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STUDENT APPROACH TO LEARNING IN A DEGREE LEVEL SUBJECT: EVOLUTION OVER THE TERM

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Abstract

Student approach to learning can vary between students depending on different factors. Those factors can be classified as contextual, perceived or student factors. Contextual factors are the type of studies, the subject, the classroom activities or the assessment system among others. Some of those factors are in the teacher domain and can be modified to influence student approach to learning. In the present study, the R-SPQ-2F questionnaire was completed by freshmen students of Biotechnology degree at the beginning and the end of a General Genetics subject. The students showed a higher deep approach than surface approach and differences were observed depending on year, gender and language used as medium of instruction. Pre- and post-test comparison showed no variation in deep approach while a slight increase in surface approach. The item reliability of the questionnaire was high, and correlations were found between the main scales and secondary subscales. The methodology, classroom activities and assessment system used in the subject seem to maintain the initial interest of the students in the subject but more studies should be made to get more involvement of the students in their own learning and improve their results.

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

1 INTRODUCTION

Student involvement in a subject can be affected by several factors, which can be classified as contextual, perceived, or student factors [1], [2]. Teacher performance, classroom activities or assessment methodology used in a subject can influence student involvement [3].The primary purpose of a good teacher would be to encourage students performance [4]. In this sense, measuring the student's approach to learning would indirectly provide an index of the quality of teaching [5]. For example, the usefulness of a learning outcome can foster deep learning, while workload can encourage surface learning [6]. Qualitative [7] or quantitative [1], [8] approximations to measure the approach to learning have been developed.

Several ways can be used to classify the approach to student learning and usually they distinguish surface learning and deep learning [9], [10]. Surface learning is characterized by an extrinsic responsibility with a minimum effort by the student and a lack of personal connection, the use of memory, and lack of reflection, [11]–[13]. On the other side, deep learning is characterized by an intrinsic responsibility, where the student assumes his/her own learning with personal connections, reflection on meaning and comprehension [1], [11]–[13]. Grading is normally the main objective of students who take a superficial approach in a subject, while learning and understanding is the main objective of those who use a deep approach [1], [14], [15]. Assessment results can be also related to student approach to learning, with positive correlations with deep approach [16]–[18], and negative correlations with surface approach [16].

Due to the importance to determine student approach to learning, several tools have been developed, such as Study Attitudes and Methods Revised Short Form (SAMS Short Form) [19], Revised Approaches to Studying Inventory (RASI) [20] modified in Approaches and Study Skills Inventory for Students (ASSIST) [21], [22], Inventory of Learning Process–Revised (ILP-R) [23], Approaches to Learning and Studying Inventory (ALSI) [24], Learning and Study Inventory Strategies (LASSI) [25], or Inventory of Learning Styles (ILS) [26]. In this study the Study Process Questionnaire (SPQ) [1], which was subsequently revised to create the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) [5] has been chosen, as the validity of this tool has been proven by different studies [12], [27], [28].

In the present work, assessment of the student approach to learning of the students was measured at the beginning and the end of the subject. The objective was to measure the initial approach and the final approach in order to evaluate if the teaching methodology influenced in the student approach of the students.

2   METHODOLOGY

This study was carried out in a first-year subject, General Genetics, of the Biotechnology Bachelor's degree at Universitat Politècnica de València (Spain). The subject has four ECTS (European Credits Transfer System) of theory sessions (40 hours) and two ECTS of lab sessions (20 hours). The study was carried out during academic years 2018-19 and 2019-20. The students were organized in three groups, two with Spanish as medium of instruction and one with English as a medium of instruction. The number of students registered was 125 students the first academic year and 112 in the second year.

Classroom activities involved active participation of the student and assessment task were written exams, online test, lab questions, reports, and presentations with screencasts of selected topics. The students had previously all the information and resources for the lectures through a learning platform based in Sakai, called PoliformaT.

SPQ questionnaire developed by Biggs [12] was used as tool to measure student approach to learning and 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. [29]. 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. In any case, the response rate was higher in the second year of the study, because the response rate in the post-test of the first year was very low (25%). The values for DA were higher than SA values. This difference can point a higher involvement of the students in their own learning. It also can indicate that students are more worried about understanding than in qualifications. DA values were similar to those found in other studies that analysed the approach to learning in students… [15], [30], [33]. No differences were observed between years, except for the differences between DA and SA (higher in the second year) and for DM (table 2). Regarding the type of test (pre or post), similar values were observed for the DA score, but higher values of SA were observed in the post test. It can indicate that the subject activities were similar to what they expected, so they did not change their deep approach; however, a more strategic approach appear, which made them to raise their surface approach [5], [14], [34], [35]. Teaching methodology also can be involved and promote deep approach, so it can help to maintain student expectations [32]. However, more studies and repetitions should be done to get more information about this point. No differences were observed regarding gender of the students, for the DA approach, but males showed a higher SA approach than females. Gender is one of the factors that can influence student approach to learning, as previously reported in other studies carried out with… [36], [37]. In some studies differences influenced by gender were related to distance education or age, [38], [39]. In our case, no one of these factors can explain the difference in SA scores related to gender, as students are of similar age and face-to-face education was common to all the students. A similar result regarding the gender effect was obtained in a previous study by the research group with students involved in different bachelor and master degree subjects [40]. Regarding the language used as a medium of instruction, the SA score was lower for students with English as a medium of instruction causing a higher difference with DA approach. This difference can be related to the different admission mark and different size of the groups, that where higher and smaller respectively for the English group.

Table 1. Number of students who answered the questionnaire by subject, year, test type, gender and language used as a medium of instruction. 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	288 (0.60)	3.31 ± 0.03	0	1.94 ± 0.03	0	1.36 ± 0.05	0	***
Year								
2018-19	115 (0.46)	3.30 ± 0.05	a	1.96 ± 0.04	a	1.34 ± 0.07	a	***
2019-20	173 (0.76)	3.31 ± 0.05	a	1.93 ± 0.04	a	1.38 ± 0.06	b	***
Test type								
Pre-test	179 (0.74)	3.33 ± 0.04	a	1.89 ± 0.03	a	1.43 ± 0.06	a	***
Post-test	109 (0.46)	3.27 ± 0.06	a	2.02 ± 0.05	b	1.24 ± 0.08	a	***
Gender								
Female	197 (0.61)	3.29 ± 0.04	a	1.90 ± 0.03	a	1.39 ± 0.06	a	***
Male	91 (0.58)	3.34 ± 0.06	a	2.03 ± 0.05	b	1.31 ± 0.09	a	***
Language								
Spanish	222 (0.58)	3.27 ± 0.59	a	1.97 ± 0.47	a	1.30 ± 0.83	a	***
English	66 (0.68)	3.43 ± 0.56	a	1.86 ± 0.45	a	1.56 ± 0.78	b	***

[1]*Different 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*

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	3.43 ± 0.04		3.18 ± 0.04		1.57 ± 0.03		2.31 ± 0.04	
Year								
2018-19	3.39 ± 0.06	a	3.21 ± 0.06	a	1.59 ± 0.04	a	2.33 ± 0.05	a
2019-20	3.45 ± 0.05	b	3.17 ± 0.05	a	1.56 ± 0.04	a	2.30 ± 0.05	a
Test type								
Pre-test	3.40 ± 0.05	a	3.26 ± 0.05	b	1.52 ± 0.03	a	2.26 ± 0.04	a
Post-test	3.48 ± 0.06	a	3.06 ± 0.06	a	1.66 ± 0.05	a	2.39 ± 0.06	a
Gender								
Female	3.43 ± 0.05	a	3.15 ± 0.05	a	1.52 ± 0.03	a	2.28 ± 0.04	a
Male	3.42 ± 0.06	a	3.26 ± 0.07	a	1.68 ± 0.05	b	2.38 ± 0.06	a
Language								
Spanish	3.39 ± 0.66	a	3.15 ± 0.66	a	1.59 ± 0.50	a	2.35 ± 0.59	a
English	3.56 ± 0.61	a	3.29 ± 0.65	a	1.53 ± 0.45	a	2.20 ± 0.58	a

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

Some differences regarding the factor studied were also significant for the secondary scales of the R-SPQ-2F questionnaire (Table 2). Differences appeared for the DM scale regarding the year of study and for DS score regarding the test type, but not for gender or language used as a medium of instruction. Only fourteen students showed a SA value lower than the DA value and mainly in the Spanish group (data not shown). The comparison on a per student basis for the test at the beginning and the end of the subject showed a decrease in the difference between DA and SA at the end of the subject (Figures 1 and 2). The number of students with a high DA and low SA increased at the end of the subject and lowered the number of students with low DA and high SA. Results like these can indicate that the level of involvement in the subject and can be related to contextual, perceived, or student factors [1], [2] and one of the reasons of this improvement can be the methodology followed, as seen in other studies [32]. In any case, the number of students that answered the post-test was low

in the first year and promoting of the survey was done in the second year to encourage students. However, more data are necessary to assess this point.
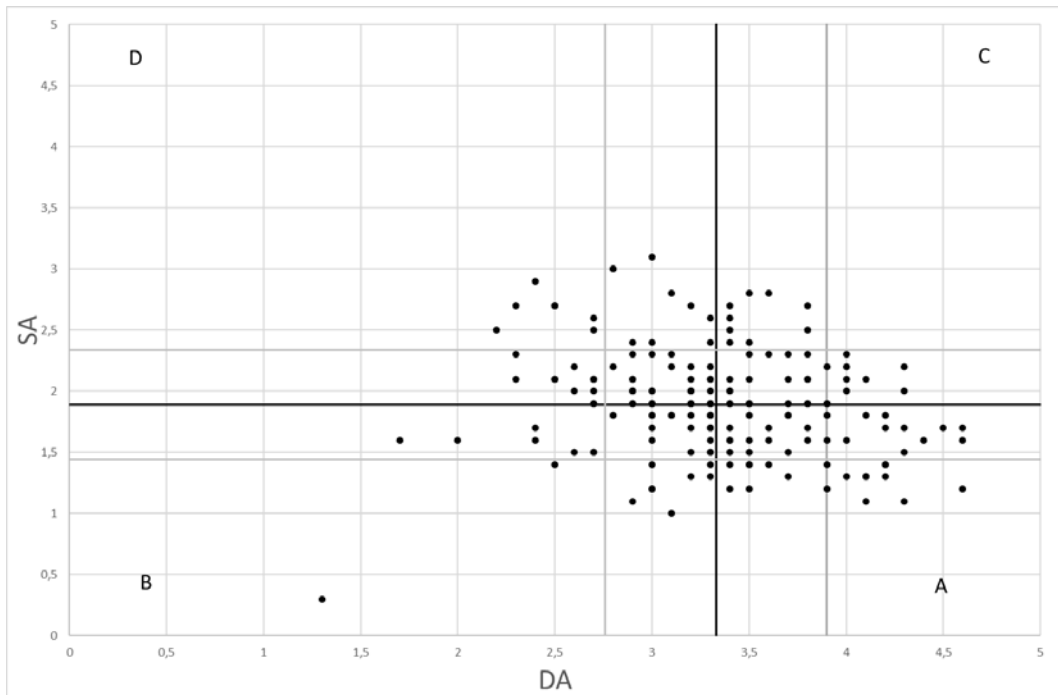

Figure 1. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the beginning of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus one standard deviation. Pooled values for two years.
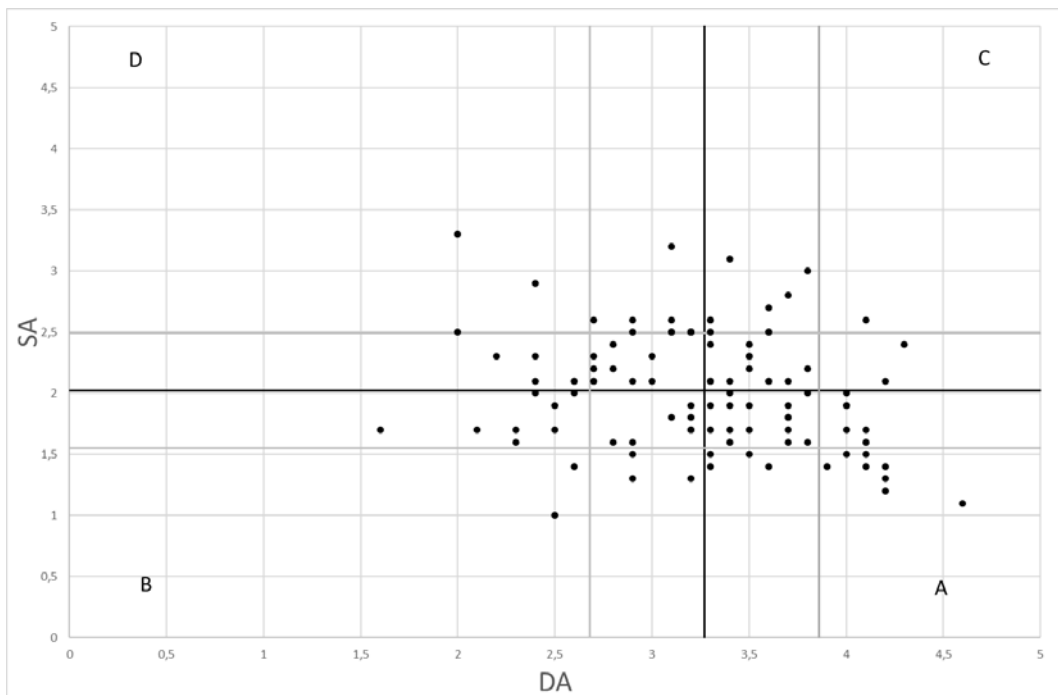

Figure 2. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the end of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus the standard deviation. Pooled values for two years.

Correlations between DA and DM and DS, and also between SA and SM and SS in both tests were high and positive (Table 3 and 4), This result was similar in other studies [27], [28], [30], as was

already predicted by Biggs et al. [5]. It can indicate the presence of two dominant factors, which are maintained in both test (deep and surface factors).

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	-0,19 *				
DM	0,89 ***	-0,16 *			
DS	0,90 ***	-0,18 *	0,60 ***		
SM	-0,14 NS	0,84 ***	-0,13 NS	-0,11 NS	
SS	-0,20 *	0,93 ***	-0,16 *	-0,20 *	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	-0,21 *				
DM	0,90 ***	-0,23 *			
DS	0,90 ***	-0,15 NS	0,61 ***		
SM	-0,15 NS	0,83 ***	-0,21 *	-0,06 NS	
SS	-0,22 *	0,88 ***	-0,19 *	-0,19 *	0,48 ***

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

In general, item reliability analysis showed high values for DA and SA factors (higher of 0.7 in most cases), but not for the secondary factors (Table 5), which confirms the reliability of the questionnaire for the two main scales [41], [42]. Associations between questions can vary [5], [12], [27], [28], [43] depending on different factors like cultural differences [30], [44]–[46]. Confirmatory factor analyses have been carried out in different cultural contexts [5], [12], [27], [28], [43], [47] and the analyses confirmed the validity of the questionnaire and the two factors structures, although some adjustments can be done.

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	0,78 (0,74)	0,69 (0,64)	0,64 (0,58)	0,67 (0,61)	0,53 (0,45)	0,53 (0,45)
Year						
2018-19	0,75 (0,71)	0,66 (0,61)	0,59 (0,52)	0,64 (0,57)	0,41 (0,31)	0,53 (0,46)
2019-20	0,79 (0,76)	0,71 (0,66)	0,67 (0,61)	0,68 (0,63)	0,59 (0,52)	0,53 (0,46)
Test type						
Pre-test	0,78 (0,74)	0,68 (0,63)	0,62 (0,56)	0,67 (0,62)	0,46 (0,37)	0,53 (0,45)
Post-test	0,79 (0,76)	0,69 (0,64)	0,67 (0,62)	0,66 (0,61)	0,59 (0,52)	0,53 (0,45)
Gender						
Female	0,79 (0,76)	0,69 (0,64)	0,69 (0,64)	0,66 (0,61)	0,53 (0,45)	0,52 (0,44)
Male	0,74 (0,70)	0,69 (0,64)	0,51 (0,43)	0,67 (0,62)	0,50 (0,42)	0,55 (0,48)
Language						
Spanish	0,76 (0,72)	0,66 (0,61)	0,60 (0,54)	0,66 (0,60)	0,51 (0,43)	0,48 (0,39)
English	0,83 (0,80)	0,76 (0,72)	0,73 (0,68)	0,70 (0,65)	0,60 (0,53)	0,66 (0,60)

4 CONCLUSIONS

The results presented in this study showed that students enrolled in a first year of a Biotechnology present higher DA values than SA. No modification of DA at the end of the subject was observed, but a slight increase of SA appeared, which can indicate a maintenance of involvement of students in the subject but an increase of a strategic approach. The reason behind this improvement can be related to contextual, perceived, or student factors [1], [2]. Teacher methodology and activities carried out in the classroom are some of the factors that can influence student performance and approach to learning, sothey should be planned carefully to improve student learning.

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