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# STUDENT APPROACH TO LEARNING DOES NOT CHANGE BEFORE AND DURING COVID-19 PANDEMIC IN A DEGREE LEVEL SUBJECT

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## Abstract

Different approaches to learning depending on the context of teaching environment, personal perception of learning process, and several intrinsic factors appear in University students. These approaches to learning can be divided into two groups: surface approach, in which memory-based techniques are used and students participate poorly, and deep approach, which involves a higher understanding and integration of different concepts. The coronavirus COVID-19 pandemic that has devastated the world since the end of 2019 may have changed the students' approach to learning as the new personal situations may have modified in many complex ways the teaching environment, the perceptions of learning processes, and the intrinsic factors (psychological traits, economic situations...). The main objective of the present study is to evaluate these possible changes on students of the second year of a life science degree, to who pandemic has affected their process of adaptation to the University life. The R-SPQ-2F questionnaire was used at the beginning and at the end of the first semester for the subject "Fundamentals of forest botany and zoology", in two different years: 2019-2020, when the subject was not affected yet by COVID-19, and 2020-2021, when the whole Spanish society was recovering from a complete lockdown that lasted more than three months and punctual lockdowns continued. Results shows a high item reliability for the main scales but not for the subscales. The main scales and subscales of the questionnaire were compared both between the beginning and the end of each academic year, and between years and gender. In both academic years, no statistical differences were found between the beginning and the end of the semester. The same result was observed related to gender, with non-significant differences. Surprisingly, there was also no significant differences between academic years. This result reveals that the pandemic has not significantly affected the approaches to learning of the students of this forest biology subject.

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

## 1 INTRODUCTION

Student approach to learning varies depending on contextual, perceived or student factors [1], [2]. Student learning research was originally developed by Marton and Säljö, who developed the student's approaches to learning (SAL) theory [3], [4]. This theory was developed subsequently by Marton and Säljö [3], [4], Entwistle [5], [6] and Biggs [1]. Two main approaches have been identified: deep approach and surface approach. These have been supported by various authors [7]–[9], although some authors describe another approach called strategic or achievement [1]. Students with a surface approach (SA) in a course aim to achieve the mark in order to pass with the minimum effort and learning is seen as an external duty [10]–[12]. This approach can be adopted by the student due to diverse factors like workload, other priorities, inability or assessing system [1], [10], [13] and it has a negative correlation with academic performance [14]. The other approach, deep approach (DA), is focused on meaning and learning, [10]–[12] and it has been positively correlated with assessment results [14]–[17].

Student approach is not considered a stable psychological trait [18], [19] and can vary due to different factors as personal, contextual or perceived factors [1], [2]. Personal factors include age, gender, personality, previous education, prior knowledge abilities and attitudes or motivations that influence student approach to learning [2], [14]. Also, cultural differences can influence student approach to learning [7], [14], [20], [21]. Contextual factors include type of studies, subject matter, structure of the course, assessment system or course [1], [2], [22], [23]. It has been suggested that students can change their approach in different subjects and years, especially a decline in DA and increase of SA over the years has been observed [24]–[27]. Methodology and teacher performance can also affect student approach to learning [23], [28]–[34]. The perceived factors represent the way the student perceives the academic environment and they can affect their student approach to learning [1], [2], [22]. Several

aspects can be found in this category like workload, clarity of goals, usefulness, or assessment system [2], [23], [29], [34].

A variety of instruments can be used to measure student approach to learning [35]. Some of the most used are Study Attitudes and Methods Revised Short Form (SAMS Short Form) [36], Revised Approaches to Studying Inventory (RASI) [37] modified in Approaches and Study Skills Inventory for Students (ASSIST) [38], or Inventory of Learning Styles (ILS) [39]. Study Process Questionnaire (SPQ) developed by Biggs [1] is also one of the most widely used. Originally it included three dimensions: deep, surface and achieving, with two sub-dimensions (motive and strategy) each of them [1], [40]. The questionnaire was revised and reduced to 20 items in the Revised 2 factor version (R-SPQ-2F) with two factors: deep and surface, and two subscales: motive and strategy [7]. The questionnaire assess how students differ in a teaching context and it does not assess general orientations but specific responses to particular situations [7], [12], [41], so it can show how student approach to learning change through the university years [27], [30].

The R-SPQ-2F questionnaire shows cultural sensitivity when adapted to different languages [11], [20], [35], [42], [43]. Several translations to different languages have been performed [11], [12], [43]–[50]. The consistency of the R-SPQ-2F questionnaire has been assessed [7], [51] and its psychometric properties have been explored [20], [21], [42]. Differences were found but the two first order factor structure has been confirmed [52].

At the end of 2019 a new Coronavirus called SARS-Cov-2 appeared [53] and caused the closures of schools and faculties around the world [54]. Learning was organized for distance learning [55] and the availability of technological facilities has been a major concern [56], [57]- However differences have been observed depending on the use of learning platforms before COVID-19 [58], [59]. This change in teaching environment has affected student's performance and behaviour and student approach to learning, but the effect can be variable depending on several factors.

In the present study the student approach to learning of students of the subject "Fundamentals of forest botany and zoology", in two different years: 2019-2020, when the subject was not affected yet by COVID-19, and 2020-2021, when the whole Spanish society was recovering from a complete lockdown that lasted more than three months and punctual lockdowns continued, with the R.SPQ-2F questionnaire at the beginning and the end of the subject. The main objectives were to determine the student approach of the students, and to assess the influence of the COVID-19.

## **2 METHODOLOGY**

### **2.1 Study case**

The subject Fundamentals of Forest Botany and Zoology is taught during the first semester of the second year of the Forest Engineering Degree, in the Universitat Politècnica de València (Spain). In the academic year 2019-2020, the first semester (from September to December) passed normally, using the usual teaching methodology in theoretical and practical sessions. Theoretical classes were taught as lectures in the classrooms and practical sessions included lab sessions and field trips. As it was the second-degree year, students were fully adapted to the University life. However, in the beginning of 2020, the COVID-19 coronavirus arrived at Spain. In March, all the country was subjected to a complete lockdown, and the usual teaching methodology had to change sudden and drastically. Both the theoretical and practical classes had to be taught online, and interactions among students and between students and teachers dramatically decreased. This change affected especially to students of the first-degree year, who were not fully adapted to University life.

In the first semester of the academic year 2020-2021, the second wave of the COVID-19 infection occurred. Teaching had to be adapted to a scenario of semi-confinement, in which all the sessions were taught in classrooms at 70% of their capacity, following strict rules of social distance and mask use. Students who did not fit in the classrooms or were confined, had the opportunity to follow the sessions in streaming using Teams (Microsoft), as all the theoretical classes were recorded. Practical sessions were more problematic, as labs capacities were lower. From time to time, COVID-19 outbreaks occurred, and all the sessions had to be online. Students of the second year were especially psychologically affected, as they felt they were losing the genuine University experience.

As a routine in our research line focused on student approaches to learning, students of Fundamentals of Forest Botany and Zoology were asked to fill out the R-SPQ-2F questionnaire at the beginning and at the end of the semester of 2019-2020, when the subject was not affected yet by COVID-19, and at

the beginning and the end of the semester of 2020-2021, after seven months of pandemic. In the first year 27 students were enrolled and 39 in the second year. In total, 23 females and 43 males which represents the usual ratio female:male in forest engineering participated. The student participation was voluntarily, and this was not related to their performance in the subject. The questionnaire was carried out online, through the learning platform PoliformaT under the Sakai system. The translation of the questionnaire was used [45].

## 2.2 Statistical analyses

Values of the factors deep approach (DA), surface approach (SA), deep motivation (DM), deep strategy (DS), surface motivation (SM) and surface strategy (SS) were calculated following the indications of Biggs' R-SPQ-2F questionnaire [7]. Student's t-test was used to compare the difference of deep and surface approaches between years, moment during the semester, and gender. A Tukey's HSD multiple range test was used to compare the mean values among different factors. Internal consistency of R-SPQ-2F was assessed using Cronbach's alpha. Statistical analyses were performed using Microsoft © Excel and Statgraphics © Centurion XVI software.

## 3 RESULTS

In the academic year 2019/2020, 27 students were enrolled (13 females and 14 males), and only 7 students (2 males and 5 females), which represented 25.9% of the total enrolled students, filled out the questionnaire at the beginning of the semester. Nineteen students (12 males and 7 females), which represented 70.4% of the total, filled it out at the end. Number of students increased in 2020/2021, with 39 (29 males and 10 females) students attending the subject. At the beginning, 36 students (26 males and 10 females; 92% of the total enrolled students) participated in the study, and at the end 29 students (22 males and 7 females; 72% of the total) participated.

The students showed a higher DA compared to SA as in other studies [60], [61], with no differences regarding to year, moment of the test or gender (Table 1), even for the subscales of the questionnaire with the exception of DM for gender (Table 2). Some differences have been observed regarding age or gender in other studies but it is not a general trend [22], [28], [62]–[65]. Also, differences have been observed related to subject, year or level of studies [22], [23], [27]. No differences were observed regarding the year, even when the pandemic situation completely changed the teaching conditions. Students have reported to have had digital and technological difficulties [66], and an increase of workload to compensate for the absence of face-to-face meetings [66], but in our case those factors seemed to have not changed the initial and final student approach to learning.

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 <sup>2</sup>
<b>Subject</b>	91 (0.69)	3.06 ± 0.07		2.40 ± 0.07		0.67 ± 0.11		***
<b>Year</b>								
2019-20	26 (0.48)	3.01 ± 0.12	a	2.61 ± 0.12	a	0.40 ± 0.19	a	*
2020-21	65 (0.83)	3.09 ± 0.08	a	2.31 ± 0.08	a	0.78 ± 0.13	a	***
<b>Test type</b>								
Pre-test	43 (0.65)	2.98 ± 0.10	a	2.31 ± 0.10	a	0.67 ± 0.17	a	***
Post-test	48 (0.73)	3.14 ± 0.09	a	2.48 ± 0.10	a	0.67 ± 0.13	a	***
<b>Gender</b>								
Female	34 (0.74)	2.90 ± 0.11	a	2.42 ± 0.11	a	0.48 ± 0.17	a	***
Male	57 (0.66)	3.16 ± 0.08	a	2.38 ± 0.09	a	0.78 ± 0.13	a	***

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

	<i>DM</i> <sup>1</sup>		<i>DS</i>		<i>SM</i>		<i>SS</i>	
<b>Subject</b>	3.14 ± 0.07		2.99 ± 0.07		2.13 ± 0.08		2.66 ± 0.08	
<b>Year</b>								
2018-19	3.06 ± 0.13	a	2.95 ± 0.13	a	2.33 ± 0.14	a	2.88 ± 0.14	a
2019-20	3.17 ± 0.09	a	3.01 ± 0.08	a	2.06 ± 0.09	a	2.57 ± 0.09	a
<b>Test type</b>								
Pre-test	3.07 ± 0.11	a	2.88 ± 0.10	a	2.01 ± 0.12	a	2.60 ± 0.11	a
Post-test	3.19 ± 0.09	a	3.10 ± 0.09	a	2.24 ± 0.10	a	2.71 ± 0.11	a
<b>Gender</b>								
Female	2.93 ± 0.12	a	2.87 ± 0.11	a	2.12 ± 0.12	a	2.72 ± 0.12	a
Male	3.26 ± 0.09	b	3.07 ± 0.09	a	2.14 ± 0.10	a	2.62 ± 0.10	a

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

Comparison per student basis can be seen in figures 1 and 2 and it showed a similar distribution. Differences in student approach to learning can be related to contextual, perceived, or student factors [1], [2]. Methodology used by the teacher can also influence and change student approach of students [28]. In our case no differences were observed that could indicate that the methodology maintained the initial high deep approach of the students.

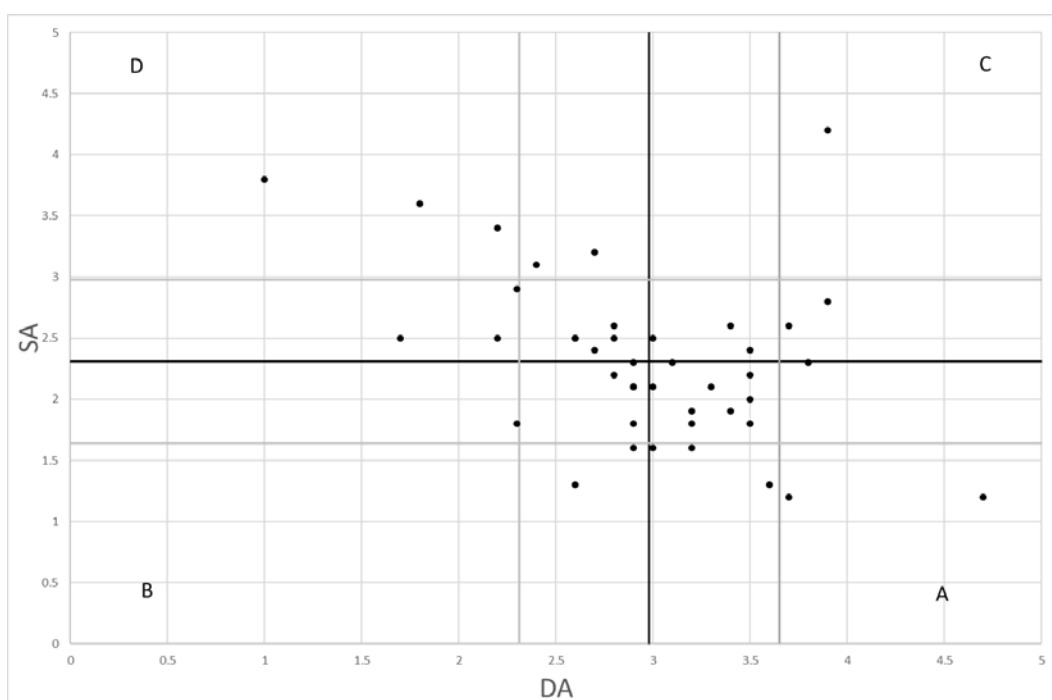


Figure 1. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the beginning of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus one standard deviation. Pooled values for two years.

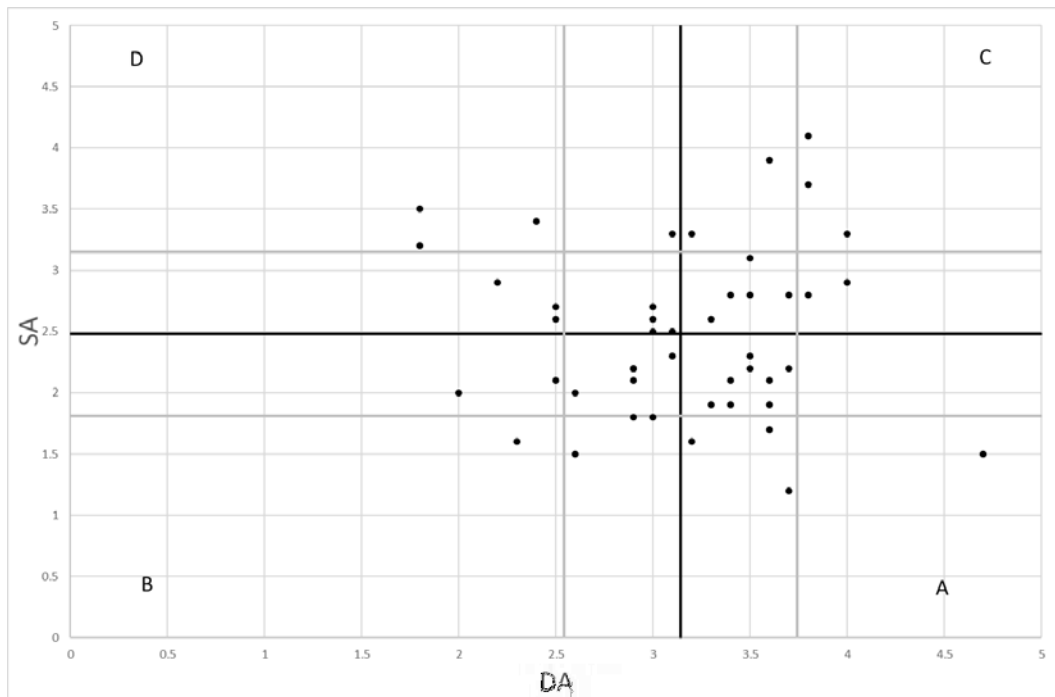


Figure 2. Deep approach (DA) and surface approach (SA) distribution of scores for each student in the test at the end of the subject. The black lines depict mean values for DA and SA and the grey lines the mean plus or minus the standard deviation. Pooled values for two years.

Correlations between the main scales and the corresponding subscales were high and positive (Table 3 and 4) similar to other studies [21], [42], [67]. This can indicate the existence of two main factors (deep and surface), and it has been assessed with confirmatory factor analyses that have been carried out in different cultural contexts [20], [21], [68]. The item reliability analysis using the alpha de Cronbach (Table 5) supported these findings as the values were higher for the main scales than the subscales.

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	-0.43 *				
DM	0.95 ***	-0.38 *			
DS	0.94 ***	-0.43 *	0.78 ***		
SM	-0.29 NS	0.90 ***	-0.22 NS	-0.32 *	
SS	-0.49 **	0.89 ***	-0.46 *	-0.46 *	0.60 ***

\*\*\*:  $P < 0.0001$ , \*\*  $0.001 < P < 0.0001$ , \* $0.01 < P < 0.001$ , 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	-0.01 NS				
DM	0.94 ***	0.02 NS			
DS	0.93 ***	-0.04 NS	0.74 ***		
SM	-0.01 NS	0.91 ***	0.06 NS	-0.08 NS	
SS	0.00 NS	0.93 ***	-0.02 NS	0.01 NS	0.69 ***

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

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
<b>Subject</b>	0.82 (0.77)	0.83 (0.78)	0.69 (0.59)	0.66 (0.55)	0.73 (0.65)	0.72 (0.64)
<b>Year</b>						
2019-20	0.83 (0.79)	0.80 (0.75)	0.69 (0.59)	0.70 (0.61)	0.65 (0.55)	0.73 (0.65)
2020-21	0.82 (0.76)	0.83 (0.78)	0.69 (0.60)	0.64 (0.52)	0.75 (0.67)	0.71 (0.62)
<b>Test type</b>						
Pre-test	0.82 (0.78)	0.83 (0.78)	0.69 (0.59)	0.67 (0.57)	0.74 (0.66)	0.74 (0.66)
Post-test	0.81 (0.76)	0.83 (0.78)	0.69 (0.60)	0.63 (0.51)	0.71 (0.62)	0.71 (0.62)
<b>Gender</b>						
Female	0.84 (0.79)	0.81 (0.76)	0.72 (0.64)	0.66 (0.55)	0.70 (0.61)	0.77 (0.70)
Male	0.80 (0.74)	0.84 (0.79)	0.64 (0.53)	0.65 (0.54)	0.75 (0.68)	0.70 (0.61)

## 4 CONCLUSIONS

This work aimed to compare the student approach to learning before and after the COVID-19 pandemic in one subject of the second year of Forestry Engineering Degree. We hypothesized that student approach to learning may have changed because of the pandemic and the lockdown effects. These effects include new personal situations that may have modified in many complex ways the teaching environment, the perceptions of learning processes, and some intrinsic factors, such as psychological traits, economic situations, or health concerns. During pandemic, students have reported to feel isolated, less motivated, at various points confused, and disappointed. Many of them reported to have had digital and technological difficulties [66]. Most of them have had a dramatic increase of workload because of the multiple activities they had to compensate for the absence of face-to-face meetings [66].

However, our results showed that no significant differences were found before and after pandemic. This has also been observed in other students from different countries, and the reason that these studies highlighted was the resilience of both lecturers and students [66], [69]. Students from different Asiatic universities showed a high level of satisfaction towards learning during pandemic [66]. On the one hand, resilience is thought to be the result of perseverance and passion [69]. On the other hand, it could also be the result of flexibility, both in terms of location (students can follow the online sessions anywhere) and of time (students can adjust learning times and watch the lectures many times) [70]. This high resilience of students and lecturers has allowed the maintenance of deep learning, in which strategies based on designing and managing adequate learning methodologies and contents were able to transform data into key, essential and productive information [71]. Besides the non-significant differences between years, we also found non-significant differences between the two moments evaluated in each year (the beginning and the end of the semester) and between males and females. This agrees with the results of previous works, in which no differences were recorded for gender in the student approach to learning [63], [72].

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