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Learning approach and learning environment perception of biological and health undergraduate students

Estilo de aprendizagem e percepção do ambiente educacional de universitários da área biológica e da saúde

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ABSTRACT | INTRODUCTION: Individual and environmental factors can influence the approach to learning. Deep learning requires the use of complex cognitive mechanisms and student involvement. **OBJECTIVE:** To investigate the approach to learning of undergraduate students in courses in the biological and health areas that use traditional teaching methodologies and their perception of the educational environment at the end of graduation. **METHOD:** Cross-sectional study with students from classes in a public university's biological and health areas. Data were collected through three questionnaires: sociodemographic, R-SPQ-2F, and DREEM. For comparison of means, Student's t or Mann-Whitney tests were used. Correlations were calculated using Spearman's coefficient. Multiple linear regression was used to verify the influence of variables on the learning approach. Statistical analyzes were performed in the SPSS Program (version 26) with a significance level of 5%. For analyses, students were divided into two groups (basic and applied courses), considering their involvement in health care. **RESULT:** The students reported using more deep approaches than superficial ones (basic courses: 29.78 versus 22.00; applied: 30.16 versus 20.25), with no significant difference between them (p>0.05). For basic courses, being employed had a negative effect on deep learning, while for applied courses, undertaking scientific initiation increased the use of this approach. The general perception of the educational environment was considered "more positive than negative" (basic courses: 104.28 and applied courses 120.47), with students from applied courses having a more positive perception of the environment and those with a steady job having a more negative perception. **CONCLUSION:** The use of a deep approach was superior to the superficial approach for all courses and there was a positive association between the use of a deep approach and a better perception of the educational environment. Sociodemographic factors, such as the need to have a job during graduation, may influence the approach to learning, as well as the perception of the educational environment.

KEYWORDS: Higher Education. Health Sciences. Biological Science Disciplines. Learning. Deep Learning.

RESUMO | INTRODUÇÃO: A abordagem ao aprendizado pode ser influenciada por fatores individuais e ambientais. O aprendizado profundo requer utilização de mecanismos cognitivos complexos e o envolvimento do estudante. **OBJETIVO:** Investigar a abordagem ao aprendizado de estudantes de graduação de cursos da área biológica e da saúde que utilizam metodologias tradicionais de ensino e sua percepção do ambiente educacional ao final da graduação. **MÉTODO:** Estudo transversal com estudantes de cursos da área biológica e da saúde de uma universidade pública. Dados coletados por meio de três questionários: sociodemográfico, o Questionário Revisado do Processo de Estudo (R-SPQ-2F) e *Dundee Ready Education Environment Measure* (DREEM). Para comparação de médias utilizou-se os testes t de Student ou Mann-Whitney. As correlações foram calculadas pelo Coeficiente de Spearman. A regressão linear múltipla foi utilizada para verificar a influência das variáveis na abordagem ao aprendizado. Análises estatísticas realizadas no programa SPSS (versão 26) e nível de significância de 5%. Para análises, estudantes divididos em dois grupos (cursos básicos e aplicados), considerando envolvimento em cuidados a saúde. **RESULTADO:** Os estudantes de ambos os grupos demonstraram utilizar mais a abordagem profunda do que a superficial (cursos básicos: 29,78 *versus* 22,00; aplicados: 30,16 *versus* 20,25), sem diferença significativa entre eles (p > 0,05). Para cursos básicos, estar empregado exerceu efeito negativo sobre a aprendizagem profunda, enquanto, para cursos aplicados, realizar iniciação científica aumentou o uso dessa abordagem. A percepção geral do ambiente educacional foi considerada "mais positiva do que negativa" (cursos básicos: 104,28 e cursos aplicados 120,47), sendo que alunos de cursos aplicados tiveram percepção mais positiva do ambiente e aqueles com emprego fixo uma percepção mais negativa. **CONCLUSÃO:** O uso de abordagem profunda foi superior à da superficial para todos os cursos e houve associação positiva entre o uso de abordagens profundas e melhor percepção do ambiente educacional. Fatores sociodemográficos, como a necessidade de ter um emprego durante a graduação, podem influenciar a abordagem ao aprendizado, bem como a percepção do ambiente educacional.

PALAVRAS-CHAVE: Educação Superior. Ciências da Saúde. Disciplinas das Ciências Biológicas. Aprendizagem. Aprendizado profundo.

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Introduction

The quality of student learning has been a frequent topic of teaching research over the last decades. Three forms of learning approaches are described: deep, surface and strategic.[1] Surface learning (SL) is related to a limited understanding of the subject studied. There is no use of complex cognitive mechanisms, but short-term memorization strategies.[2]

On the other hand, deep learning (DL) presumes a comprehensive understanding of the subject, including perception and understanding of concepts, principles and underlying mechanisms. Regarding this, students must be interested in the subject, be responsible for studying it and adopt strategies that maximize understanding.[1,3] Students who experience DL will have a more significant understanding of the topic studied compared to those who used a surface approach.[2,4,5]

On the other hand, in the strategic learning or high-performance approach, students are motivated by competitiveness and to increase self-esteem, instead of having a real interest in the subject. This approach aims at gaining knowledge content, which can be surface or profound.[4]

To assess the quality of learning styles, the Revised Study Process Questionnaire (R-SPQ-2F) is one of the most used instruments[6] and was validated for use in Brazil.[4] The R-SPQ-2F helps to understand how students approach learning, as the answers obtained in its items are the result of individual characteristics and the teaching context.[7,8]

The nature of educational activities, assessment methods and social relationships influence the approach that the student will adopt for learning.[2,9] Thus, the learning environment, which comprises the social, psychological and pedagogical context in which learning takes place, assumes a central role.[10] The Dundee Ready Education Environment Measure (DREEM) is one of the most used questionnaires to assess the educational environment and is applied in several undergraduate courses for health professionals around the world, including Brazil.[11-13] The DREEM provides diagnostic information and a basis to improve the teaching and learning environment, justifying its application in higher education.[10] In addition, students' perception of the educational environment is considered a strong predictor of academic performance at university.[12]

For the training of professionals in the biological field, especially for health care practice, studies show that a more humanistic training is required, with content integration and development of essential skills for clinical practice.[13] Significant learning enhances the achievement of these goals and, therefore, it is essential to check the approach to learning adopted during undergraduate studies by these future professionals. It is important to point out that different forms of teaching-learning approaches also significantly influence the ability of students and professionals to keep up with the evolution of science, which ultimately provides an instrument to improve their clinical performance throughout their professional career.[14]

Several elements influence the type of learning, but little is known about how they relate to each other and to the different learning environments.[15] Teaching methods are among the factors that influence the learning approach. However, studies that investigated the association between the teaching method and the learning style adopted by students presented contradictory results, which may be the result of methodological differences or institutional singularities.[6] In addition, there is a limited number of studies that evaluated the influence of traditional teaching methods on the type of learning adopted by Brazilian university students from biological areas. Therefore, this study aimed to investigate the type of learning approach adopted by students of biological and health courses at a public university and its correlation with individual characteristics and learning environment, using R-SPQ-2F and DREEM questionnaires.

The research questions of this study are:

1st) what is the learning style adopted by university students in biological and health courses that adopt traditional teaching methodologies?

2nd) what is the correlation between the learning style and the perception of the learning environment at the end of an undergraduate course?

3rd) what are the sociodemographic and academic determinants of learning styles?

Methods

Cross-sectional, quantitative study, approved by the Ethics Committee and Human Research at the Universidade Federal de São Carlos (UFSCar) (CAAE: 11515419.5.0000.5504/Document: 3.363.505), where the study was carried out. UFSCar a public university, located in the southeastern region of Brazil. Data collection took place from August to October 2019.

Students regularly enrolled in the last year of Biological Sciences, Management and Environmental Analysis, Physical Education, Nursing, Physiotherapy and Gerontology courses were invited to participate. These courses adopted traditional curricula and teaching methodologies. We excluded students from courses that utilize or utilized active teaching-learning methods (Medicine and Occupational Therapy), those who were in internship off-campus (Biotechnology) and students enrolled only in the undergraduate courses for teachers were excluded. The questionnaires were conducted in person by the same researcher in a single moment, individually, and only after the respondent had signed the Free and Informed Consent Form (TCLE).

Data were collected through a sociodemographic questionnaire, the R-SPQ-2F1 and the DREEM.[11] The Sociodemographic Questionnaire investigated students' sociodemographic situation and academic information, such as gender, age, grades, type of access, type of student assistance, employment, participation in extracurricular activities (English courses, scientific initiation, tutoring, leagues, athletic associations, congresses, among others) and in Curricular Activity of Integration Teaching, Research and Extension (ACIEPE in Portuguese, which are complementary curricular activities offered by the university and mandatory in the undergraduate course curricula, lasting 60 hours and freely chosen by the student). ACIEPES were included in the analysis because they are activities that provide flexibility to the curriculum and are highly valued in the institution.

We utilized the DREEM questionnaire to analyze the students' learning environment. The questionnaire consists of 50 questions categorized into five dimensions: D1 = learning perception, D2 = teachers' perception, D3 = academic results perception, D4 = general environment perception, D5 = social relations perception. The questions are based on a Likert scale, ranging from 0 (strongly disagree) to 4 (strongly agree). The maximum score is 200 points (total DREEM or DT) calculated by the sum of the items, and the higher the value, the more positive the perception. Traditionally, this total score is transformed into nominal categories and for scores between 0 and 50, the environment is considered poor; between 51 and 100, it has many problems; between 101 and 150, it has more positive aspects than negative; and, between 151 and 200, the environment is excellent.[16]

The Revised Study Process Questionnaire (R-SPQ-2F) instrument was used to evaluate the type of student learning. The questionnaire contains 20 questions scored according to a Likert scale with five answers. It has two subscales: the surface learning (SL) approach and the deep learning (DL) approach, consisting of 10 questions each. The total score is a simple sum of the questions for each approach, which can vary from 10 to 50. The higher the score, the greater the use of a specific approach.

Descriptive statistics were used to characterize the sample. To compare means, the Student's t-test or Mann-Whitney test were performed, depending on the distribution of the variable. Correlations were calculated using the Spearman Correlation Coefficient. Multiple linear regression was used by the stepwise method to verify the influence of the independent variables on different learning approaches. The significance level considered was 5%. Data were tabulated in Microsoft Excel 2010 for Windows. Statistical analyses were performed using the statistical package Statistical Package for the Social Sciences (SPSS), version 26. For comparative analysis, the undergraduate courses were divided into 2 groups (basic and applied), according to their involvement in health care. The courses considered as basic were Biological Sciences and Management and Environmental Analysis because they did not have direct contact with patients. The others were classified as applied.

Results

At the time of the research, the university had a total of 152 last year students in nursing (18), physical

education (19), physiotherapy (35), biological sciences (33), gerontology (22), and environmental management and analysis (25) undergraduate courses. 131 students participated in the study (86% of the 152 total): 17 from nursing (12.98%), 15 from physical education (11.45%), 31 from physiotherapy (23.67%), 28 from the bachelor's degree in biological sciences (21.37%), 18 from gerontology (13.74%) and 22 from the environmental management and analysis course (16.79%). Therefore, there was a good sample distribution among the courses, as well as a good representativeness of the sample collected (over 80% of the total).

In the basic courses group, 50 students participated (38.17% of the total), most of whom were female (60.0%). The mean age was 23.9 ± 3.8 years, and 70% came from the state of São Paulo. In the applied courses, 81 students participated (61.83% of the total), 74.1% of whom were female. The mean age was 24.1 ± 3.3 years; most were from public schools (59.3%) and from the city (45.70%) or from the state (45.70%) where the university is located.

Table 1. Descriptive analyses of the students' perception of the approach to learning and the learning environment

Variable	Basic Courses (N = 50)					Applied courses (N = 81)				
	Mean	Median	DP	Minimum	Maximum	Mean	Median	DP	Minimum	Maximum
Learning style										
DL	29.78	29.50	6.32	15	41	30.16	30.00	5.95	19	43
SL	22.00	21.50	6.17	12	35	20.25	20.00	6.18	10	38
Learning environment perception										
DT	104.28	104.00	26.17	36	174	120.47	122.00	22.73	63	173
D1	22.36	22.00	7.51	10	42	27.48	28.00	6.50	13	44
D2	23.74	24.00	6.82	7	37	27.51	28.00	5.86	15	40
D3	16.90	16.00	4.73	7	29	20.20	21.00	4.53	8	27
D4	26.20	26.50	6.45	9	41	29.56	29.00	6.49	13	44
D5	15.08	14.50	4.94	2	26	15.73	17.00	3.61	7	23

Abbreviations: DL = deep learning, SL = surface learning, DT = DREEM Total, D1 = learning perception, D2 = teachers' perception, D3 = academic results perception, D4 = General environment perception, D5 = social relations perception.
Source: The authors (2023).

Students in both groups adopted the DL approach more (basic courses: 29.78, applied courses: 30.16) than the SL approach, on average (basic courses: 22.00; applied courses: 20.25), with no significant differences between them.

Concerning the total score (DT) of the DREEM evaluation of the learning environment, it was noted that, on average, students from applied courses (DT = 120.47) presented a significantly ($p < 0.05$) more positive evaluation than students of basic courses (DT = 104.28). However, when we evaluated the groups by classification, we observed that both had an average score between 100 and 150 (basic courses: 104.28 and applied courses 120.47), resulting in an evaluation "with more positive aspects than negative ones".

For both courses, the "the general environment perception" (D4) had the best evaluation mean, while the "social relations perception" (D5) had the worst. The "learning perception" (D1) and "teachers' perception" (D2) dimensions were evaluated with very similar values in both courses, without any significant differences. The "academic results perception" dimension (D3) was better evaluated in the applied courses.

The correlation between DT and DL was positive and statistically significant, with a weak value among the basic courses ($\rho = 0.357$) and moderate among the applied courses ($\rho = 0.428$). Between DT and SL, the correlation was also statistically significant and negative, with a moderate magnitude among the basic courses ($\rho = -0.489$) and weak in the applied courses ($\rho = -0.321$) (Table 2).

The results indicated that, in general, using DL approaches is positively associated with the perception of the learning environment (Table 2). It should be noted, however, that among students of basic courses, the only two dimensions of the DT that were statistically significantly associated ($p < 0.05$) with the DL were: learning perception (D1) ($\rho = 0.442$) and general environment perception ($\rho = 0.392$). Among the students of the applied courses, all dimensions were significantly correlated, except for the perception of social relations (D5).

Table 2. Binary correlation (Spearman's rank) between the approach to learning and the learning environment

	Basic courses (N = 50)		Applied courses (N = 81)	
	DL	SL	DL	SL
DL	-	-	-	-
SL	-0.355*	-	-0.471**	-
DT	0.357*	-0.489**	0.428**	-0.321**
D1	0.442**	-0.489**	0.401**	-0.369**
D2	0.188	-0.312*	0.356**	-0.260*
D3	0.272	-0.352*	0.421**	-0.225*
D4	0.392**	-0.449**	0.432**	-0.329**
D5	0.214	-0.438**	0.124	-0.045

Abbreviations: DL = deep learning, SL = surface learning, DT = total DREEM, D1 = learning perception, D2 = teachers' perception, D3 = academic results perception, D4 = general environment perception, D5 = social relations perception. *p<0.05 (2 two-tailed). **p< 0.01 (2 two-tailed).
Source: The authors (2023).

The multiple linear regression model using stepwise method was used to analyze the DL determinants (Table 3). DL is a continuous variable, with normal distribution, resulting from the simple sum of the questions applied by the R-SPQ-2F, and ranging from 15 to 41 for the basic courses (26 points) and from 19 to 43 for the applied courses (24 points). The initial model had the following as predictor variables (independent): sex, age group, course entry (access without affirmative actions, affirmative actions, transfer), high school (private or state), student assistance, whether currently employed, family financial aid, improved in English in undergraduate course, scientific initiation in undergraduate studies, monitoring activities, participation in scientific congresses, participation in ACIEPE. The variables are described in the following table (Table 3). All predictor variables were nominal. The "did not respond" categories were excluded from the analyses.

Table 3. Description of entry variables from the stepwise method

Variables	Basic courses (N = 50)		Applied courses (N = 81)	
	N	%	N	%
Sex				
Female	30	60.0	60	74.1
Male	20	40.0	21	25.9
Age group				
20-22 years old	22	44.0	35	43.2
23-25 years old	21	42.0	25	30.9
25 years old or over	7	14.0	21	25.9
Course entry				
Access without affirmative actions	24	48.0	42	51.9
Affirmative actions	24	48.0	38	46.9
Transfer	1	2.0	0	0
Did not respond	1	2.0	1	1.2
High school				
Private	23	46.0	31	38.3
State	26	52.0	48	59.3
Did not respond	1	2.0	2	2.4
Student assistance				
No	36	72.0	61	75.3
Yes	14	28.0	19	23.5
Did not respond	0	-	1	1.2
Currently employed				
No	41	82.0	64	79
Yes	9	18.0	17	21
Family financial aid				
No	15	30.0	18	22.2
Yes	35	70.0	63	77.8
Improved in English in undergraduate course				
No	24	48.0	46	56.8
Yes	26	52.0	35	43.2
Scientific initiation in undergraduate course				
No	17	34.0	15	18.5
Yes	33	66.0	66	81.5
Monitoring activities				
No	30	60.0	57	70.4
Yes	20	40.0	24	29.6
Congresses				
No	31	62.0	46	56.8
Yes	19	38.0	35	43.2
ACIEPE				
No	38	76.0	47	58
Yes	12	24.0	34	42

Abbreviation: ACIEPE = Curricular Activity of Integration Teaching, Research and Extension
Source: The authors (2023).

The ANOVA analyses were significant ($p < 0.05$) and, after the stepwise procedure, an R^2 of 17% was obtained for the basic courses and 12% for students of the applied courses.

In the model for students of basic courses, the employment variable had a negative and statistically significant effect on DL. On average, being employed reduced the DL score by 5.82 points ($p < 0.05$). Participating in ACIEPE also decreased the DL by an average of 4.97 points ($p < 0.05$).

The model for students of applied courses obtained only one variable after the stepwise procedure. In this case, students who performed scientific initiation increased, on average, 5.37 points in the DL score ($p < 0.05$).

Table 4. Multiple Linear Regression using the stepwise method. Dependent variable: DL

	Basic courses (N = 50)		**Applied courses (N = 81)**	
	Beta (Standard error)	*Beta standard*	*Beta (Standard error)*	*Beta standard*
Constant	32.044** (1.093)		25.933** (1.453)	
Employed	-5.825* (2.196)	-0.357	-	
ACIEPE	-4.976* (1.980)	-0.338	-	
Scientific initiation in undergraduate course	-		5.373** (1.619)	0.358
R^2 adjusted	0.17		0.12	

Abbreviation: ACIEPE = Curricular Activity of Integration Teaching, Research and Extension. *p<0.05 (2 two-tailed). **p< 0.01 (2 two-tailed).
Source: The authors (2023).

In the next step, the perception of the learning environment was analyzed, using the same method and variables, with DL and SL as independent variables. The dependent variable was the DREEM total score (DT). This is a continuous variable, with a normal distribution, which ranged from 36 to 174 (138 points) in the basic courses and from 63 to 173 (110 points) in the applied courses. The adjusted R^2 for the models was 42% for the basic courses and 22% for the applied courses. The models' ANOVA were significant ($p < 0.05$).

After selecting the most relevant variables using the stepwise method, a negative and statistically significant ($p < 0.05$) effect of SL on the perception of the learning environment was observed among basic course students: for each point on the SL scale (which ranged from 23 points for the basic courses to 28 points for the applied courses), there was a loss of -1.823 on the DREEM total score (DT). Students who received student assistance also had, on average, a more negative perception of the learning environment (-13,709). On the other hand, participation in congresses increased the total DREEM by 18.38 points and for each increase in age category (which had 3 categories), there was an increase of 1.712 in the DREEM score.

Table 5. Multiple Linear Regression using the stepwise method. Dependent variable: DREEM

	Basic courses (N = 50)		**Applied courses (N = 81)**	
	Beta (Standard error)	*Beta standard*	*Beta (Standard error)*	*Beta standard*
Constant	100.101** (23574)	-	68.559 (12.260)	-
SL	-1.823** (0.490)	-0.430	-	-
Participation in congresses	18.388** (6.165)	0.337	-	-
Age group	1.712* (0.794)	0.250	-	-
Student assistance	-13.709* (6.552)	-0.236	-	-
DL	-	-	1.640** (0.391)	0.426
Employed	-	-	-11.338* (5.612)	-0.206
R^2 standard	0.42		0.22	

Abbreviations: DL = deep learning, SL = surface learning. *p<0.05 (2 two-tailed). **p< 0.01 (2 two-tailed).
Source: The authors (2023).

Discussion

The way students approach their learning is considered changeable and influenced by factors such as individual characteristics and the academic environment.[6] The present study evaluated the type of learning adopted by university students in the last year of their undergraduate courses adopting a traditional methodology in the area of biology and health and its relationship with sociodemographic variables and the learning environment. It was found that, in all courses, students used more DL approaches than SL ones. These results corroborate the understanding that the learning style adopted by students is influenced by several factors and not just by the teaching methodology.[5,17,18]

The DL concept is associated with meaningful learning and greater intrinsic motivation, constructs often related to educational environments centered on student learning. However, Gijbels et al. compared the students' perception of the learning approach before and after a curriculum reform and did not show differences in the students' perception regarding the type of learning approach.[5] Vermetten et al. suggest that individual learning characteristics influence the student's relation with the educational environment and may lessen the possible impact of teaching methodologies on DL.[18]

Considering the individual characteristics of the students, the greater use of DL compared to SL approaches can be explained by the predominance of female students in the sample. Falk et al. found that a high proportion of female students in the sample could explain higher DL scores, as female students reported less use of SL than male students.[19]

The predominance of DL in the present work may also be due to the fact that the students were in their final year of their undergraduate course. Similar results were found by Haghparast et al. in a sample of dental students. The authors observed that, at the end of the undergraduate course, there was a decrease in the SL score, when compared to the beginning and middle of the course.[8]

However, in our sample, DL predictors were different in the two studied groups. In the basic courses group, being employed during the undergraduate course and participating in ACIEPEs were negative predictors for the use of DL strategies. A possible explanation could be the fact that such activities reduce the time available for studying the course's mandatory disciplines. A similar result was observed by Barros, Monteiro and Moreira, who demonstrated a positive correlation between an exclusive dedication to studies and adopting DL approaches.[9] Mork et al. also identified that study overload reduces motivation and increases fear of failure, leading to SL strategies.[20] In these two studies, using DL strategies was also attributed to less time available for studies.

In the group of applied courses, taking a scientific initiation course during an undergraduate course had a positive and statistically significant impact on using DL strategies. One hypothesis is that students involved in research are more interested in a comprehensive understanding of the topic. When part of the knowledge construction process, they acquire greater responsibility and the ability to establish relationships, favoring DL.[21] Although having similarities with scientific initiation due to the fact that they are a free choice topic, ACIEPEs are mandatory subjects and rely on traditional evaluation processes that favor surface learning, which could explain their effect as negative predictors of DL, in contrast with the positive predictive effect of scientific initiation. More studies are needed to understand these differences.

Regarding the educational environment, both groups of students considered it adequate, with more positive than negative aspects. This result is corroborated by the literature, which shows that about 80% of studies using the DREEM scored in the same range.[22]

Students on the applied courses showed a more positive perception of their educational environment, when compared to students on the basic courses. In the applied courses, the "social relations perception" dimension obtained a lower score, similar to the work by Guimarães et al., indicating that, on average, students felt tired, discouraged and alone.[13] In these courses, there is a demand for full responsibility and dedication from students who deal with health care, as they actively participate in decisions that directly interfere with patients' quality of life, which often causes students to neglect leisure and rest. In the basic courses group, it was mentioned by the students that the dimension that could be improved the most was the "learning perception", which considers whether the student is encouraged to participate in classes, encouraged to look for his own knowledge, or whether teaching emphasizes memorable facts. In addition, in this group, students in vulnerable situations evaluated the educational environment more negatively, reinforcing the importance of psychosocial support for these students.

Considering that all courses in this study used traditional teaching methodologies, the difference in perception of the educational environment between the two groups was surprising. A possible explanation for this finding is that the greater satisfaction in the applied courses group can be attributed to the practical internships taken in recent years. Learning in practical environments, such as health services, is based on the theory of experiential learning, which promotes meaningful learning, stimulating the search for knowledge and favouring the perception of a curriculum centered on student learning, and consequently, more positively evaluated.[23]

Considering the sociodemographic variables, in contrast to the results obtained from Gustin et al., it was observed that, for basic courses, an increase in the student's age positively influenced the educational environment perception.[24] When considering the respondent's gender, Bakhshialiabad et al. found that the average of this perception was higher in females[25], however in this study, the average perception of the educational environment did not differ between men and women, indicating an alignment of objectives and academic results between genders.

Among students of applied courses, being employed negatively impacted, with statistical significance, the index of perception of the learning environment. This finding can be explained by the student's difficulty in dealing with the overload from the double shift, which influences both learning and social relations.

Studies using the DREEM indicate that overloaded students tend to negatively evaluate their educational environment.[26]

It was also found that using DL approaches was positively associated with the educational environment perception. For the basic courses group, the "teachers' perception" dimension showed a low association with DL and SL, when compared with the other analyzed dimensions. The "learning perception" dimension was the one most positively associated with DL and negatively associated with SL. For the applied courses, the "learning perception" dimension showed the strongest negative association with SL. These results showed that the perception about teachers had little influence on the type of learning approach, but that the perception about the learning environment influenced the type of approach, stimulating the DL and reducing the SL approaches in both groups. In the regression models, SL had a negative and statistically significant impact on the perception of the learning environment among students taking the basic courses, while DL had a positive and statistically significant impact among students studying for the applied courses.

Similar results were found by Gustin et al., in a study with 1,394 medical students in three institutions in two countries, demonstrating that approximately 25% of the variation in the use of the DL approach could be explained by the impact of the educational context, directly or indirectly.[24]

In this study, some limitations must be considered. Participants were not randomly selected and a convenience sample was used. All data were obtained from the students' perception, not using other sources of information in the academic performance. The R-SPQ-2F and DREEM questionnaires capture the students' perceptions, but do not provide explanations for the results obtained, requiring further studies to understand the data in more depth.

Given the above, the results of the present study indicated that although students use DL approaches more and consider their educational environment adequate, areas that can be improved were identified. For instance, the need for students to be supported in times of stress and find a balance between university demands, rest and leisure, suggesting the implementation of a psychopedagogical support center. In addition, adopting methodologies that involve more student participation in the learning process, avoiding purely memory content, could contribute to increasing the use of deep approaches by students throughout their undergraduate studies. Including service learning in basic course curricula can be an option. Other studies are needed to confirm this hypothesis.

Conclusions

The present study reaffirmed the positive correlation between a greater use of a DL approach and an adequate educational environment, as well as the importance of sociodemographic variables in this approach. In our sample, the need of being employed during the undergraduate course influenced the approach to learning, as well as the educational environment perception.

Students from biological areas demonstrated more DL than SL approaches at the end of their undergraduate course and their perception of the educational context was more positive than negative. However, areas that could be improved were identified, mainly with regard to psychopedagogical support, as well as implementing pedagogical approaches centered on student learning that can enhance using DL strategies, which are fundamental for developing skills such as a critical analysis of knowledge, synthesis capacity, association between new and previous knowledge, and applying acquired knowledge to professional practice throughout life. Offering courses based on service learning could improve the evaluation of the educational environment.

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Authors' contributions

Cruz PSN participated in designing the research questions, methodological design, collection and statistical analysis of research data, interpretation of results, and writing the scientific article. Rocha SR and Casalecchi GA participated in designing the research questions, methodological design, statistical analysis of research data, interpretation of results, writing the scientific article. Germano CMR participated in designing the research questions, methodological design, statistical analysis of research data, interpretation of results, writing the scientific article. All authors reviewed and approved the final version and are in agreement with its publication.

Conflict of interests

No financial, legal or political conflicts involving third parties (government, companies and private foundations, etc.) were declared for any aspect of the submitted work (including, but not limited to grants and funding, participation in an advisory board, study design, preparation manuscript, statistical analysis, etc.).

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