

Psychometric Study of a Questionnaire for Academic Study Processes of Portuguese College Students

D. Oliveira³, G. Esgalhado¹, D. Oliveira³ and N. M. Garcia^{2,3}

¹Psychology and Education Department, University of Beira Interior, Covilhã, Portugal

²Computer Science Department, University of Beira Interior, Covilhã, Portugal

³Instituto de Telecomunicações, Covilhã, Portugal

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Abstract: Background: The assessment of the study processes or approaches to learning more often used by college students as they are understood by Biggs and his collaborators is considered fundamental in providing tools to better understand the way students learn and how this should be taken into account by tutors and teachers. The choice of a deep approach to learning as opposed to a surface approach is often considered connected to a more significant learning. Aim: This research aimed to adapt and validate the Revised Two Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001). for the Portuguese college student population. Method: A population of 707 college students and internet users was used. From these 241 were male and 466 female. The participants' age varied between 18 and 40 years old (M= 22.96; SD = 4.41). The inclusion criteria used for the study was: (1) being Portuguese and studying in a Portuguese university, and (2) willingness to participate in the study after learning its objectives. Participants were recruited through two sampling methods: (1) Informal social networks. The eligible internet users who agreed to participate were asked to refer their friends to participate in the study; and (2) The Internet. Material: Two instruments were used in this assessment, a socio-demographic questionnaire to enable the characterization of the participants' age, gender, degree and University/college attendance and the Revised Two Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001). Results: The final Portuguese version has a total of 16 items, instead of the 20 items proposed by the original version. A principal components factor analysis with varimax orthogonal rotation revealed a two factor structure, consistent with other researches using the instrument but not confirming the four factor structure found in the original version. In this version factor I - deep approach to learning, has a 9 items scope, and includes deep motives and deep strategies ($\alpha=.783$), with an explained variance of 20.463%; factor II - surface approach to learning has a 7 items scope, includes surface motives and surface strategies ($\alpha=.751$) and an explained variance of 16.544%. Deep and surface approaches were analysed separately in relation to age gender and academic degree, and in all cases significant statistical differences were found. Conclusion: The study provided evidence of the reliability and validity of the instrument, which showed good psychometric characteristics. The results indicate the Portuguese Revised Study Processes Questionnaire is an acceptable measure of learning approaches. Authors like [2] consider that when students are confronted with a learning task, they use the learning strategy that corresponds with their motivation to learn, in which case, it is important to analyse whether students are opting more frequently for deep or surface approaches and act upon that knowledge in a continuous effort to improve the learning process.

1 INTRODUCTION

To authors such as (Biggs, 1999) the acts of teaching or the adequacy of the learning techniques used by a teacher depend upon what each individual, whether a teacher, a student or someone external to the learning process feel is appropriate. This means that learning acquisition isn't bereft of subjectivism; or rather there isn't a single formula for the

teaching-learning process that ends up invariably in academic success. From this point of view it becomes clear that both teacher and student are responsible for behaviour gains, which in turn explains the importance of researching what every individual thinks is more adequate.

According to (Kember et al., 1994) approaches to learning are a direct characterization of the learning process used by students, resulting in the

creation of categories that classify those approaches, which (Biggs, 1979) differentiates in relation with the fact that some students study in order to develop their skill, and others do it to be able to pass the year or finish a certain academic task. These started to be referred by [6,7] as deep learning and surface learning, respectively, after researching done in an academic context.

However, [1, 8] point out that the fact a student prefers a deep or a surface approach to learning doesn't allow the student's classification in a deep learning student or a surface learning student. In this respect, (Biggs, 1999) thinks that even though students' approaches to learning vary and aren't a stable trait of an individual, the knowledge of this preferences might as expressed by (Alharbi et al., 2011) help the teacher/tutor in searching and creating study materials appropriate for every student.

Even though both types of approach have advantages and disadvantages, depending on the task required, various authors suggest that the adoption of a deep approach to learning might positively influence academic results, because it leads to a more meaningful learning (Gomes, 2011) and helps develop ways of promoting the adoption of that approach in the cases students aren't using it already, even though memorization and other surface approach techniques might be adequate when performing certain tasks, including evaluation (Figueiredo, 2008).

Concerning the materials used to evaluate learning conceptions and approaches to learning, (Valadas et al., 2009) indicates that there are few that have been normalized and validated for Portuguese college students. The decision to use the R-SPQ-2F (Biggs et al., 2001) derives from the fact that this instrument was created to: (1) identify the learning approaches preferred by students, indicating how much a student differs from his peers in a similar context; (2) ask students to fill a questionnaire with questions adapted to a certain task, which indicate how students actually perform the task; (3) indicate the context evaluation, providing information regarding differences between classes or teaching environment. Furthermore, the authors of this questionnaire believe it can be used in different classes, institutions, and grade system before and after introducing changes. On a last note, the R-SPQ-2F has been used all over the world, adapted when necessary, which renders it a natural good choice.

2 AIM

This research aimed to adapt and validate a study processes questionnaire for the Portuguese college student population, while at the same time producing comparative measurements of participants' gender, age, type of superior education institution of enrolment (university or polytechnic institute), degree of enrolment (graduate, masters, PhD) and year of graduation participants are attending. Various variables were studied: variables inherent to the questionnaire, total scores and scores attributed to the questionnaires dimensions. It was considered that gender, age, degree and year of enrolment are independent variables and students study processes (deep and surface approach) are dependent variables.

3 METHOD

A population of 707 Portuguese college students participated in this study.

3.1 Participants

3.1.1 Age

The 707 participants' age varies from 18 to 40 years ($M=22.96$; $SD=4.41$), as presented in Fig. 1.

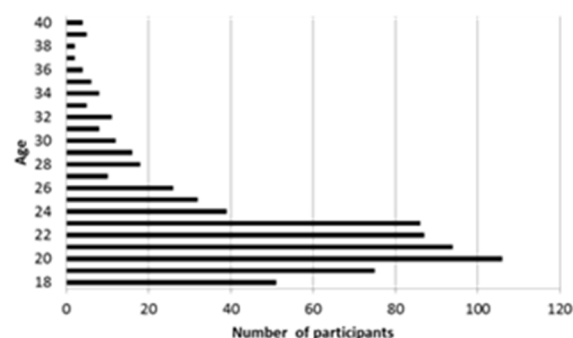


Figure 1: Frequencial distribution by age.

3.1.2 Gender

From the total of participants 466 are female and 241 are male, as shown is Fig. 2.

3.1.3 Degree

Not every participant gave information about their degree. In fact, 8 students didn't provide this information. From the remaining students, 9 have a bachelor degree, 363 a graduate degree, 263 a

masters, 16 a PhD and 48 participants signalled the option “other” which means that even though there’re enrolled, they have yet to conclude any degree, as shown in Fig. 3.

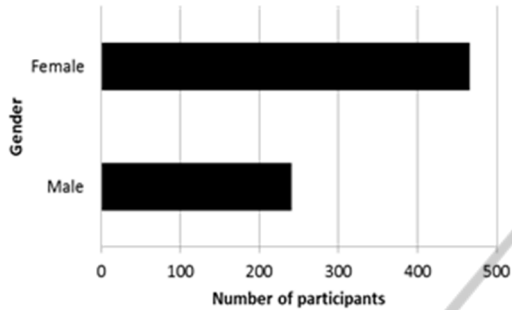


Figure 2: Frequencial distribution by gender.

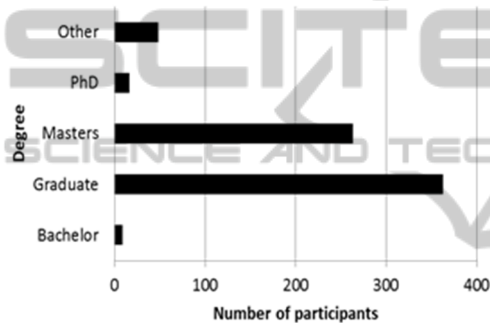


Figure 3: Frequencial distribution by degree.

3.1.4 Year

Not every participant gave information about their degree. In fact, 8 students didn’t provide this information. From Fig. 4 presents the information about the year the students are enrolled in or have successfully concluded, and the year they attend of the referred degree. For the bachelor degree 3 students referred to being enrolled in a first year and 6 in the third year. Concerning graduate studies, a total of 369 participants indicated this degree: 98 are enrolled in the first year, 111 in the second and 160 in the third. A total of 262 are masters students with 87 enrolled in the first year and 175 in the second year. Only 16 students were enrolled in a PhD. From these 8 are enrolled in the curricular year and the other 8 are in the second or third year of their thesis. A total of 49 participants referred to being enrolled in years 1 to 3 of “Other” degree.

3.2 Material

In this study two instruments were used: (1) Socio-demographic questionnaire; and (2) Revised Two

Factor Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001).

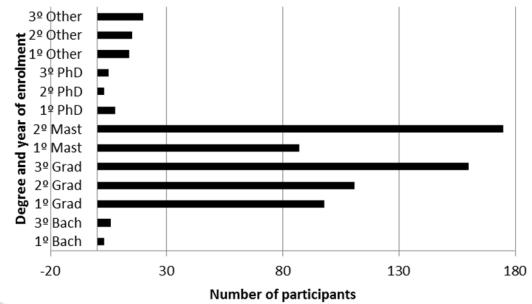


Figure 4: Frequencial distribution by study degree and year of enrolment.

3.2.1 Socio-demographic Questionnaire

A socio-demographic questionnaire was built for the study. In it the questions aimed to characterize participants in terms of age, gender, academic degree, year of the respective degree the participants were enrolled at during the lective year 2013-2014, type of establishment the participants were attending (university or polytechnic institute) and the identity of the referred establishment.

3.2.2 Two Factor Revised Study Processes Questionnaire (R-SPQ-2F) (Biggs et al., 2001)

The R-SPQ-2F is composed of 20 items that evaluate the approaches to learning, grouping them into two dimensions, with 10 items evaluating deep approach and 10 items evaluating surface approach. Each scale has two subscales measuring motivation and strategy components. This means the subscale that measures deep learning is composed of 5 deep motive items and 5 deep strategies items, while the subscale that measures surface approach has 5 items relating to surface motives and 5 items relating to surface strategies. All items are classified in a 5 options Likert scale, between 1 (never or rarely true) and 5 (always or almost always true).

The total score in each scale is calculated by the sum of the score obtained in the items relating to it, that is, for the Deep Learning scale, the sum is comprised of items 1+2+5+6+9+10+13+14+17+18 and for the Surface Learning scale, the sum is comprised of 3+4+7+8+11+12+15+16+19+20. To calculate each subscale the sum of the corresponding items is made: Deep motive: 1+5+9+13+17; Deep strategy: 2+6+10+14+18; Surface motive: 3+7+11+15+19 and surface strategy:

4+8+12+16+20. For each scale the score varies between 10 and 50 and for each subscale between 5 and 25 (Biggs et al., 2001).

In this research, between the various models to score the questionnaire's items found in the literature, the one used by (Hernández et al., 2002) was chosen. In it the higher the medium score, the more a type of approach is being used.

Because there have been many adaptations of the R-SPQ-2F, in different languages, the results of those psychometric studies vary. The Cronbach's alpha varies between .57 in (Biggs et al., 2001) and .78 in (Leung and Chan, 2001) in the surface strategy subscale, for example, and other such differences can be found for the other 3 subscales. Additionally not all adaptations found the proposed two scales and 4 subscales structure found in the original questionnaire (Biggs et al., 2001). In fact, some studies suggest solely the presence of two factors, namely the two approaches to learning (deep and surface) [16-18], even after performing a second or third order factorial analysis.

On a last note it should be added that the two types of approaches to learning reflect both the student's intention towards learning and the strategies the student uses to reach that knowledge.

3.3 Procedure

Previously to the development of this research a literature review helped choose the learning concept to be measured and studied. Following the choice of variable, a review of the known instruments to measure it was undertaken. Additionally it should be noted that permission was asked and granted by the author of the original instrument (Biggs et al., 2001) for it to be validated and used in a sample of Portuguese college students.

It was necessary to translate the original instrument from English to Portuguese. The Portuguese version results from a formal process of linguistic adaptation, with translation and retroversion by specialists in the English language and in Psychology. The specialists targeted the creation of a version equivalent with the original, both from a linguistic structure as from a semantic content stand point.

After finishing this step, the formal data collection was initiated with a pilot study that used six participants, and aimed to guarantee that both the instructions and the questions or items in the instrument were clear. It was necessary to do some small alterations to account for the observations made in the pilot study.

The instrument was made available using Google forms and a link for the questionnaire was distributed by email, Facebook, and personal contact list, to the Portuguese college institutions and students. Additionally word of mouth was also used to spread the request for filling the research form.

During all the process anonymity and confidentiality were guaranteed to all participants and the instructions held an e-mail to handle all possible questions and doubts.

Reception of answers to the questionnaire was available during January 2014. The answers stored in the online database provided with Google forms was afterwards transferred to Excel (.xls) for initial analysis and then migrated to SPSS v.22.0 for further and more complete analysis.

4 RESULTS

In order to assure that the Portuguese version of the revised study processes questionnaire could be used in the future by other researchers in other studies, the instrument was analysed in terms of its sensibility, reliability and factorial analysis.

4.1 Sensibility

The sensibility analysis of the items was done through measurements of Skewness and Kurtosis. According to (DeVellis, 1991), I2I absolute values indicate absence of dispersion which guarantees an instrument sensibility. All items showed a good sensibility with the exception of item 7, which was for this reason eliminated. In Table 1 items and corresponding sensibility values are presented.

After analysing sensibility, internal consistence was also analysed.

4.2 Internal Consistence

The sensibility analysis of the items was done through measurements of Skewness and Kurtosis. According to (DeVellis, 1991), I2I absolute values indicate absence of dispersion which guarantees an instrument sensibility. All items showed a good sensibility with the exception of item 7, which was for this reason eliminated. In Table 1 items and corresponding sensibility values are presented.

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4.3 Confirmatory Factor Analysis

An exploratory factor analysis was performed; that is, without previous fixed dimensions items were allowed to group and form dimensions. Afterwards sample adequacy was tested through the Keiser Meyer Olkin (KMO) test. This test whose scores vary between 0 and 1, considers that scores close to 1 are evidence of an excellent adequacy (Marôco, 2011). For this instrument a KMO=.857 was obtained. Furthermore, Bartlett's test revealed an $X^2=2897.626$; $p<.001$, indicative of the adequacy of performing the factor analysis. The principal components method was applied to extract factors and varimax rotation was used to arrive at the factor solution.

Table 1: Skewness and Kurtosis values of the Portuguese version of the items of the Revised Study Processes questionnaire (Biggs et al., 2001).

Items	Skewness	Skewness Std. Error	Kurtosis	Kurtosis Std. Error
1. Studying gives me a sense of...	-.196	.092	-.470	.184
2. I have to work or study hard...	-.161	.092	-.609	.184
3. My objective is to pass the year...	1.007	.092	.310	.184
4. I only study seriously what is given...	-.413	.092	-.502	.184
5. I feel that every subject might...	-.305	.092	-.403	.184
6. I consider the majority of new...	.154	.092	-.469	.184
7. I don't think my course is very...	1.996	.092	4.107	.184
8. I learn some things by heart...	.666	.092	-.091	.184
9. I consider that studying academic...	-.269	.092	-.549	.184
10. I ask myself questions...	-.485	.092	-.192	.184
11. I believe I can obtain approval in...	.578	.092	-.237	.184
12. Generally, I just study...	.213	.092	-.528	.184
13. I study hard because...	-.148	.092	-.387	.184
14. I spent a fair amount of my...	.584	.092	.044	.184
15. I don't consider it is useful to study...	.934	.092	.648	.184
16. I consider teachers don't...	.088	.092	-.867	.184
17. I go to the majority of classes with...	.389	.092	-.428	.184
18. I make it a point of looking at...	-.205	.092	-.681	.184
19. I don't see any reason in...	.508	.092	-.213	.184
20. I believe the best way to pass...	.876	.092	.312	.184

Initially four factors were produced, with a total explained variance of 49.991%. Factor 1 is comprised by 7 items relating to deep motives and strategies and explains a total variance of 17.378 %, with an alpha of .779; factor 2 is formed by 5 items related to surface motives and strategies, and explains a total variance of 13.224%, with an alpha of .703; factor 3 has 3 items related to surface motives and strategies and explains a total variance of 11.117%; finally, factor 4 has 3 items related to deep motives and strategies and explains a total variance of 8.271%, with an alpha of .449, which

justifies the elimination of this dimension and, consequently, of items 2, 17 e 18, even though according to authors as (Ford et al.,1986) the alpha score should be at least .40 to be considered acceptable. Table 2 shows the organization of the extracted factor analysis dimensions and the factor scores for the items.

By observing table 2, it is possible to conclude that the factor structure found in the theoretical design of the instrument proposed by (Biggs et al., 2001): 4 subscales resulting in 4 different factors, isn't verified in the present study.

Next, Scree Plot was analysed (Fig.5), and the pronounced curvature considered consistent with a two factors solution. Based on this information a new factor analysis with varimax rotation was performed, locking two factors.

Table 2: Component matrix by principal component analysis, and items factor value.

Items	Factors			
	I	II	III	IV
9. I consider that studying academic...	.721			
6. I consider the majority of new...	.719			
14. I spent a fair amount of my...	.707			
13. I study hard because...	.644			
1. Studying gives me a sense of...	.610			
10. I ask myself questions...	.486			
5. I feel that every subject might...	.430			
16. I consider teachers don't...		.727		
19. I don't see any reason in...		.676		
15. I don't consider it is useful to study...		.624		
12. Generally, I just study...		.598		
4. I only study seriously what is given...		.578		
3. My objective is to pass the year...		.495		
11. I believe I can obtain approval in...			.805	
8. I learn some things by heart...			.796	
20. I believe the best way to pass...			.708	
18. I make it a point of looking at...				.657
2. I have to work or study hard...				.605
17. I go to the majority of classes with...				.422
A	.779	.736	.717	.449

Fixing the two factors, the explained total variance of the instrument becomes 37.008%, and the instrument is now composed of 2 factors. Factor 1 has 9 items related to deep approach, including deep motives and strategies and is denominated "Deep Approach". This factor explains a variance of 20.463%, and has an alpha of .783; factor 2 is composed by 7 items, including surface motives and strategies, and is denominated "Surface Approach". This factor explains a variance of 16.544% and presents a .751 alpha, as shown in Table 3.

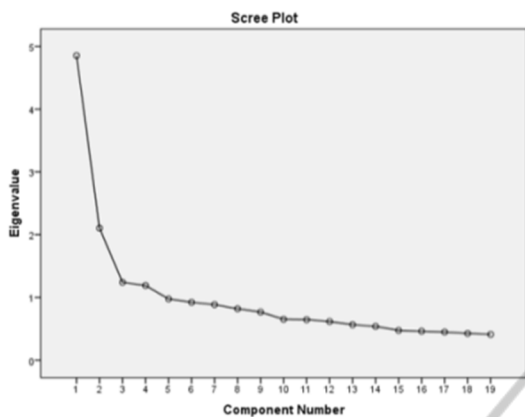


Figure 5: Scree plot graphic.

Table 3: Organization of the factor analysis extracted dimensions, fixing two factors and presenting the factor score values for each item.

Items		
	I	II
1. Studying gives me...	.656	
5. I feel that every...	.437	
6. I consider the...	.627	
9. I consider that...	.666	
10. I ask myself...	.532	
13. I study hard because...	.694	
14. I spent a fair amount of my...	.674	
17. I go to the majority of classes with...	.487	
18. I make it a point of looking at...	.462	
8. I learn some things by heart...		.661
11. I believe I can obtain approval in.....		.712
12. Generally, I just study...		.578
15. I don't consider it is useful to study...		.542
16. I consider teachers don't...		.482
19. I don't see any reason in...		.571
20. I believe the best way to pass...		.734
α	.783	.751

Table 4: Portuguese Revised Study Processes Questionnaire (QPER) final structure.

Items		
	I	II
1. Studying gives me a sense of...	.656	
5. I feel that every subject might...	.437	
6. I consider the majority of new...	.627	
9. I consider that studying academic...	.666	
10. I ask myself questions...	.532	
13. I study hard because...	.694	
14. I spent a fair amount of my...	.674	
17. I go to the majority of classes with...	.487	
18. I make it a point of looking at...	.462	
8. I learn some things by heart...		.661
11. I believe I can obtain approval in.....		.712
12. Generally, I just study...		.578
15. I don't consider it is useful to study...		.542
16. I consider teachers don't...		.482
19. I don't see any reason in...		.571
20. I believe the best way to pass...		.734
α	.783	.751
Dimensions	Items	
Deep Approach	1, 5, 6, 9, 10, 13, 14, 17, 18	
Surface Approach	8, 11, 12, 15, 16, 19, 20	

The Portuguese Revised Study Processes Questionnaire (QPER) presents a two scales factor structure and not the 4 subscales presented in the original instrument (Biggs et al., 2001). Furthermore, the Portuguese questionnaire is

composed of 16 items and not the 20 items of the original.

The structure and total score calculus proceedings for each approach result of the total score of the sum of the items in each respective dimension as shown in Table 4.

Besides validating the instrument, the data collected in this research was further analysed to study its compliancy with proposed hypothesis on whether gender, age and degree of scholarship might produce statistical significant differences in one or both of the scales.

The research found that there is a significant statistical difference between genders. In terms of Surface Approach male students (M=16.73; SD=4.38) have higher scores than female students (M=15.45; SD=4.26), with a statistical significant difference of $p < .001$. When analysing Deep Approach, results showed that female students (M=28.03; SD= 5.34) have higher scores than male students (M= 26.75; SD= 4.91), and there is also a significant statistical difference between genders ($p < .005$). To both genders higher scores were obtained in the Deep Approach dimension.

When age was analysed, a significant statistical difference was found between students with ages between 23 and 40 years old and deemed older students (M=28.56; SD=5.07) and students with ages between 18 and 22 years old and deemed younger students (M=26.91; SD=5.24), and older students scoring higher in the Deep Approach dimension ($p < .001$). In terms of the Surface Approach dimension, a significant statistical difference was also found ($p < .05$), but in this case younger students (M=16.20; SD= 4.30) scored higher than older students (M= 15.45; SD= 4.36). Concerning age, both younger and older students obtained higher scores in the Deep Approach dimension.

Significant statistical differences were also found between students with a higher degree and a lower degree. In this case, for the Surface Approach dimension, students with a higher degree (M=15.53; SD=4.17) scored lower than students with a lower degree (M=16.19; SD=4.47) and the statistical significant difference is $p < .05$. As for the Deep Approach, in this case students with a higher degree (M= 28.08; SD= 5.09) scored higher than students with a lower degree (M= 27.17; SD= 5.31), and there's also a significant statistical difference ($p < .05$). Lastly, in what concerns students with a higher or a lower degree, students scored higher in the Deep Approach dimension.

5 CONCLUSIONS

According to authors such as Lublin, (2003) Pashler et al. (2008) and de Souza et al. (2010) the need to promote an educational context that facilitates the students' learning process requires a precise diagnostic of the individual types and approaches to learning these students use. This diagnostics is possible by using available instruments that study the approaches to learning adopted by students when they're faced with different academic tasks and how to adapt the teaching method and techniques in response to those findings.

In this research a particular instrument (Biggs et al., 2001) whose characteristics and objectives were in line with the researchers study was selected, more so because this instrument has been adapted by several researchers for different populations.

In the process of adapting and validating the original instrument, the results of the Portuguese Revised Study Processes Questionnaire were found to not replicate the factor structure found on the original instrument, however they were similar to those found by other researchers when validating and adapting the original instrument to their own samples. The researchers concluded that the Portuguese version of the instrument showed good psychometric properties that make it suitable to apply in studies using samples of Portuguese college students.

Besides enabling the production of a validated instrument, by analysing the data collected the researchers acquired valuable knowledge related not only to what approach to learning is more often used, but also how variables like gender, age and academic degree might influence student choices. Knowing the choices made by students and how those are influenced can allow teachers and tutors to analyse how the techniques and methods they are employing are influencing students in their choices of approaches to learning, and also help teachers and tutors develop ways to adapt their techniques and methods in the hopes of providing a learning environment that promotes the predominant use of a deep approach to learning and therefore make sure students have a more meaningful learning, which authors associate with the predominant use of a deep approach to learning.

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