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EVOLUTION OF STUDENT APPROACH TO LEARNING IN A MASTER LEVEL SUBJECT

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Abstract

Teaching environment is one of the contextual factors that influence the student approach to learning, apart from perceived or student factors. Contextual factors can be in teachers' domain, who have the possibility to modify them in an attempt to promote deep student approach to learning. This approach is more related to a better academic performance of the student in opposition to surface approach to learning. Classroom activities and assessment system are among the factors mainly determined by the teachers of the subject. In the present study, the student approach to learning of student of a second-year master subject was determined using the R-SPQ-2F questionnaire at the beginning and at the end of the subject, during two different years. The main scales and subscales of the questionnaire were analysed, and gender and teaching and assessment system were used as variables that can influence the modification of student approach to learning. Results showed an improvement of deep student approach, while no modifications were made in the surface approach to learning. These results can indicate that teaching and assessment activities used in this subject promote a deeper approach to learning and can give guidelines to teachers to improve their performance in the classroom.

Keywords: R-SPQ-2F questionnaire; deep and surface approach; assessment; teaching methodologies.

1 INTRODUCTION

The theory of constructivism was developed by Marton and Säljö according to student approaches to learning theory [1], [2]. This theory led them to identify some of the characteristics of successful students [3]. Complexity is one of the characteristics of students' approach to learning. One classification of the factors that influence it can be contextual, perceived, or student factors [4], [5]. Personality is another of the factors that influences the learning approach of the students [6]. Additional student factors include sociodemographic characteristics and academic abilities. These would be the case of gender, age, and cultural differences [7], [8]. Differences in student approaches to learning have also been found between countries or cultural contexts [8]–[13] and disciplines [14], [15]. Teaching context can also influence the learning approach of the students [16], [17] and contribute to determine their learning performance [8], [17]–[19].

A classification of student approach to learning can be surface learning and deep learning [2], [20]. Surface learning is characterized by minimum effort and an extrinsic responsibility with a lack of personal connection and use of memory as learning tool [9], [21], [22]. On the other side, in deep learning the student assumes his/her learning, and has an intrinsic responsibility and personal connections [4], [9], [21], [22]. Positive correlations between assessment results and deep approach have been found [8], [23], [24], while surface approach has been negatively correlated [8].

Contextual factors affect the approach to learning, like the type of studies, the subject matter, the classroom activities, the assessment system, the institutional setting, or the course in which the subject is framed [15], [25]. As an example, deep approach has been shown higher in the first years at the University than in higher courses [4], [25], [26]. This may indicate that a surface approach may be sufficient for the students depending on the context [6]. Also teaching methodology can influence students' engagement [15]; flipped classroom methodology has been shown to encourage deep approach [27] and can indicate that teacher's domain of control can be used to influence student approach to learning.

Teaching activities are focused in students' learning and have to build a positive atmosphere [28]. This teaching-learning environment can make student approach to learning change, from surface learning to a deep learning approach [11]. Teacher can help students to create their learning environments and optimize their performance [29]. By these reasons emphasis in deep approach can be the primary purpose of a good teacher [30]. For example, the usefulness of a learning outcome can foster deep

learning, while excessive workload can encourage surface learning [31]. A measurement of student's approach to learning can be a tool to assess teacher performance [11]. In this context, the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) questionnaire can be a useful tool to analyse the effectiveness of teaching methodologies to promote deep learning [11].

R-SPQ-2F questionnaire was developed from the Study Process Questionnaire (SPQ) [4]. The validity of this tool has been proven by different studies [9], [10], [29]. The R-SPQ-2F questionnaire proposed by Biggs [11] has been used to establish the relationship between approach to learning and personality, knowledge acquisition, academic performance, learning style preference, self-efficiency, goal orientation, or self-regulation strategies [32]–[35].

These studies have analysed the approach to learning in many contexts. More studies are needed to analyse the influence of the teaching methodology in the student approach to learning. In the present study the response of master level students was analysed at the beginning and the end of the subject with the R-SPQ-2F questionnaire to get more information about students' engagement in a subject.

2 METHODOLOGY

A second-year subject called Plant Yield Breeding of the Plant Breeding master's degree at Universitat Politècnica de València (Spain) was chosen for this study. The subject has four ECTS (European Credits Transfer System) of theory sessions (40 hours) and one ECTS of computer sessions (10 hours). The study was carried out during years 2018-19 and 2019-20 and students were organized in one single group, with Spanish as medium of instruction. The number of students registered was 17 students the first academic year and 18 in the second year of this study.

Scientific paper exposition by the students was used as main assessment methodology with previous general context of each module of the subject outlined by the teacher. In the next session after teacher exposition the students performed an exposition of the assigned paper. Assessment was done by the teacher and completed with peer-assessment and self-assessment. Rubrics were provided at the beginning of the subject and were used by students and the teacher to assess every exposition. Expositions were complemented with computer sessions, discussions, and teaching games in the classroom.

At the beginning and the end of the subject, the SPQ questionnaire developed by Biggs [9] was submitted to the students on-line through University learning platform Sakay-based PoliformaT. The test includes 20 items divided into Deep and Surface Approach subscales. The Deep Approach (DA) scale includes Deep Motive (DM) and Deep Surface (DS) subscales; the Surface Approach (SA) scale includes Surface Motive (SM) and Surface Strategy (SS) subscales. Each subscale consists of five items with a 5-point likert-type scale ranging from 1 ('rarely true of me') to 5 ('always true of me'). The questionnaire used was a translation to Spanish done by Muñoz San Roque et al. [36]. Results were analysed using Statgraphics Centurion XVII (Statpoint Technologies, Inc.) calculating correlations between factors and Cronbach's alpha values.

3 RESULTS

The participation in the study was very high (Table 1), with a higher percentage of the students answering at the beginning of the subject than at the end. Higher values were observed for DA than SA, which indicated a high involvement in their own learning. These results suggest that the students' approach to learning is more focused on understanding than in obtaining a good qualification in the subject. DA values were similar to those found in other studies [12], [27], [37], [38]. Differences were observed between years with lower SA the first year than the second. In addition, differences appeared regarding DA values between the beginning and the end of the subject. However, no differences were observed between the pre and the post-test for the SA. One possible explanation is that students' engagement was rewarded with better results in activities developed during the course, leading to an increase in deep learning approach [25]. Other possibility is that this deep learning approach was encouraged by teaching methodology [27]. More data will be necessary to gain more insight into this point. No differences were observed regarding gender of the students, confirming the low effect of gender on students' approach to learning, as previously reported in other studies [39], [40]. In fact in those cases in which the authors have reported differences influenced by gender, they were related to distance education, a completely different environment [41], [42].

Table 1. Number of students who answered the questionnaire by subject, year, test type, and gender. Values (average and standard error) of the R-SPQ-2F questionnaire scales in the deep approach (DA), surface approach (SA), difference between DA and SA and null hypothesis DA-SA.

	No. answers (% enrolled)	DA		SA		Difference DA-SA		Null hypothesis DA-SA ²
Subject	49 (0.70)	3.15 ± 0.08		2.17 ± 0.08		0.98 ± 0.12		***
Year								
2018-19	25 (0.74)	3.26 ± 0.10	a ¹	2.00 ± 0.11	a	1.26 ± 0.18	b	***
2019-20	24 (0.67)	3.03 ± 0.12	a	2.35 ± 0.11	b	0.69 ± 0.14	a	***
Test type								
Pre-test	30 (0.86)	3.01 ± 0.11	a	2.15 ± 0.10	a	0.85 ± 0.15	a	***
Post-test	19 (0.54)	3.37 ± 0.10	b	2.20 ± 0.14	a	1.17 ± 0.19	a	***
Gender								
Female	30 (0.68)	3.07 ± 0.09	a	2.11 ± 0.10	a	0.96 ± 0.16	a	***
Male	19 (0.73)	3.27 ± 0.15	a	2.27 ± 0.13	a	1.00 ± 0.19	a	***

¹Different letters in the same column indicate significant differences (P -value<0.05) between groups according to Tukey's test
²***: $P < 0.0001$, **: $0.001 < P < 0.0001$, *: $0.01 < P < 0.001$, NS>0.01

For the secondary scales of the R-SPQ-2F questionnaire (Table 2) differences only appeared for the DM scale regarding the moment in which the students were tested and SM regarding year and gender; thus supporting the findings on the main scales. Only four students showed a SA value lower than the DA value (data not shown). The comparison on a per student basis for the test at the beginning and the end of the subject showed an increase in the difference between DA and SA at the end of the subject (Figures 1 and 2). These results can indicate a higher level of involvement in the subject and can be related to contextual, perceived, or student factors [4], [5] and one of the reasons of this improvement can be the methodology followed, as seen in other studies [27]. In any case, the number of students was low and in the future it will be necessary to include rewards in order to promote students participation in the state in post-test. More data are necessary to assess this point.

Table 2. Values (average and standard error) of the R-SPQ-2F questionnaire scales in the deep motivation (DM), deep strategy (DS), surface motivation (SM) and surface strategy (SS).

	DM ¹		DS		SM		SS	
Subject	3.32 ± 0.09		2.98 ± 0.09		1.91 ± 0.08		2.44 ± 0.10	
Year								
2018-19	3.43 ± 0.12	a	3.09 ± 0.11	a	1.66 ± 0.09	a	2.35 ± 0.14	a
2019-20	3.21 ± 0.13	a	2.86 ± 0.15	a	2.17 ± 0.12	b	2.53 ± 0.13	a
Test type								
Pre-test	3.14 ± 0.12	a	2.87 ± 0.13	a	1.88 ± 0.11	a	2.43 ± 0.12	a
Post-test	3.61 ± 0.12	b	3.14 ± 0.12	a	1.95 ± 0.14	a	2.45 ± 0.17	a
Gender								
Female	3.24 ± 0.10	a	2.90 ± 0.11	a	1.77 ± 0.10	a	2.44 ± 0.13	a
Male	3.45 ± 0.17	a	3.09 ± 0.17	a	2.12 ± 0.13	b	2.43 ± 0.15	a

¹Different letters in the same column indicate significant differences (P -value<0.05) between groups according to Tukey's test

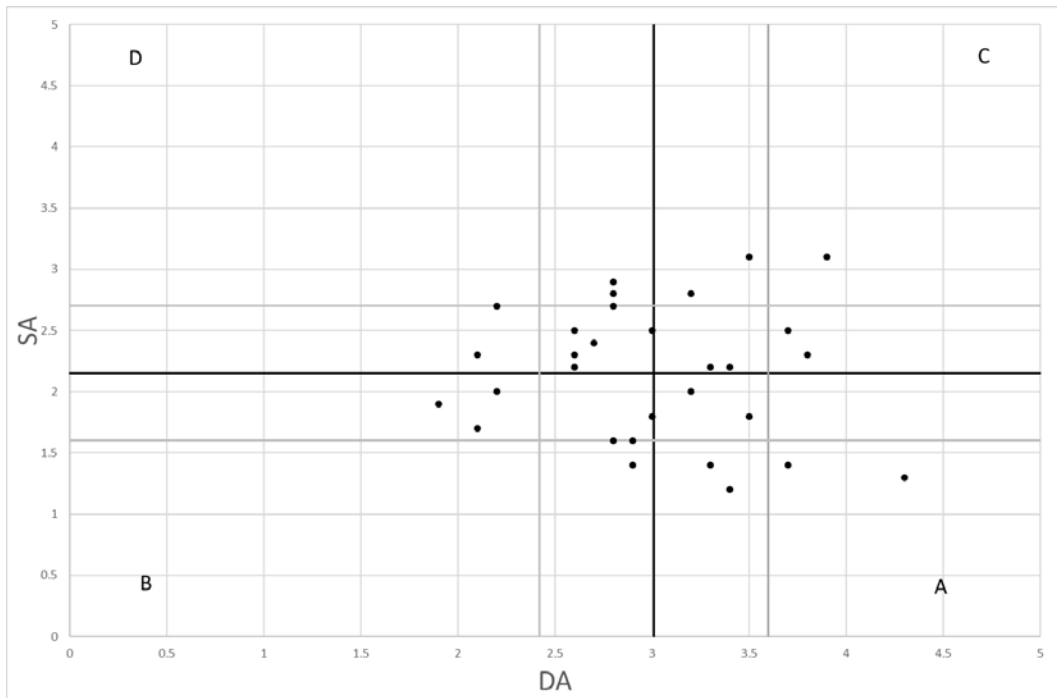


Figure 1. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the beginning of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus one standard deviation. Pooled values for two years.

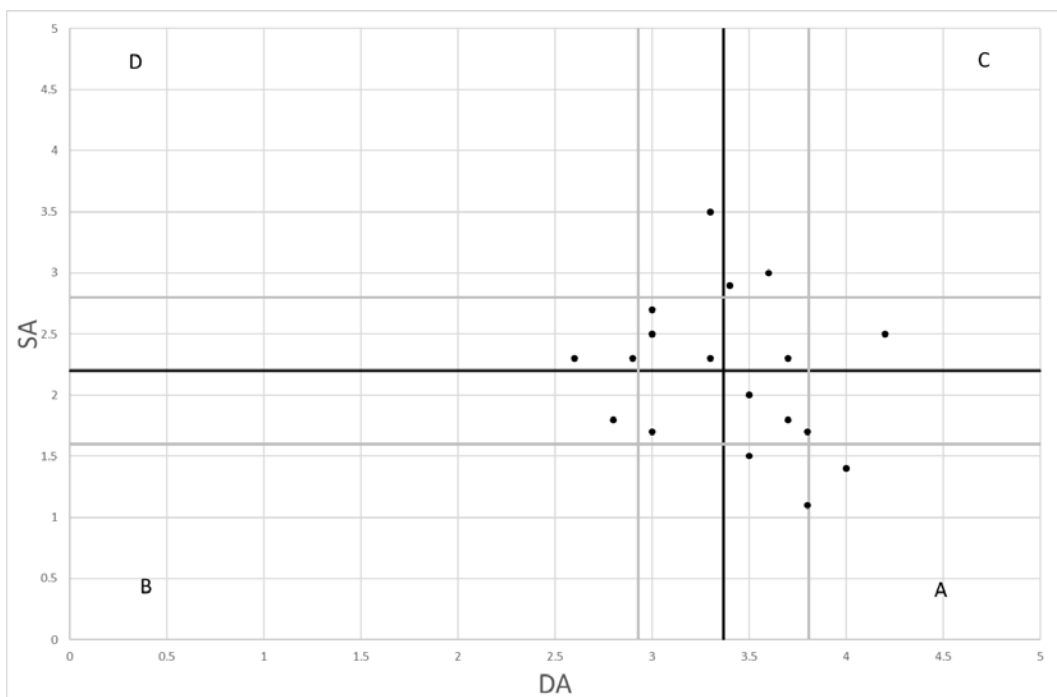


Figure 2. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the end of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus the standard deviation. Pooled values for two years.

High and positive correlations were observed between DA and DM and DS, and also between SA and SM and SS in both tests (Table 3 and 4), This result can indicate the presence of two dominant factors (deep and surface factors), which are maintained in both test. Similar results were obtained in other studies [10], [12], [29], as was already predicted by Biggs et al. [11].

Table 3. Correlations between different factor of the R-SPQ-2F questionnaire scales at the beginning of the subject. Deep approach (DA), surface approach (SA), deep motivation (DM), deep strategy (DS), surface motivation (SM) and surface strategy (SS).

	DA	SA	DM	DS	SM
SA	-0.09 NS				
DM	0.84 ***	0.04 NS			
DS	0.88 ***	-0.17 NS	0.49 *		
SM	0.01 NS	0.87 ***	0.08 NS	-0.05 NS	
SS	-0.15 NS	0.90 ***	-0.01 NS	-0.24 NS	0.58 ***

***: $P < 0.0001$, ** $0.001 < P < 0.0001$, * $0.01 < P < 0.001$, NS > 0.01

Table 4. Correlations between different factor of the R-SPQ-2F questionnaire scales at the end of the subject. Deep approach (DA), surface approach (SA), deep motivation (DM), deep strategy (DS), surface motivation (SM) and surface strategy (SS).

	DA	SA	DM	DS	SM
SA	-0.25 NS				
DM	0.85 ***	-0.18 NS			
DS	0.85 ***	-0.24 NS	0.45 NS		
SM	-0.14 NS	0.89 ***	-0.07 NS	-0.16 NS	
SS	-0.29 NS	0.93 ***	-0.23 NS	-0.26 NS	0.65 ***

***: $P < 0.0001$, ** $0.001 < P < 0.0001$, * $0.01 < P < 0.001$, NS > 0.01

Item reliability analysis showed in general values higher than 0.7 for DA and SA factors, but not for the secondary factors, which confirms the reliability of the questionnaire for the two main scales [43], [44]. Associations between questions and factors can vary depending on different factors [9]–[11], [29], [45] and cultural differences have been observed [12], [46]–[48]. Confirmatory factor analyses have been carried out in different cultural contexts [9]–[11], [29], [45], [49] and the analyses confirmed the validity of the questionnaire, although some adjustments can be done depending on the cultural context.

Table 5. Cronbach alpha coefficient values (95% lower confidence band) among the different R-SPQ-2F questionnaire scales of the questionnaires evaluated. Deep approach (DA), surface approach (SA), deep motivation (DM), deep strategy (DS), surface motivation (SM), and surface strategy (SS).

	DA	SA	DM	DS	SM	SS
Subject	0.74 (0.64)	0.74 (0.64)	0.61 (0.45)	0.63 (0.47)	0.57 (0.39)	0.59 (0.42)
Year						
2018-19	0.66 (0.53)	0.73 (0.63)	0.59 (0.42)	0.44 (0.20)	0.42 (0.18)	0.64 (0.49)
2019-20	0.79 (0.71)	0.71 (0.59)	0.63 (0.47)	0.75 (0.64)	0.50 (0.28)	0.53 (0.33)
Test type						
Pre-test	0.78 (0.69)	0.72 (0.62)	0.63 (0.48)	0.73 (0.62)	0.60 (0.44)	0.53 (0.33)
Post-test	0.54 (0.36)	0.77 (0.68)	0.36 (0.09)	0.27 (-0.04)	0.52 (0.32)	0.68 (0.55)
Gender						
Female	0.68 (0.56)	0.76 (0.67)	0.51 (0.30)	0.56 (0.37)	0.56 (0.38)	0.66 (0.52)
Male	0.82 (0.75)	0.73 (0.63)	0.77 (0.68)	0.73 (0.62)	0.53 (0.33)	0.54 (0.34)

4 CONCLUSIONS

The results presented in this study showed higher DA values than SA in students enrolled in a second year of a Plant Breeding Master degree. An improvement of DA was observed at the end of the subject. The reason behind this improvement can related to contextual, perceived, or student factors

[4], [5]. The teaching methodology can be one of the factors than can influence this change and it is in the domain area of the teacher, so can be used to improve engagement of the students.

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