 1979; Marton, Dall'Alba, and Beaty 1993). In fact, European studies, such as the one by Tynjäla (1997) identified categories of description not strictly defined as a hierarchy: (1) Learning as an externally determined event/process; (2) Learning as a developmental process; (3) Learning as student activity; (4) Learning as strategies/styles/approaches; (5) Learning as information processing; (6) Learning as an interactive process; and (7) Learning as a creative process. In this very study, many students referred to more than one conception when describing their conceptions of learning, which was what happened in the present study.

A qualitative study by Marton (1976) identified two levels of processing and coined the term "approaches to learning" as "attitudinal or dispositional constructs to explain why students [adopt] deep-level or surface-level processing in experimental settings and deep-level or surface-level thinking in their normal academic studies" (Richardson 2015, 246). The two identified approaches to learning were later confirmed by questionnaire-based studies (e.g. Biggs 1979; Entwistle, Hanley, and Hounsell 1979) and interview-based studies (e.g. Yan and Kember 2004) and refer to ways in which students undertake academic tasks as a result of personal factors, environment and contextual factors mediated by perception (see Richardson 2010, 2011). Students with a deep approach (DA) to learning focus on understanding meaning when learning because of an interest in the subject matter; learning implies exploring, discovering and relating new and existing ideas, which in turn involve engagement with

the learning process and critical thinking. Students with a surface approach (SA), by contrast, show little commitment to the task at hand and memorise the subject matter in order to pass (Biggs and Tang 2007). Depending on various factors (see Baeten et al. 2010 and Monroy and Hernández Pina 2014 for a review), students may adopt different learning approaches in different situations (Entwistle and Peterson 2004).

Prior research has analysed the relationship between approaches to learning and learning outcomes. Some studies have shown that students who adopt a DA, understand the learning materials better and tend to have higher quality outcomes (in tune with higher education aims) than those who adopt a SA (e.g. Marton 1976; Biggs 1979). On the other hand, the evidence is inconclusive when it comes to an association between approaches to learning and quantitative academic outcomes. While, some studies (e.g. Ruohoniemi, Parpala, Lindblom-Ylänne, and Katajavuori 2010; Rosário et al. 2013) have identified a positive link between a deep approach and high academic performance, others (e.g. Lizzio, Wilson, and Simons 2002; Asikainen, Parpala, Lindblom-Ylänne, Vanthournout, and Coertjens 2014) have shown less clear results.

The relationship between students' approaches to learning and conceptions of learning has been confirmed by a number of studies for the past decades (e.g. Dart et al. 2000; Edmunds and Richardson 2009; Abhayawansa and Fonseca 2010; Richardson 2011). Thus, students with lower-order, reproductive conceptions of learning (A to C, if following Marton, Dall'Alba, and Beaty's (1993) classification) tended to adopt SA, while those with high-order, meaning-oriented conceptions (D to F) preferred DA. Hence, there is an association between conceptions of learning and learning outcomes (Van Rossum and Schenk 1984).

### *Quantitative and qualitative research on learning conceptions and approaches*

The first studies on learning followed a qualitative approach (e.g. Marton 1976) aimed at understanding how individuals set about their studies. Data were collected via interviews and open-ended questions, and provided rich, qualitative descriptions of how individuals learn and perceive their learning environment (Marton, Hounsell, and Entwistle 2005). These methods, however, involve a lengthy process of analysis and interpretation, and do not allow generalising results.

As a result of qualitative research and in an attempt to simplify and quantify the identification of conceptions of learning, inventories have been devised using the categories described in prior studies such as: (a) the Conceptions of Learning Inventory (COLI) by Purdie and Hattie (2002); (b) the Reflections on Learning Inventory (RoLI) by Meyer and Boulton-Lewis (1999); and (c) the Inventory of Learning Styles (ILS) by Vermunt (1998) (see Richardson 2011, for an overview). Some studies have analysed conceptions of learning by narrowing down their focus on specific domains like science (e.g. Sadi and Dagyar 2015) or health sciences (e.g. Lonka et al. 2008). As for learning approaches, the two most widely administered SAL inventories are Entwistle, Hanley, and Hounsell's (1979) Approaches to Studying Inventory (ASI) and its later revisions (RASI, ASSIST, see Duff and McKinstry 2007) and Biggs, Kember, and Leung's (2001) Revised Two-Factor Study Process Questionnaire (R-SPQ-2F).

To measure both learning conceptions and approaches simultaneously, some studies (e.g. Dart et al. 2000) have focused solely on quantitative measures such as questionnaires. One clear disadvantage of using inventories is the constraint faced by respondents when choosing from set statements. In addition, factors, such as length of instrument, misleading

translation of items if using a foreign instrument, poor statement or ambiguity of items, non-response, respondents' lack of interest or good understanding of inventory items, among others, may be sources of error and lead to biased or faulty instrument completion. Furthermore, Richardson (2011) suggested that the way respondents fill out questionnaires may point at an apparent association between constructs. In particular, students' systematic tendency to agree with questionnaire items or choose the extreme response categories may be responsible for variations in instruments scores measuring approaches and conceptions, which may in turn suggest both constructs are associated. One way to overcome instrument limitations and avoid respondent tendencies (and therefore, methodological drawbacks) is using other types of research evidence collected with methods which do not have the same limitations as inventories.

Some studies, nevertheless, have used a variety of instruments and research designs (e.g. Vedenpää and Lonka 2014; Monroy and González-Geraldo 2017), which have revealed inconsistencies in results of same individuals when a particular aspect was measured both quantitatively and qualitatively. This approach combines the advantages of both methods and provides a thorough, clearer picture of a phenomenon.

## *This study in the Spanish educational context*

In accordance with recent Laws of Education (Ley Orgánica 2/20062006 2006; Ley Orgánica 8/20132013 2013), education in Spain is compulsory for all individuals aged 6–12 (primary education) and 12–16 (compulsory secondary education). Those students wishing to attend university must complete two additional years of non-compulsory secondary education.

In the past decade, Spanish educational system has undergone major changes regarding teacher education. Among these was the evolution from a brief pedagogical course to a post-graduate teaching programme (Master's Degree in Teacher Training at Secondary Level), which is now a compulsory prerequisite for those individuals interested in teaching at secondary school level. Following regulations (Royal Decree 1834/2008 2008), most Spanish universities introduced this one-year, 60-ECTS (European Credit Transfer System) teacher training programme in 2009–2010, which offers common subjects, specialism subjects such as mathematics, music, physical education, among others, and school placement.

As students attending this teacher education programme are prospective teachers, while still learners, analysing how they conceive of learning is particularly interesting and should become the focus of research. Previous studies (e.g. Trigwell, Prosser, and Waterhouse 1999) have shown a relationship between approaches to learning and approaches to teaching, so the way prospective teachers conceptualise learning may influence how they will teach (at least in the first stages of their career).

Unlike research that analyses learning from a purely quantitative perspective, in this study a mixed methods approach was undertaken to examine learning conceptions and approaches. The aim was to measure teacher education students' conceptions of learning and approaches to learning using qualitatively and quantitatively instruments respectively to effectively describe the learning profile of the sample and identify convergence (or similarities) of results. The motivation for this study was to draw attention to the limited and possibly distorted view some researchers may get of conceptions of and approaches to learning if only inventories such as SPQ and variants are used.

## Method

### Participants and sampling procedure

The population comprised 1532 Spanish teacher education students enrolled in a one-year master level teacher education programme, and was distributed in four consecutive academic years (2010–2011: $N = 432$; 2011–2012: $N = 335$; 2012–2013: $N = 350$; and 2013–2014: $N = 415$). Figures were obtained from the Secretary's Office in the Faculty of Education.

Data were collected by convenience sampling (Creswell 2012) from 1113 individuals registered in one of these four years, but three cases were discarded because of missing data, having, therefore, no lost cases. The final sample was 1110 (females: $n = 661$, 59.5%; males: $n = 449$, 40.5%), of which 527 participants reported their age (mean age: 26.3; minimum age: 21; maximum age: 53). Students agreed to participate voluntarily without being granted any reward.

A subsample of 111 students which represented 10% of the full sample was randomly selected from $N = 1110$ by stratified random sampling in terms of academic year and specialism. This subsample was chosen so responses to the open-ended question would be analysed qualitatively. Table 1 shows the distribution of participants in terms of specialism and gender.

In order to ensure that the larger ($N = 999$) and smaller sample ($N = 111$) were similar in terms of certain variables, independent samples Student's $t$-tests were conducted, showing no statistically significant differences between these two groups in terms of mean age $t[525] = -.025$; $p = .980$; $r = .001$), DA mean scores ($t[1108] = -.754$; $p = .451$; $r = .02$), and SA mean scores ($t[1108] = 1.361$; $p = .174$; $r = .04$).

### Design

This study collected data over a four-year period and followed a convergent (or parallel) mixed methods design, as quantitative and qualitative were simultaneously collected, analysed separately and compared to understand a research problem (Creswell 2012). The dependent variable was participants' approaches to learning measured through two scales (Deep approach, DA; and Surface approach, SA).

### Procedure

Once permission from university authorities was gained, the authors collected usable questionnaires from 1110 teacher education students (distributed in four academic years, from 2010–2011 to 2013–2014) present in class at given scheduled teaching hours. The purpose of the study and administration instructions were disclosed to students so as to ensure voluntary participation and to assure them of anonymity and confidentiality of participation and responses. The open-ended question was given to students before the R-SPQ-2F had been completed in order to ensure that structured items did not influence participants' responses. Administration time was approximately 15 minutes.

**Table 1.** Distribution of participants in the smaller subsample ($N = 111$) and larger sample ($N = 999$).

| | $N = 111$ | | | | | | | | $N = 999$ | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Specialism | | | | Gender | | | | Specialism | | | | Gender | | | |
| | SC | | HU | | MA | | FE | | SC | | HU | | MA | | FE | |
| Year | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % |
| 2010–11 *n* = 337 | 11 | 33.3 | 22 | 66.7 | 14 | 42.4 | 19 | 57.6 | 103 | 33.9 | 201 | 66.1 | 108 | 35.5 | 196 | 64.5 |
| 2011–12 *n* = 243 | 7 | 28.0 | 18 | 72.0 | 6 | 24.0 | 19 | 76.0 | 58 | 26.6 | 160 | 73.4 | 72 | 33.0 | 146 | 67.0 |
| 2012–13 *n* = 240 | 6 | 25.0 | 18 | 75.0 | 12 | 50.0 | 12 | 50.0 | 57 | 26.4 | 159 | 73.6 | 102 | 47.2 | 114 | 52.8 |
| 2013–14 *n* = 290 | 7 | 24.1 | 22 | 75.9 | 14 | 48.3 | 15 | 51.7 | 63 | 24.1 | 198 | 75.9 | 121 | 46.4 | 140 | 53.6 |
| Total | 31 | 27.9 | 80 | 72.1 | 46 | 41.4 | 65 | 58.6 | 281 | 28.1 | 718 | 71.9 | 403 | 40.3 | 596 | 59.7 |

Note: SC: Science, HU: Humanities, MA: Males, FE: Females.

## Data collection

In this survey-based study, data were collected at the beginning of the Teacher Education programme for four consecutive academic years. Participants completed a questionnaire divided into three sections. In the first part, respondents introduced background variables such as gender, age, specialism chosen in the teacher education programme, previous teaching experience. In the second part, an open-ended question aimed at eliciting participants' opinions of what learning is ("In your opinion, what is learning?"). Previous studies (e.g. Sharma 1997; Lord and Robertson 2006; Virtanen and Lindblom-Ylänne 2010; Vedenpää and Lonka 2014) pursued similar research objectives and asked similar questions. In the third part, a Spanish version of Biggs, Kember, and Leung's (2001) Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) was administered; this version has been used in a number of studies in Spain (e.g. Hernández Pina et al. 2002; González-Geraldo, Del Rincón, and Del Rincón 2011) and showed acceptable reliability levels (Cronbach's alpha above .750) according to George and Mallery's (2003) rule of thumb for the acceptability of reliability coefficients (>.9, excellent; >.8, good, >.7, acceptable; >.6, questionable; >.5, poor; and <.5, unacceptable).

Both Spanish and original R-SPQ-2F are 20-item self-report instruments structured in two 10-item scales which measure participants' DA and SA to learning respectively. Responses were rated on a five-point Likert scale in terms of agreement with statements (from "Strongly agree" to "Strongly disagree"), and participants scored on both DA and SA. In this study, reliability of the DA scale and the SA scale with Cronbach's alpha was .787 and .753, respectively. Since R-SPQ-2F is a widely used instrument and our data only reproduced the expected two-approach structure by forcing two factors with a Maximum Likelihood analysis and oblique rotation, a confirmatory factor analysis (CFA) was also performed. A parsimonious two-factor latent structure was obtained, thus, supporting Biggs, Kember, and Leung's (2001) proposal and confirming earlier findings in the Spanish context (e.g. Justicia, Pichardo, Cano, Berbén and De la Fuente 2008; González-Geraldo, Del Rincón, and Del Rincón 2011).

## Data analysis

### Content analysis of the open-ended question

The approach to analyse the qualitative data-set was to transform it so that it could be compared to the quantitative data-set. Responses to the open-ended question were first skim-read and then thoroughly analysed by the two authors independently and deductively using Marton, Dall'Alba, and Beaty's (1993) learning conceptions categorisation as to ensure the same theoretical background and coding process were followed.

Students' responses were taken as a whole and the position or order of statements was neglected in an attempt not to miss any valuable piece of information. Although participants reported features typical of different conceptions of learning, they were classified under the most complex conception, such as Case 11-922 ("Learning is receiving knowledge, assimilating it and retaining it in my memory. It is also understanding what I'm learning"), whose response was categorised under conception D. The two authors conducted a trial jointly to agree on how to classify participant under this qualitative perspective. Then, each author separately read participants' responses thoroughly and sought to identify features of any of Marton, Dall'Alba, and Beaty's (1993) conceptions of learning.

After coding responses independently, the authors shared their categorisation results, reviewed each case individually, and discussed discrepancies. In case of disagreement, the theoretical frameworks were reviewed. Cross-checking the classification of descriptors aimed to ensure that the data-set was analysed effectively and aligned with the theory. Independent classification yielded a strong inter-rater agreement with a Cohen's (1988) Kappa coefficient of $\kappa = .90$. Once participants had been categorised, a descriptive analysis of frequencies of occurrence of the categories was done. Recoding qualitative responses into quantifiable data enabled the comparison of open-ended question data and inventory results.

### *Analysis of questionnaire*

Questionnaire data were analysed with IBM SPSS and AMOS v.22 and a significance level of .05 was set for all statistical analyses. As students in the Master's course first take common subjects but later choose specialism subjects, it was thought that there might be differences between groups of specialisms. Thus, similar to previous studies (e.g. Biglan 1973; Lindblom-Ylänne et al. 2006), students were classified into two groups: (a) science specialism which included the following course specialisms: Physics and Chemistry, Biology, Mathematics and Health-related specialism; and (b) humanities specialisms which included: History and Geography, Philosophy, Art, English or French as a foreign language and Management. Descriptive analyses were conducted in terms of academic year, gender and specialism.

As to the analysis of approaches and similar to previous studies (e.g. Trigwell et al. 1999), hierarchical cluster analyses were used to identify an appropriate number of clusters per approach. Then, non-hierarchical cluster analyses (*k* means) were conducted in order to identify subgroups of individuals with similar DA mean scores on the one hand, and similar SA mean scores on the other. This procedure was chosen as the most appropriate to determine what was a "high" or a "low" score and how to categorised participants in term of learning approaches. Student's *t*-tests were used to calculate significant mean differences between groups. Finally, Mann–Whitney rank sum tests were done to see whether there were differences between approach groups in terms of learning conceptions.

## Results and discussion

Following the principles of a convergent mixed methods design, the qualitative and quantitative data-sets were analysed separately and subsequently compared to determine whether results supported or contradicted each other. The rationale for this design is that one instrument provides strengths which may offset the weaknesses of the other (Creswell 2012). Qualitative and quantitative results will be presented and discussed in turn.

### *Qualitative data*

Responses of sub-sample participants ($N = 111$) were classified following Marton, Dall'Alba, and Beaty's (1993) categories of description. Some typical responses reflecting conceptions of learning were as follows: (A) Increasing one's knowledge: "Gaining knowledge" [Case 10-566]; "Acquiring new knowledge" [Case 11-055]. (B) Memorising and reproducing: "When I learn something, I never forget it. That is what learning is for me" [Case 13-911]; "Acquiring knowledge about a new topic and not forgetting it" [Case 13-959]. (C) Applying: "Being able to perform new tasks previously unknown" [Case 10-493]; "Acquiring knowledge (and then

knowing how to apply it)" [Case 10-625]. (D) Understanding: "Catching the ideas another person tries to teach us, not only listening to and repeating them but assimilating them" [Case 11–844]; "It is, first of all, about understanding what you learnt" [Case 11-710]. (E) Seeing something in a different way: "It is becoming mature enough to be able to analyse what we learnt in the world we live in" [Case 11-798]; "The art of becoming interested in the world that surround us …" [Case 13-773]. (F) Changing as a person: "Gaining autonomy, competences, values, behaviours" [Case 10–153]; "Gaining knowledge to develop a personal and sound vision of things. It understands the origin of or reasons for something and becoming nourished with the experiences told by teachers which may be useful for the development of the person and the interaction with society" [Case 11-373].

A descriptive analysis in terms of frequencies of occurrence (Table 2) showed that around 50% of participants showed lower-order conceptions (A, B, C). This result should be analysed carefully, as it comprises increasing one's knowledge, memorising and reproducing, respectively. Many participants used the verb "to understand" when explaining what learning meant to them (e.g. "Learning is getting, understanding and acquiring new knowledge" [Case 10-321]), yet from their overall response it might be inferred that it referred to learning as acquisition of knowledge and not as interpretation of reality or abstraction of meaning.

Earlier studies (e.g. Van Rossum and Hamer 2010) also pointed at the fact that the real meaning of "understanding" and "applying" may be qualitatively different depending on the context of the answer. In fact, these words may relate to each of the six conceptions of learning if considering the following argument: "Not only do people mean different things when using the same words or concepts, the interpretations of these concepts have direct effects on many aspects of learning" (p. 30). In addition, Abhayawansa and Fonseca (2010) found a shallow or superficial use of the word "understand", and identified a majority of participants with lower-order conceptions of learning. It is, nonetheless, impossible to assert how many of those D cases actually meant comprehension and not mere knowledge acquisition. In any case, over 32% of the sample held an A–B conception of learning, which may be regarded as a relatively high percentage if considering that the Teacher Education programme the participants were undertaking was a Master's degree targeting future secondary school teachers.

As to the conception of learning as application of learnt contents (conception C), about 17% of participants chose this option. Given the emphasis placed on the development of skills to do a job and employability derived from the Bologna reform, as well as the vocational and professional orientation of the Teacher Education programme, this result is striking and to some extent disappointing; one would expect trainee teachers to hold a conception of learning as acquisition of knowledge and competences to be applied in the real world,

**Table 2.** Frequencies and percentages of cases under each category of description of conceptions of learning.

| | *n* | % |
|---|---|---|
| *A* | 29 | 26.1 |
| *B* | 7 | 6.3 |
| *C* | 19 | 17.1 |
| *D* | 36 | 32.4 |
| *E* | 10 | 9.0 |
| *F* | 10 | 9.0 |
| Total | 111 | 100.0 |

particularly in a secondary education classroom, as posited by Bologna precursors (Yerevan Communiqué 2015). Unlike findings in some studies (e.g. Abhayawansa and Fonseca 2010), the professional orientation of this course does not seem to contribute to the development of application-focused conceptions of learning. This result reflects the ambiguity that surrounds some of the key concepts of the European Higher Education Area (EHEA).

Finally, 18% viewed learning as "seeing something in a different way" or "changing as a person" (conceptions E and F, respectively). In these cases, participants elaborated on their answers, which revealed an intrinsic motivation and appealed to personal growth (e.g. "to become better citizens" [Case 12-208]; "to understand the world we live in" [Case 13-020]; "to improve quality of life, both individually and as a society" [Case 12-121]). In terms of specialism, the percentage of science and humanities students was quite balanced (science: $n = 8$; 40%; humanities: $n = 12$; 60%), so discipline may not have played a role in determining high-order conceptions.

### *Quantitative data*

First, it is worth noting that the CFA model fit of the R-SPQ-2F shows an acceptable model only after dealing with 13 error constraints (CFI = .902 and SRMR = .051) presenting convergent validity concerns in both factors: Average Variance Extracted (AVE) = .271 in DA and AVE = .216 in SA.

As all students scored on both DA and SA, a paired samples Student's *t*-test showed statistically significant differences between the DA and SA variables ($t[1109] = 36.884$; $p < .000$), where DA was higher and the effect size was large ($r = .73$). The average DA score was 3.14 (SD = .62; minimum score = 1.40; maximum score = 4.90) and the average SA score was 2.06 (SD = .56; minimum score = 1.00; maximum score = 4.30). When comparing the DA and SA scores of the two specialism categories (science vs. humanities) on the one hand, and of males vs. females on the other, there were statistically significant differences only in SA between genders, as men scored higher in SA but the effect size was very small ($t[1108] = 6.147$; $p = .000$; $r = .18$).

Hierarchical cluster analyses with the larger and smaller sample were conducted on both variables separately so as to identify an appropriate number of groups per approach. These analyses revealed that a two-cluster solution per approach would be acceptable. Next, a non-hierarchical cluster analysis was done on each of the two variables so as to classify participants into: (1) the two DA clusters and (2) the two SA clusters previously suggested. Table 4 shows the distribution of participants in clusters and the mean scores around which participants clustered.

About 66% of participants in the full sample ($N = 1110$) were categorised as having a low SA, while 33% as a high SA (Table 3). This may be due to an easy identification of items when completing the instrument and a desire for social acceptance. As to the DA, the distribution between high and low is balanced.

Given the representativeness of the subsample of the larger sample, subsequent analyses focused on the quantitative data from the subsample ($N = 111$). Thus, over 63% of this subsample was found to have a LSA, while less than 37% showed a HSA (Table 3) presumably due to an easy identification of less complex inventory items by participants and a desire for social acceptance when completing the learning questionnaire.

**Table 3.** Distribution of cases in clusters in terms of DA and SA.

| | Subsample $N = 11$ | | | | Sample $N = 999$ | | | | Full sample $N = 1110$ | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | DA | | SA | | DA | | SA | | DA | | SA | |
| | Low LDA | High HDA | Low LSA | High HSA | Low LDA | High HDA | Low LSA | High HSA | Low LDA | High HDA | Low LSA | High HSA |
| *n* | 58 | 53 | 70 | 41 | 500 | 499 | 672 | 327 | 558 | 552 | 742 | 368 |
| % | 52.3 | 47.7 | 63.1 | 36.9 | 50.1 | 49.9 | 67.3 | 32.7 | 50.3 | 49.7 | 66.8 | 33.2 |
| *M* | 2.61 | 3.63 | 1.78 | 2.71 | 2.64 | 3.65 | 1.73 | 2.70 | 2.64 | 3.65 | 1.74 | 2.70 |

Notes: DA: deep approach; SA: surface approach; LDA: low deep approach; HDA: high deep approach; LSA: low surface approach; HSA: high surface approach.

**Table 4.** Number of participants per learning approach and conception (N = 111).

| | | | | Deep approach to learning | | | | Surface approach to learning | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | LDA $n = 58$ (52.3%) | | HDA $n = 53$ (47.7%) | | LSA $n = 70$ (63.1%) | | HSA $n = 41$ (36.9%) | |
| | | Total | | $M = 2.61$ | | $M = 3.63$ | | $M = 1.78$ | | $M = 2.71$ | |
| | | *n* | % | *n* | % | *n* | % | *n* | % | *n* | % |
| Conceptions of learning (Marton, Dall'Alba, and Beaty 1993) | A | 29 | 26.1 | 18 | 31.0 | 11 | 20.8 | 22 | 31.4 | 7 | 17.1 |
| | B | 7 | 6.3 | 4 | 6.9 | 3 | 5.7 | 3 | 4.3 | 4 | 9.8 |
| | C | 19 | 17.1 | 12 | 20.7 | 7 | 13.2 | 8 | 11.4 | 11 | 26.8 |
| | D | 36 | 32.4 | 15 | 25.9 | 21 | 39.6 | 24 | 34.3 | 12 | 29.3 |
| | E | 10 | 9.0 | 4 | 6.9 | 6 | 11.3 | 5 | 7.1 | 5 | 12.2 |
| | F | 10 | 9.0 | 5 | 8.6 | 5 | 9.4 | 8 | 11.4 | 2 | 4.9 |
| | | 111 | 100.0 | 58 | | 53 | | 70 | | 41 | |

Note: LDA: low deep approach; HDA: high deep approach; LSA: low surface approach; HSA: high surface approach.

In order to identify any differences between approach groups in terms of conceptions in the subsample $N = 111$ (for which there was both quantitative and qualitative data), Mann–Whitney rank sum tests were done between the two groups derived from the cluster analysis (high and low) of the DA and the six conceptions of learning on the one hand, and between the two SA groups and the conceptions on the other. The results showed no statistically significant differences between the high DA and low DA groups in terms of their conceptions ($z = -1.661$, $p = .097$); and between the high SA and low SA groups in terms of their conceptions ($z = -.154$, $p = .877$).

Next, the authors identified under which conception each of the four groups described earlier (low DA, high DA, low SA and low SA) had been categorised in the qualitative analysis (Table 4). Following previous studies (e.g. Van Rossum and Hamer 2010, 30) "[l]earning-teaching conceptions 1 through 3 [i.e. A–C in our study] can be associated with surface-level processing and learning outcomes that are mostly of a reproductive nature". In addition, "[l]earning-teaching conceptions 4 through 6 [i.e. D–F] in turn can be associated with deep-level processing and learning outcomes that are mostly of a constructive nature". It was decided that it would be considered there was congruence between conceptions and approaches when high-order conceptions (D–F) matched a high deep approach, and when low-order conceptions (A–C) matched a low deep approach. Some figures showed congruent results; for instance, 32 of the 53 HDA students (60.3%) were categorised as having a complex conception (i.e. D–F). Similarly, 22 of the 41 HSA students (53.7%) were described as low-order conceptions A–C. In contrast, 21 of the 53 HDA students (39.7%) held low-order conceptions

**Table 5.** Approaches and conceptions of participants with a HDA mean score (n = 53).

| | | Total | | HDA ($M$ = 3.63), LSA ($M$ = 1.78), ($n$ = 40; 75.5%) | | HDA ($M$ = 3.63), HSA ($M$ = 2.71), ($n$ = 13; 24.5%) | |
|---|---|---|---|---|---|---|---|
| | | $n$ | % | $n$ | % | $n$ | % |
| Conceptions of learning (Marton, Dall'Alba, and Beaty 1993) | A | 11 | 19.3 | 9 | 22.5 | 2 | 15.4 |
| | B | 3 | 7.0 | 1 | 2.5 | 2 | 15.4 |
| | C | 7 | 14.0 | 5 | 12.5 | 2 | 15.4 |
| | D | 21 | 38.6 | 15 | 37.5 | 6 | 46.2 |
| | E | 6 | 10.5 | 5 | 12.5 | 1 | 7.7 |
| | F | 5 | 10.5 | 5 | 12.5 | | |
| | | 53 | | 40 | | 13 | |

Note: LDA: low deep approach; HDA: high deep approach; LSA: low surface approach; HSA: high surface approach.

A–C, whereas 19 of the 41 HSA cases (46.4%) showed high-order conceptions D–F, which would seem to be contradictory results as one would expect alignment of qualitative responses with inventory data.

In addition, cases with a HDA mean score ($n$ = 53) were specifically analysed (Table 5). This group comprised participants with HDA and HSA scores ($n$ = 13, 24.5%) on the one hand and HDA and LSA scores ($n$ = 40, 75.5%) on the other. It was worth analysing under which conception those participants had been categorised. First, the 13 cases with HDA-HSA were examined, showing that almost 46.2% ($n$ = 6) was in the less complex end of the spectrum (conceptions A–C), while 7 cases (53.8%) showed complex conceptions D–F. These results have important implications because they evidence that scoring high on both DA and SA does not necessarily mean that students hold a complex conception of learning. As to the 40 cases with HDA-LSA, 62.5% ($n$ = 25) had complex conceptions of learning (D–F).

As shown in Table 5, a relatively large number of participants was categorised as holding a D conception, yet these cases should be analysed with caution, as the underlying intentions of participants when using the word "to understand" (whether acquiring knowledge or fully grasping it) remain unknown, as suggested earlier. Overall, the results revealed that the majority of "good" students (75.5% of those with HDA) held a LSA. In contrast, the remaining 24.5% held HDA and HSA simultaneously.

## Conclusions

This study aimed at gaining an insight into how participants learn and at identifying any similarities and differences in participants' responses by implementing a mixed method design and triangulating quantitative and qualitative data. No priority was given to the quantitative data-set over the qualitative one. Overall, the qualitative and quantitative data do not support each other and the final picture remains unclear as to how to describe the sample. When looking at the quantitative data of the full sample ($N$ = 1110) solely, almost half of cases had a high DA and over two thirds had a low SA. In contrast, the qualitative analyses show a predominance of lower-order conceptions, particularly conception A and possibly conception D if the ambiguity argument of the word "understanding" is accepted. Thus, the results show a lack of agreement between the qualitative categories and the quantitative findings on learning, and are similar to previous studies on teaching conceptions and approaches (see Monroy and González-Geraldo 2017). Furthermore, this study supports

Vedenpää and Lonka's (2014) findings in two respects: there is a mismatch between participants' qualitative and quantitative responses, and responses to open-ended question were less "socially desirable" than (and not as constructivist as) responses to the structured questions (R-SPQ-2F). In the answers to the open-ended question, few participants viewed learning as "seeing something in a different way" or "changing as a person", while many claimed that learning is accumulation of knowledge and contents.

Unlike previous recent research (e.g. Asikainen et al. 2013) which suggests a shift in conceptions of learning in that students do not emphasise an increase of knowledge in their learning, the results of the present study reveal a balanced distribution of participants between simple and complex conceptions. Nevertheless, following the EHEA principles mentioned earlier, one would expect a more skewed distribution towards the development of skills and competences among higher education students promoted by the Bologna reform (C conception and above). Bearing in mind the specific context of this study (Master's degree in teacher education), the results are all the more striking as students would be expected to show application-oriented conceptions of learning given the professionalising nature of the course, which would eventually be reflected in both types of data collection instruments. These outcomes are even more conspicuous if one realises how little attention is being paid to fundamental aspects such as "learning how to be and to be together" (UNESCO 2015), which relate to the more complex conceptions (E–F) and are in fact key factors in the transformation process which would turn today's information society into the wisdom society we should be aiming for (Jover and González-Geraldo 2014). In this respect, our study revealed more positive results than those by Van Rossum and Hamer (2010), who found that only 1% of their sample showed the most complex conception, maybe due to student age. These authors (2010, 32) claimed that the move from C towards D conception was the largest and most difficult, and the move from E to F ("from learning-to-know towards learning-to-be") the second largest.

This investigation questions those studies which have solely focused on measuring which approach is predominant and neglected that high scores on both approaches may not necessarily be a good result. As shown by our findings, students with such as profile (high scores in both approaches) did not have complex, meaning-focused conceptions; hence, it may equally important to identify mean scores of approaches, as well as to consider the distance between approaches.

The incongruence revealed in this study points at a number of possible explanations such as (1) participants responding the survey in ways which were socially acceptable despite anonymity; (2) the difference between reported opinions and beliefs and actual behaviour, as reported by previous studies (e.g. Lonka, Joram, and Bryson 1996); thus, students' perception of their behaviour may not match their actual behaviour; (3) the fact that the inventory used measured approaches which are supposed to be more flexible and contextually influenced, whereas the open-ended question measured learning in general terms; hence, one may argue that this study measured different, non-comparable constructs, while approaches and conceptions in fact display images of the same phenomenon from different angles.

Future studies may consider a number of limitations identified in this study such as the not so clear latent structure of the inventory, or the non-random selection of participants from the population. Nevertheless, the sample selected contained two-thirds of the population it came from, and the smaller sample was indeed selected randomly to ensure

representativeness. In addition, as only 10% of the sample was described qualitatively, future research may wish to consider examining the conceptions of learning of the whole sample and contrast qualitative findings with quantitative outcomes. Furthermore, written responses to open-ended questions hinder rich collection of data, particularly if responses are hand-written. Respondents could provide qualitative answers only in written form, which constrained the amount of information they could give and did not allow the authors to gather additional, more detailed information or feedback. Thus, future studies should consider conducting interviews which would make up for the weaknesses of written responses and would ensure a wealth of data may be collected.

Since only the highest conception stated by respondents was recorded in the categorisation process, it was not possible to know whether participants also held any additional lower-order conceptions and which in particular. Hence, a student with a C conception may also hold a B and/or an A conception, but this remains unknown. Previous studies have defended the hierarchical nature of conceptions, but the lack of evidence in the present study does not allow us to support such a premise. In addition, this study reports researchers' perceptions of participants' perceptions,

There is evidence of an association between how a person conceives of learning and of teaching (Van Rossum, Deijkers, and Hamer 1985; Prosser, Trigwell, and Taylor 1994). Thus, one of the most important implications of the results this study yields is that they way individuals learn is related to how they might teach, as "learning and teaching activities are one another's mirror image and may be described in the same terms" (Vermunt and Verloop 1999, 265). And more importantly, there is a relationship between how teachers teach and how their students learn (Trigwell, Prosser, and Waterhouse 1999; Rosário et al. 2013), which, given the characteristics of the sample under study (future teachers), may have educational implications, as a teacher with student-centred approaches to teaching may foster deep approaches to learning in his/her students and vice versa. Previous studies (e.g. Postareff, Lindblom-Ylänne, and Nevgi 2007) have shown that training programmes may have a positive impact on individuals' approaches to teaching, which may influence student learning outcomes, most probably indirectly (Chalmers and Gardiner 2015) even when other authors (Hanbury, Prosser, and Rickinson 2008, 472) identify some relevant literature as a proof of direct impact (e.g. Gibbs and Coffey 2004).

As to the future lines of research, many of the previous investigations which have administered inventories solely to measure approaches to learning have concluded that students tend to adopt a DA. In some cases, data analysis focused on identifying which approach had the highest score, which most likely led to too optimistic yet weak conclusions, and was clearly insufficient to describe a sample, as shown in this study; thus a re-examination of methods and procedures may be necessary. Research on learning ought to combine various methodologies to ensure that constructs are accurately analysed and adequate educational decisions are made, as "multiple measures are increasingly desirable to measure multifaceted constructs particularly in selection/credentialing and in educational settings" (Clauser and Wainer 2016, 26). This is particularly relevant in the light of the aims and complexity of the EHEA and its move towards excellence in all aspects of higher education.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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